# The National Statement of Science Investment

**Feedback from the New Zealand Association of Scientists**

The New Zealand Association of Scientists (Inc.)

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This document was prepared on the basis of consultation with the scientific community, both current members of the Association and scientists who do not belong to the Association. We would like to thank them all for their input.

***Contents:***

## *I. Introduction and Context*

The National Statement of Science Investment (NSSI) is of serious importance to the New Zealand Association of Scientists (NZAS). Our aims, as set down in the Rules of our Association, are:

- *To secure the widest application of science for the welfare of society.*
- *To promote public discussion and participation in the resolution of scientific and technical issues of public concern that may affect the welfare of society.*
- *To uphold interchanges of scientific knowledge and discussion both nationally and internationally.*
- *To promote measures to eliminate discrimination in science on any grounds other than scientific merit.*
- *To encourage excellence in science, science education, and an awareness of social responsibility and ethics in science.*
- *To defend the right of scientists to work in a spirit of intellectual freedom, to pursue, express and defend the scientific truth as they see it.*
- *To defend the right of scientists to express themselves freely on the human, social or ecological value of projects, and to defend their right to withdraw from projects if their conscience so dictates.*
- *To combat all tendencies to limit scientific investigation or to suppress scientific discoveries, to expose pseudo-scientific theories and claims, particularly where such are used as justification for social and financial ends or policies.*
- *To promote the use of expert scientific advice by official agencies on all matters involving the application of science and the institution of government, supported by research wherever necessary.*
- *To advance the status of scientists in the community and to secure for them those conditions of employment appropriate to their professional standing.*
- *To hold either alone or jointly with other bodies meetings and conferences promoting social awareness in matters of scientific concern, and to recognise excellence in scientific work and outstanding service to science in an appropriate manner.*
- *To do all such lawful things as are incidental or conducive to the attainment of the above aims or any of them.*

The NZAS welcomes the draft National Statement of Science Investment as an important step towards transparency around government funding of scientific research, and towards evidence-based policy making. It signals the start of an open conversation between policy makers and the science community on priorities for science investment in New Zealand.

## *II. Major recommendations*

*We provide ten key recommendations based on our answers to the questions asked by MBIE, which we address in full on the following pages.*

| | |
|---|---|
| 1 | **Reinstate a nationally competitive postdoctoral funding scheme** to support knowledge transfer and innovation. For example, this could be managed by RSNZ alongside the Rutherford Discovery Fellowships. Consider aligning incentives in PBRF, e.g. including postdoctoral training as a key indicator of research quality. |
| 2 | **Increase (at least double) the size of the Marsden Fund**. Currently, the Marsden Fund represents less than 5% of total investment. Contestable funds (both through Marsden and MBIE) are crucial for the development of new ideas and the competitiveness of NZ researchers on the international stage. Success rates must go up to lower transaction costs: this applies to both the Marsden Fund and other contestable funding. |
| 3 | **Increase funds available to early stage targeted research** (i.e. with reduced expectation for direct industry co-funding) to enable connection and complementarity between the Marsden and MBIE funded programmes over time. |
| 4 | **Support the use of evidence about the science sector** to inform science policy. The NZAS has previously run NZ wide surveys on the state of science in NZ: we would welcome MBIE involvement and support of future surveys. Capture of appropriate demographic information, such as gender of PIs and career development information across the science sector, should also be instituted. |
| 5 | **Simplify the present administrative model for health-related National Science Challenges** to a single independent administrative body covering all research mapped to these challenges funded by the HRC, NSC and MBIE. |
| 6 | **Downsize the National Science Challenges**, and institute an independent review of the entire NSC process, led by international science experts. This review should consider the opportunity cost of repurposing the allocated NSC funding into alternative existing science funding mechanisms within NZ such as the Marsden Fund, the Health Research Council, and the MBIE contestable round. |
| 7 | **Amend the CRI Act to require that the boards of CRIs support the RSNZ code of ethics** as a professional code of conduct for scientists, to mitigate issues of trust where scientific opinion may differ and scientists are expected to speak publicly.<br>e.g. 6.1 (1): A member must endeavour to make the results of their work as widely available to the public as possible and to present those results in an honest, straightforward and unbiased manner |
| 8 | **Work to develop a culture of collaboration** between MBIE and other government agents responsible for managing investment in the science sector (e.g. TEC, other Ministries), to mitigate loss of institutional knowledge over time. |
| 9 | **Work to develop a stronger culture of trust** between funding providers (e.g. MBIE) and science practitioners, based on the value of transparency in allocating public money to institutions, scientists, and their individual projects. |
| 10 | **Recognise that in order to achieve the above, the government should increase investment to (at least) match the OECD average.** |

## *III. Feedback on Overall Science Investment Outlook*

### *Q1. Overall balance of investments*

*What is your reaction to the overall balance of Government investment in science? In particular:*

*a. Do we have the right balance of direct funding for institutions versus more contestable funds? If not, what should it be and why?*

*b. Do we have the right balance of funding between CRIs, universities, independent research organisations, and industry? If not, what should that balance be and why?*

*c. Do we have the right balance of funding between investigator-, mission- and industry-led funding? If not, what should that balance be and why?*

The structure of these questions reflects the diagram on p.14. This supposes that funds can be distinguished on the basis of two axes:

- a vertical axis covering disparate concepts
  - 'institutional' identifies input funds for research organisations and a Crown agency that are often allocated contestably, almost always involve forms of collaboration and certainly provide for infrastructure and other forms of support
  - 'infrastructure' picks out some funds that are vaguely connected to various notions of capability building
  - 'collaborative' identifies two modes of research operation ignoring the facts one is awarded after contest, that both involve intense internal contest and competition as well as collaboration and that both provide various sorts of infrastructure and capability development and support
  - 'contestable' separates funds awarded by different agents (MBIE, HRC, Marsden Committee, Callaghan, MPI) and hence, in a mixed fashion, by sector, based on 'contest' as a common general method of allocation while ignoring the fact that most of the projects funded involve competition, collaboration and capability building.
- a horizontal axis showing who has the main control over research projects – investigators, mission leaders or private-sector entities.

The inadequacy of this two-way classification is illustrated throughout the draft statement. It is hard to address questions about balances by allocation mechanisms, organisational groupings or sectors, about how funds interface and about collaboration and other modes of carrying out research when the basic model offered is confused and when declarative statements about what MBIE perceives the balances to be are missing. Recommendation 8 addresses our concerns about the extent to which the NSSI demonstrates incomplete knowledge of the science sector and its complexity.

*Question a: balance of funding between organisations and contests*

Given the presence of contest under all funding mechanisms, the widely differing range of scales of organisational funding and of size of contracts awarded through contest, and the different interests involved this question seems to be of doubtful value. NZAS recommends that MBIE direct its thinking towards:

- the match of organisational funding to the different business models that different classes of organisation operate under – blindness of the 'purchase' side of government policies to misalignments with government 'ownership' interests in the cases of CRIs and universities has long been a source of friction and instability in the science system
- the need for sufficient stability of base funding in research organisations and the research components of larger organisations such as universities for there to be reasonable career prospects for researchers and, in particular, those who are just beginning their careers
- the fact that the contest it refers to is simply that which occurs at the point of formation of research contracts with funding agencies. The much more significant facet of contestability in terms of ultimate impacts is the way in which decisions are made within the teams that carry out research and technology transfer.

*Question b: balance of funds between classes of organisations*

NZAS notes that each of the classes of organisation mentioned will consider that it should get more direct, or input funding. That aside, it is clear that different classes of organisation fill different roles in the research and innovation system:

- Tertiary-sector organisations have a primary role in educating the future research workforce and a science-literate public through the teaching of research-active staff. This means they are best suited to carry out investigator-led research and, because of their disciplinary diversity, to work across the spectrum of users (e.g. as the main locus for social science research)
- CRIs and independent research organisations (IROs) are configured to put together multidisciplinary teams in a small number of broad sectors. They fulfil a separate role to that of University research.
- CoREs, NSC, platforms and the like form another class of multi-institutional organisation. They may fill niches, or act as balances on the overarching incentives of organisations, for example to enhance inter-institutional collaboration.

The question of balance between classes of organisations is obscured by the incomplete accounting for funding in the draft document:

- 'Commercial income' from businesses, industry groups and central and local government agencies is an important source of funding for CRIs and to a lesser extent, universities. This should be accounted for as part of understanding the impact of government expenditure
- Tertiary-sector organisations receive funds that support research over and above the amounts received through the PBRF. Additional funds – in

particular funds that go to support university research through TEC should be accounted for more explicitly: PhD student completion incentives are known to have a distortionary effect on the ability of the sector to afford postdoctoral positions, and therefore must be part of the picture. The centralized funding of PhD student completions is one reason why postdoctoral funding is not effectively done through institutions. (see recommendation 1.)

*Question c: balance of funding between investigator-led, mission-led and industry-led groupings*

The answers to this question are likely to reflect interests:

- Investigator-led research best meets the interests of tertiary-sector organisations and staff. Research-competent tertiary-sector organisations compete for domestic and international rankings and have interests in gaining access to investigator-led funds. Their staff require access to these funds if they are to progress in their careers.
- CRIs and IROs are organised and managed so that they are equipped to carry out collaborative, multi-disciplinary mission-led research projects with sufficient basic science base to support their wider mission-driven purpose. They are often less concerned about investigator-led research funds, although investigator-led funds still play a crucial role in career development and in the underpinning science in these organisations.
- User groups have interests in driving up levels of funding for user-led (consistently misnamed as 'industry-led' in the draft document) research funds.
- Early-career researchers (ECRs) are a group with specific interests that are distinct from the institutions that they work for. They tend to benefit most from investigator-led funds that build an internationally competitive c.v., but can also benefit from other funds where there are strict targets for the inclusion of ECRs.

NZAS also considers that there is rarely a clear division between these categories of research. Work that starts out as purely investigator-led research can progress over time all the way through to application and thus may acquire mission-led and even user-led elements. In a similar manner, mission-led and even user-led research may involve circuits back into investigator-led research on particular aspects of a problem. The critical point is that MBIE should not be aiming to pigeon-hole or constrain research by type under the three labels. In general it should be aiming to fund research that is fit for purpose and then trusting and incentivising whatever grouping is involved to achieve outcomes.

However, there is data available that can be used to critique the current balance.

Figure 1. compares the level of R&D funding per researcher FTE in our universities. New Zealand is at the low end, which reflects the fact that university R&D in New Zealand is characterised by a large number of PhD students and a very low level of postdoctoral and other fellowship funding. However you look at

it, we cannot expect to have internationally ranked universities with this level of R&D funding per researcher. (See recommendations 1 and 10.)

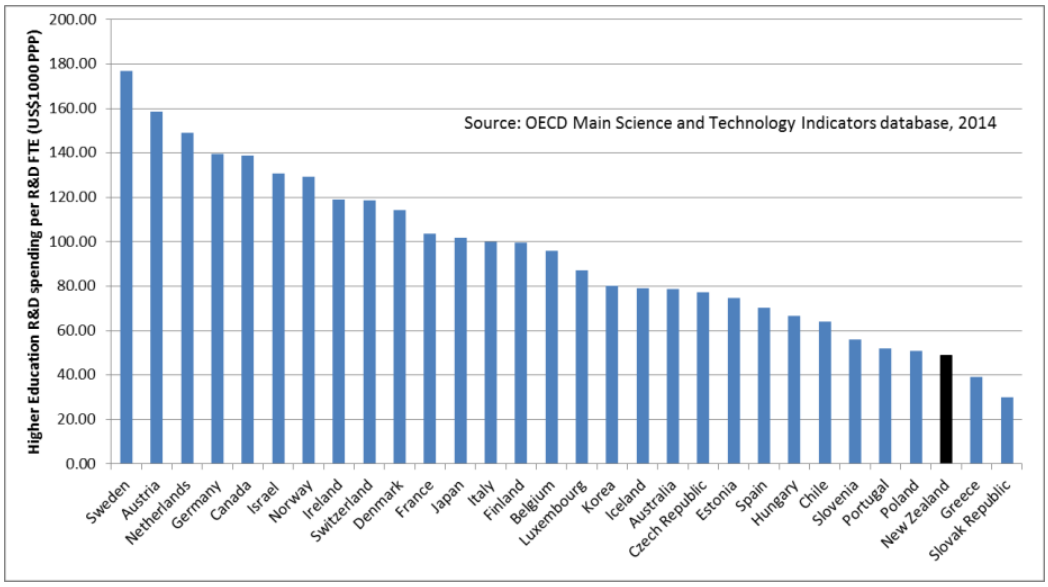


**Figure 1: University R&D funding per researcher across the OECD**

Figure 2. compares our spend on untargeted R&D funding (e.g. Marsden Fund) with the rest of the OECD. We spend very little on untargeted R&D funding (6.8% of public expenditure versus 18.7% across the OECD). Tripling the size of the Marsden fund would be justified in order to bring us closer to the OECD average, in terms of the proportion of public funds that we devote to untargeted R&D. (See recommendation 2.)

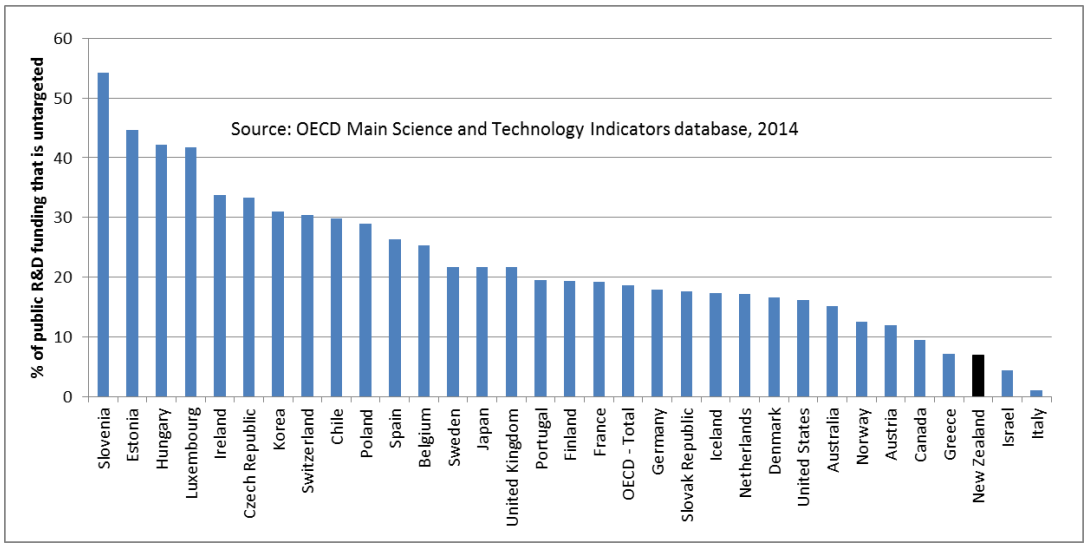


**Figure 2: Untargeted R&D spend as percentage of total public expenditure across the OECD**

**Contestable funds** (both through Marsden and MBIE) are crucial for the development of new ideas and the competitiveness of NZ researchers on the

international stage. Success rates must go up to lower transaction costs and increase innovative new approaches: this can be achieved by

a) Increasing the size of the Marsden Fund – as justified by the OECD data on untargeted R&D funding (See recommendation 2.)

b) Increasing the proportion of scientific funding administered by MBIE that is accessible to researchers looking to move a Marsden funded research project towards commercialization, without having yet found direct support from industry. (cf. the FRST NERF). (See recommendation 3.)

### *Q2. Changes in emphasis*

*Are there parts of the Government's wider objectives and system for investing in science that are over- or under-emphasised in terms of scale or scope? If there are parts that are under-emphasised and need to grow, can you identify other parts of the system that are less important, that could be scaled back over time?*

The draft statement does not clearly define the 'Government's wider objectives'. It is possible that these are embodied in the main objective' to support a transformative system that delivers to New Zealand's economic, social, environmental and cultural needs' (p.16). NZAS supports this set of targets while noting delivery against them requires policies, funds and the organisation of research to be aligned to the broad sectors mentioned. These alignments are not apparent in the document.

The 'Government's wider objectives' may also be the 'key priorities for action' on p.16 and elsewhere and the ideas expressed in the similar but different list of headings used in the section on 'The current profile of science investment'. These lists cover directions and priorities for action that have mostly been operating in the science system for decades – none of them are new. NZAS continues to support them as directions that should be present in the science system in one form or another.

Objective 1 in the list concerns 'producing science of highest quality' and links this to testing for impact. The document is imprecise about the meaning of 'quality' throughout.

- Quality of science is best achieved through international peer review
- The key determinants of impact are not simply the quality of science, but they do depend on it. Distributed decision making within a science program is important to maximise impact.

Objective 2 points to a greater focus on the utility of research and states that even investigator-led research should have clear relevance to the most pressing industry, social and environmental needs. This focus is <u>not</u> supported by the NZAS across the board, though it can certainly be appropriate for mission- and user-led research. Utility is often based on vague possibilities that cannot be predefined: it would be more effective in the long-term to capture the utility of research through emphasizing the responsibility to report over the years post-contract. The responsibility to manage science funding so that effort is not wasted or may be redirected as opportunities present themselves should also be emphasised. Scientific research is inherently serendipitous, and discoveries of

critical importance to modern society have routinely been under-appreciated at the time of discovery. Hence, it does not make any sense to look for 'relevance' from all investigator-led research.

### *Q3. Performance of parts*

*How well do the different parts of Government's overall investment system perform, both individually and in combination? Could settings be changed to improve their performance? If so, how?*

We assume that the 'Government's overall investment system' covers the funds discussed in the draft document rather than the overall system that is enabled by public investments in research activities. Settings affect both and the most important place to look for improvements is in the domain of the wider settings. Areas for improvement include:

- account taken of organisational objectives and incentives
- objectives and incentives for individuals should be acknowledged – e.g. in the workforce section p68, including the acknowledgement of TEC funding
- performance is much wider than the performance envisaged here – it depends on much more than MBIE manages
- misalignment exists – e.g. PBRF creates personal career incentives that conflict with commercial focus of recent incentives
- core funding and statements of corporate intent have reduced inter-CRI competition. Alignment with/of the tertiary sector is lacking.

### *Q4. Mix of Public Research Organisations*

*Do we have the right mix of public research institutions in New Zealand?*

NZAS notes that the draft statement does not contain either a definition of 'public research institutions' or references for assessing the meaning of 'right mix'.

'Public research institutions' could refer to the three components shown in the diagram on p14:

- Callaghan Innovation's residual research component – part of a Crown agency with ambiguous status as a research entity
- Crown Research Institutes – Crown owned companies
- PBRF funded organisations, such as universities

The list would be extended if other forms of public research organisations or partially publicly funded research organisations are included:

- together, the Health Research Council (including the ownership interest of the Ministry of Health) and the research it supports, predominantly in two universities, but also in IROs and other research organisations, create another form of public research institution
- CoREs with an ambiguously independent status under host universities
- National Science Challenges (and at least one predecessor in the Natural Hazards Platform) provide another form of public research organisation

- Independent Research Organisations, to the degree they get core (capability) funding, might also be included in this category.

These lists provide a very diverse mixture of possible 'public research institutions'. A question about the 'right mix' therefore has no simple answer.

We note:

- The mixture of business models and ownership interests provides an unhelpful mix in terms of the stability of the science system. It incentivises competition for funds for organisational rather than for national benefit. This is a critical flaw, and a major overhead cost, for a very small country.
- There is a split between organisations aligned broadly to sector interests (Callaghan, CRIs, IROs, CoREs, NSC, HRC and medical establishments) and tertiary-sector organisations whose prime purposes are educational.
- There are questions around long term stability. Some CRIs and some universities are under pressure. Amalgamations are possible. The introduction of NSC has created new points of competition and instability – both CRIs and universities see NSC as an opportunity to leverage more money, but CRIs lose control over some of their core funding. New governance arrangements create new compliance costs.
- CoREs exploit areas of opportunity and provide a successful mixture of research, capability development, sharing of equipment and infrastructure and public outreach. However, the CoRE system also creates instability in bidding rounds and whenever a CoRE is discontinued. The issue of the lifespan of a CoRE also needs to be addressed or simply clarified.
- NSC also create instabilities at formation with the prospect of a round of instability in the early 2020s as the current ones end

NZAS notes the implication on p.24 that there should be more researchers employed in the tertiary sector and fewer in 'government' research organisations because the NZ balance between these groupings differs from those in other small economies[1].

NZAS believes that 'right mix' can only be considered in relation to the diversity of needs and targets to be addressed and based on evidence, not on comparisons with other small and often quite different economies. There have been recent attempts to create fewer and larger programmes and organisations. This implies an increased requirement for distributed decision making. Core funding for CRIs and IROs is important. Universities are important elements in enabling diversity and activities that are complementary to those of the CRIs/IROs.

There are differences in the ability to organise large, multidisciplinary teams vs. small, single-discipline teams. CRIs can manage the first and are therefore best for 'homogeneous sectors' (e.g. primary sectors, while recognising that these sectors are, in detail, very heterogeneous). Universities and Polytechs operate better through small teams and, collectively, they may have a greater ability to

[1] The reliability of the split has to be in question given that the draft report is inconsistent (p.24) on the number of FTE researchers in New Zealand in 2012, citing different total numbers at the top and bottom of the page, neither of which match the numbers shown in Chart. 7. See recommendation 8.

meet the diversity of research need in manufacturing and services. If Callaghan Innovation is to meet its promise, it will need to capitalize on the lessons learned from IRL: the progress of the 10th NSC may be worthwhile monitoring for this explicit purpose. (See recommendation 6.)

### *Q5. Monitoring and evaluation*

*How could we improve the way we monitor and evaluate the performance of:*

*a. research institutions in the science and innovation system?*

*b. our policy instruments for making investments in science and innovation?*

*c. the science and innovation system overall?*

Monitoring and evaluation are terms that suggest a mindset of control from the top. It would be better to put more effort into developing a culture of trust and a collective responsibility for creating, tracking and explaining outcomes. (See recommendation 9.) This would involve:

- better models for the systems and of the nature of innovation as it applies across all sectors (it is not simply an economic activity or an activity in the manufacturing and services sector)
- recognition of the fact that responsibilities for funding instruments are now widely spread across a range of funding agencies (including CRIs and universities) and ad-hoc governance structures (e.g. those for NSC and CoREs) and that evaluation capabilities must be coordinated and shared
- a shift in mindset from control-oriented mechanistic evaluation against preset assumptions about outcomes, to evaluation as a steering and adaptation mechanism more fitted to the uncertain realities of true research
- an articulation of the ways in which evaluative and steering activities at different levels of aggregation carried out by different entities (e.g. teams, governance structures, research organisations, funding agents, MBIE, TEC, MPI, other government agencies) will fit together
- some form of collective commitment to track and explain outcomes from the totality of science and innovation investment (i.e. wider than the funds covered in the draft document) over time.

*Question a: better monitoring and evaluation of research institutions*

The 'we' in question appears to be MBIE and, as before, 'research institutions' are not defined. It is clear that MBIE has the statutory authority to monitor and evaluate the performance of CRIs but it does not have this authority elsewhere. NZAS considers it would be more conducive to outcomes for MBIE to put effort into working with others under the approach outlined than to seek to extend its authority over other research organisations.

*Question b: better monitoring and evaluation of policy instruments*

NZAS assumes that 'policy instruments' means 'funding instruments. We note that MoRST and FRST had programmes for systematic evaluation of funding

instruments in the early 2000s and that these were degraded and largely disappeared when MSI was formed. We do not know why this happened.

Monitoring and evaluation of funding instruments is required but, as outlined above, it should be part of a larger and more integrated evaluation and steering effort. (See recommendations 4 and 8.)

*Question c: better monitoring and evaluation of the science and innovation system as a whole.*

NZAS does not agree that the model proposed in Chart 9 is an adequate basis for thinking about the science and innovation system and about economic, social and other impacts. It is simply a vague collection of diverse concepts loosely linked by arrows. There is little sense of how the parts relate, how the system works in whole or sub-part or how it generates outcomes. There is minimal connection to the material about the system elsewhere in the draft document. The first step to better monitoring and evaluation should therefore be a model that relates the instruments and organisations in chart 1 to some broader conception of New Zealand's innovation system (a much larger concept).

The second step towards better monitoring and evaluation of science and innovation should be a major rethink of the indicators in the table on p.29. Many of these have very little to do with the policies and instruments covered in the draft statement. When indicators related to the draft statement do appear, they are strongly biased towards economic outcomes – there are in fact no indicators related directly to any other outcomes including societal, workforce and health issues which are at least as important as economic measures – and then mainly to high-value manufacturing and services.

The NZAS strongly supports better monitoring of the science system as a whole. Our 2008 survey of New Zealand Scientists and Technologists was an important document which has no current analogue. We would be keen to discuss with MBIE whether they would be willing to reconsider providing support for a 2015 Survey, as was done by MoRST in the past. Scientists are an essential part of our science system and working with them would seem to us to be an important component of a good management and evaluation system. (See recommendations 4, 8, and 9.)

### *Q6. Benchmarking and monitoring measures*

*Are there any features of our institutions, policy instruments or overall system that are particularly relevant or useful for benchmarking or monitoring performance?*

There has been continual change in settings and funding mechanisms in the research system for more than 30 years. The consequences of this change should be monitored. Although changes have improved the focus on, and delivery of, outcomes, they have also created ongoing instability and lowered the attractiveness of science as a career. There are therefore two important areas where monitoring and benchmarking need to be improved:

- The overhead costs of policies and instruments to research organisations, users, research teams and individuals should be benchmarked and monitored. New policies and instruments should not be introduced

without publication of clear analyses of expected impacts on these costs and of long-term consequences for capabilities within the system.

- There should be regular and independent surveys of the state and morale of the scientific workforce. NZAS has run NZ-wide surveys of the state of the science system in the past (see our answer to Q5) and this is an activity that should also involve MBIE (it, after all, spends money monitoring the state and morale of its own workforce). We do not expect MBIE will find much comfort in the results of such surveys but it should at least be aware of the issues and be interested in knowing what is working and what is not from the viewpoint of researchers. The recent NZAS survey of scientists' experiences with the NSCs provides a clear example: scientists opinions need not dictate funding, but a funding system that has lost the trust of scientists needs to be seriously looked at. (See recommendations 6 and 9.)
- The high cost of regulatory compliance needs to be included in the monitoring system.

### *Q7. Addressing critical issues*

*To what extent does the current set of Government-wide investment policies and processes, and balance of investment in different mechanisms, address critical problems either in the science system or to New Zealand as a whole? What changes could be made to ensure those problems are being addressed?*

The following issues need to be addressed (many of these are also mentioned in responses to other questions):

- Continual change is a major issue for the science system. There has been no period with stable settings during the past three decades. To some extent, change does serve the interests of Governments and bureaucrats but it creates instability and imposes large overhead costs to the detriment of the productivity of the research sector.
- There continue to be unhelpful misalignments between the business interests of research organisations and the national benefits required from research funding. (See recommendation 7.) Governments and policy makers are likely to make better progress by realigning business interests than by attempting to push change through more intrusive funding, contracting and monitoring arrangements.
- Attention needs to be paid to the accumulation of overlapping governance structures particularly under policies designed to force more inter-organisational collaboration through mechanisms such as NSC and CoREs. Researchers and research organisations are now surrounded by a profusion of boards, panel, committees, consultation arrangements, associations, steering groups and contractual arrangements. Collectively, these drive up compliance costs. Streamlining is required.
- Policy makers and funding agencies continue to operate with little understanding of the distributed nature of decision making in the science

system. The amount and quality of outcomes depends on the quality of decision making at all levels down to the metaphorical 'lab bench'.

- Researchers, research teams and research organisations continue to under-invest in explaining what they do (there have been notable improvements in this area in some CRIs recently; see also recommendation 7). NZAS acknowledges that scientists are often poor in this role. Improvements could be fostered by adopting a more comprehensive and useful system for evaluation and steering (see question 6). We also hope that the Science in Society project: A Nation of Curious Minds, will have measurable impact in this respect.
- The workforce section (p68) deals only with peripheral issues and misses the main point, namely the necessity for organisational structures in which it is safe to pursue a specialised career. (TEC funding should be explicitly acknowledged; see recommendation 8.) Scientists and research engineers, like medical consultants, make an enormous investment (training time and income forgone) in narrow fields of expertise to equip themselves to be at the forefront in their field. Faced with a constantly changing structure of research employment and ephemeral funding they will be discouraged from entering the profession or will emigrate. As a consequence, New Zealand will not retain or recruit world-class let alone world-leading scientists.
- Differences between CRI and university scientists: PBRF drivers vs. need to obtain MBIE funds and commercial contracts. PhD student training in conflict with prescriptive outcomes-based reporting (in short term).
- Differences between career stages: The Marsden Fund favours senior scientists and early career scientists (Fast-Start). The limited funding pool (see recommendation 2) means there is a gap in the middle not plugged by Rutherford Fellowships (too much capture of funds by institutions). In this context, very few senior researchers have access to funds to employ postdocs. (See recommendation 1.)

**Common issues:**

- Contestability is crucial to allow for the turnover of ideas. C.V.s need to be kept internationally competitive for international peer review (publication, promotion, awards, not to mention proposals!)
- Marsden Fund probably has the lowest overhead possible (relative to success rate). It also has a large amount of trust from researchers – which promotes good behaviour, and results in less gaming of the system. We recommend an immediate increase in the Marsden Fund (recommendation 2) as well as an adjustment of the MBIE contestable pool to promote movement of successful Marsden research towards industry (requires lessened expectation of cofunding from industry in initial stages – see recommendation 3).
- Postdoctoral funds needed for career development (emerging researchers 0-6 years post PhD); but also Rutherford Discovery Fellows (our best researchers building world-leading research groups) should be able to

employ postdoctoral fellows to build critical mass in research laboratories. (See recommendation 1.)

### *Q8. Mixture of investment mechanisms*

*To what extent do Government's different science mechanisms work together? Could they be made to work together more coherently? If so, how? Do we have enough investment mechanisms, or too many? If too few, where are the gaps? If too many, which could be combined, changed or removed to simplify the system?*

They could be made to work more coherently but it should also be recognized that it is in the nature of science that not all Marsden projects, for example, will lead to mission-led funding and eventually to industry application. The role of MBIE should be to take a system view, to enable capture of the progression of that subset of research programmes, to describe the complementarity of the different funding mechanisms over time.

**Postdoctoral funds need to be reinstated**, (see recommendation 1) and could be most efficiently managed by the RSNZ alongside their current processes for the Rutherford Discovery Fellowships. In addition, the incentives built in to the PBRF which disincentivise the hiring of postdoctoral fellows on research grants are of major concern. Including postdoctoral training as a key indicator of research quality would improve the balance of incentives.

**Health Research Funding needs to be rationalised.** (See recommendation 5.) The three health-related NSCs overlap considerably with research funded by the HRC and by CoREs, leading to relatively low investment in these challenges, a significant amount of which will be consumed in adminstrative costs. These challenges are in disarray because they are institutionally aligned and are not seen as independent. The health research community has voted no confidence in the current institutionally-aligned structures proposed. We suggest one integrated institutionally-independent funding organization for all health-related research and in particular for research covered by the health-related NSCs. The efficiency, independence, quality assurance and monitoring mechanisms of the HRC make it an ideal body for administering these NSCs. If necessary different funding mechanisms could be established within the HRC to cover all research under the health-related NSCs. We advise a radical rethinking of the present model for these challenges that includes one administrative body for HRC, NSC and MBIE funded health research.

### *Q9. International collaboration and cooperation*

*How can New Zealand achieve more international collaboration and cooperation? How well do existing mechanisms support this objective? What policy changes or new mechanisms could advance this goal?*

We would like to see the evidence that New Zealand is lacking in international collaboration before agreeing that more is required.

- There are strong incentives for international collaboration in science. Almost all scientists collaborate with peers overseas. There are frequent

collaborations through email and internet exchanges as well as interactions through visits, conferences, joint research, sabbaticals and similar. New Zealand science depends on international referees in publishing, grant proposals, review processes and promotion applications. New Zealand scientists contribute to these processes elsewhere.

- Almost all research organisations have formal and informal relationships with overseas research organisations. Many also derive substantial sums from international research contracts. There is little evidence in the draft statement to suggest that MBIE recognises or collects data on these relationships.
- International collaboration needs access to funds, and needs to allow researchers to find the best or most suitable collaborator – this is compatible with and is supported by funding in the contestable, investigator-led space (e.g. Marsden, HRC, etc.).

Summary: International collaboration will look after itself, with access to funding of the kind that is already available.

### *Q10. Other considerations in overall mix*

*Is there anything else we should consider about Government's overall mix of investment in science?*

- Rebalance the position of the Marsden Fund relative to other investment mechanisms by doubling investment in this pool (See recommendation 2.)
- Establish one institutionally-independent organization to administer the health NSC. We suggest that the HRC would be the most suitable body for this purpose (see 9 above). (See recommendation 5.)
- We propose encouraging closer relationships between CRIs and Universities with less-targeted basic research being conducted in an academic environment as already happens with some CRIs (AgResearch, Plant & Food, NIWA and GNS)

## *IV. General Feedback on Direction*

*Section 1 of this Statement sets out some proposed objectives for Government's science investment. These are:*

*1. Producing excellent science of the highest quality*

*2. Ensuring value by focusing on relevant science with highest potential for impact for the benefit of New Zealand*

*3. Committing to continue increasing investment over time*

*4. Increasing focus on sectors of future need or growth*

*5. Increasing the scale of industry-led research*

*6. Continuing to implement Vision Mātauranga*

*7. Strengthening and building international relationships to strengthen the capacity of our science system to benefit New Zealand.*

*These objectives signal a new direction for Government's science investment.*

None of the objectives are new. To a greater or lesser extent all of them have been in existence since the science reforms of the 1990s. Hence all should start with 'Continuing' in the same manner as #6. The objectives may appear new to MBIE. If so this is almost certainly because it has lost almost all of its institutional memory in relation to science investment.

MBIE should refer to the 1996 Government science policy document, RS&T2010 and subsequent Government science policy documents.

### *Q11. Focus on quality, relevance and impact*

*Should our funding mechanisms have a greater focus on the quality and on the relevance and impact of research? If so, why, and how could it be achieved? For example, should investigator-, mission- or industry-led, funded investments, across most mechanisms, have a sound pathway to impact and application, even if long term?*

There have been quality and relevance requirements in the research system for at least three decades.

We note that quality, relevance and impact are not defined. We discussed the difference between science quality (as indicated by internation peer review) and broader definitions, including relevance and impact, in our answer to Q2.

It appears that MBIE means 'scientific quality' when it refers to quality. This should be evaluated through expert peer review. For the evaluation of relevance and impact a 'sound pathway' is a poor measure. Any competent research leader will be able to describe 'sound' pathways to at least some impact or application. Whether or not these will eventuate is another matter, as research involves significant unknowns. MBIE or the Government could ask for more descriptions of sound pathways to impact and application for all of its investments. This would mainly achieve a flowering of creative writing.

What is required is self-steering and an improved culture of trust. (See recommendation 9.) There are always tensions between public, organisational, team, individual and user interests (or goods). Incentives from these sources need to be combined to create a culture that thrives on, and embodies, research excellence and, where possible outreach and excellence. It appears that the Centres of Research Excellence have successfully achieved this kind of culture change – MBIE should look to learn from what has worked well here. (See recommendation 4.)

Stronger pathways should obviously exist for mission-led and user-led programmes. Pathways to application are not necessarily appropriate for all investigator-led research proposals but such proposals should contain explanations of significance.

### *Q12. Business innovation and economic growth*

*Do you support a greater orientation of public science investments towards a stronger contribution to business innovation and economic growth?*

*a. If not, towards what high-level outcomes or orientation would you direct shifts in our science investments?*

*b. If yes, what, if any, key enabling technologies or industry sectors would you place as priorities for our science investments?*

The evidence presented in the NSSI to suggest that there is low utilisation of university research by business is highly misleading. As a percentage of business expenditure on R&D, New Zealand businesses spent 2.9% on university R&D compared to the OECD average of 2.2% (using data from 2010-2012). Similarly businesses devoted about 8.5% of BERD (business expenditure on R&D) on the CRIs and government labs compared to 1.9% across the OECD. Thus one can make an argument that business R&D is better connected to public sector R&D (both University and CRI) in New Zealand than it is across OECD. The low level of financing of HERD (higher education R&D) by industry noted in the NSSI simply reflects the low level of expenditure in general. (Source: OECD Main Science and Technology Indicators database, 2014.)

It is unclear what MBIE means by 'business'. It appears to be manufacturing and services rather than businesses in the primary sector (merely 'industries') and then mainly high-tech businesses. This narrow view of 'business innovation' is evident in the list of indicators on p.29.

It is also unclear what is intended by 'greater orientation'. The large amount of new funding claimed for Callaghan Innovation (p.19) should suffice as a driver of non-primary-sectors 'business innovation and economic growth'. No greater re-orientation should be required until Callaghan Innovation has demonstrated both its effectiveness and the extent of unmet demands for its services and funds.

*Question a: high-level outcomes*

The document states intentions to continue to support high-value manufacturing, primary industries, high-growth high-productivity export sectors and areas of comparative advantage (p. 23). These intentions have been in place as targeted 'high-level outcomes' for at least three decades.

NZAS notes that the high-level outcomes (goal) structure that question *a* may be referring to does not appear in the draft statement. Shifts in science investments at this level are hard to recognise because there are no data under the structure.

Any shifts in public science investment relevant to the New Zealand economy, environment, society and workforce should be transparent, evidence based, and made in consultation with those scientists most affected by the changes.

### *Q13. Role of collaboration*

*How should collaboration between scientists and institutions feature in our science investments? What can we learn from the collaborative approaches taken to date? What is the appropriate balance in the system between collaboration and competition?*

We noted under question 1 that MBIE does not appear to appreciate that collaboration and competition are almost always present in all research. In fact:

- collaboration already exists extensively between scientists and is part of the normal way of carrying out research
- collaboration exists extensively within research organisations and this can be just as valuable as collaboration between organisations (e.g. CRIs are multidisciplinary organisations and organise almost all of their work around collaborative teams)
- many collaborations also exist between many different research organisations at the level of individuals and teams.

The historic concern about collaboration that is still reflected in the question arises from the very different issue that research organisations operate under 'ownership pressures'. These incentivise them to maximise the income they can get from other organisations pursuing the same end, and make interactions difficult. It is always much easier to collaborate when jobs and survival are not on the line. The NZ system has had a long history of trying to operate under this arrangement. Improvements have come in the CRI space with the increase in core funding – a lesson is to be learned from this.

Competition almost always exists at all levels, and is healthy when it does not disincentivise natural collaboration, as outlined above.

### *Q14. Current configuration of research organisations*

*How might the current set-up of New Zealand's research institutions either encourage or discourage across-research institution collaborations, international researcher collaborations, or user collaborations?*

Collaboration is incentivised in some parts of the science system (e.g. CoREs, NSCs) and disincentivised in others (PBRF incentives, NSC mapping of CRI core funding). In particular:

- scientists collaborate in order to gain a competitive advantage – they will do so naturally when it is not disincentivised. Complementary expertise is important in science.

- Barriers to collaboration within NZ include, for example, the shrinking size limit on a Marsden grant: senior researchers (who get these grants) can only pay a small proportion of their own salary.
- NSC processes appear to have been driven by institutions, and this is reflected by comments from the science community with regard to the capture of these funds. Coming to a consensus on how to divide up the pot is not the same as collaboration. NSC administration should be institutionally non-aligned.
- CoREs are a great means of encouraging collaboration – especially where originally built around access to shared equipment and infrastructure.
- Infrastructure is a key driver of collaboration – the need for infrastructure is also why we have institutions. We need to ensure best practice across the sector with regard to large infrastructure purchases.
- Collaboration with industry – there is a need to understand the extent to which commercially-funded work in CRIs supports the maintenance of capability etc.
- Core funding for CRIs: the lesson is that relative stability is good
- The creation of new opportunitites, such as NSC, CoREs create new points for competition. This has both pros and cons.

### *Q15. Engaging knowledge users*

*How should knowledge users engage in improving the impact of our science investments? What can we learn from how they have been engaging to date?*

Knowledge users can engage in improving the impact of research by paying for the research that they need. Many do already although this is not evident in the draft statement as it stands.

Paying for research is particularly important because 'users' rarely exist as homogeneous groupings. Individual organisations may be able to determine their needs and contract for research to meet them whereas groupings of users can rarely agree on needs and therefore come together mainly as lobbyists seeking more funds rather than specific impacts.

With this reservation in mind, there is still scope for user influences that have the potential to improve impacts of Government ('our') science investments. User representatives should have roles in the development of RfPs, in the organisation, development and operation of all industry-led research and, to lesser extents in mission-led research, in the organisation, development and operation of NSC and in the governance of research organisations. All of these avenues of influence are currently in play.

NZAS is not in a position to assess what can be learned from mechanisms designed to increase user engagement including structures such as platforms, CoREs, research consortia, PGP consortia, Envirolink groupings, the tertiary-sector-funded consortia and the various structures used by the Foundation and HRC to encourage user-led research groupings. The critical point is that MBIE should be prepared to learn from what has worked or not worked in the past

before it tries to put in place any new mechanisms designed to increase user engagement.

### *Q16. Adequacy of general direction of change*

*Is there anything else we should consider about the proposed general direction of change?*

The general direction of change is to incentivise research which has commercial or economic value. A social, environmental and health imperative must be included in the science direction as these values impact on commercial and economic directions.

It needs to be recognized that increasing emphasis on economic and commercial outcomes comes at the cost of disincentivising other forms of research, such as those that produce new knowledge or create public goods. Not all of the goals in the funding system should incentivise the same behavior, but in recent years there has been a narrowing of alignment of research funding with all incentives pointing in the same direction. This must stop. Economic and commercial outcomes are only one of the desirable outcomes from public investment in science. A more balanced values-based approach to science investment is strongly encouraged by NZAS.

### *Q17. Improving quality and impact*

*How can we continue to improve the quality and impact of the science we fund?*

The draft statement contains many instances of loose construction. 'We fund' could suggest MBIE, but MBIE is an agency that funds on behalf of Government which supports science on behalf of all New Zealanders. All stakeholders should be involved in working to improve the quality and impact of Government investment in science.

### *Q18. Differential assessment of quality*

*Should quality be assessed differently in investigator-led, mission-led, and industry-led research? If so, how?*

See answers to Q2 and Q11 for a discussion of 'quality'.

If quality is taken to mean 'science quality', then no: peer review should be the standard for any science that receives public funds.

If quality is taken to include measures of impact, then yes: impact will look very different in these different areas. It is likely to also require different timeframes for assessment.

### *Q19. Improving international connectedness*

*How can we improve the international connectedness and engagement of our research community and research-active companies?*

We assume that this question applies particularly to the International Relationships Fund (otherwise it is covered by our response to question 9).

We note that the IRF already has very diverse objectives for a relatively small fund. The recent move to expand IRF's scope to embrace more

commercialisation, increased exports by New Zealand businesses (p. 60) and understanding of international markets (p. 59) is simply diluting the fund further. It is unclear to us why this expansion is necessary given the existence of whole funding agencies with responsibilities in these areas in the form of NZ Trade and Enterprise and Callaghan Innovation. It appears that MBIE is trying to make every fund serve every purpose. (See our answer to question 16.)

The draft statement provides little meaningful analysis of the international connectedness and engagement of the research community, and none at all for research-active companies; collecting information should be the first step (See recommendation 4).

## *V. Feedback on Structure of MBIE Sector-Specific Research Funds*

*We want to refine the funding architecture so that it is best suited to meet New Zealand's science needs into the future. We want to know whether funding tools are appropriate to deliver on the NSSI objectives, and in particular whether further reforms to, and simplification of, sector-specific funds are necessary. This draft Statement proposes work to:*

- *consider the role of 'contest' in refreshing and supporting emerging opportunities now that we have a significant proportion of Vote Science and Innovation funds allocated to long-term, strategic investments via CRI core funding and the National Science Challenges*
- *increase flexibility and ease of operation by having fewer, larger funding mechanisms, and more flexible use of mechanisms to adjust the degree of contestability of funding. We will aim to reduce and minimise compliance costs in doing so*
- *increase the focus of the funds on research with direct relevance to the most pressing industry, environmental and social needs*
- *implement measures to place greater emphasis on impact in assessment of applications, new contracts and existing contracts, including potentially separating assessment of impact from*
- *assessment of quality of science, as per the Irish model. Where possible, emphasis should be on investment in sectors of future growth, value, and critical need.*

### *Q20. Changing sector-specific research funds*

*Are the current sector-specific research funds in need of change? If so what direction of change is desirable? Issues that you may want to consider are:*

*a. the multiplicity of funds and whether there is a need to reduce the number of funds and the complexity of funds*

*b. the accessibility of funds to different types of researchers: university, CRI, established or new entrants into the system*

*c. the sector-based nature of funding tools*

*d. the length of funding allocation*

*e. the form and processes of peer review*

*f. the relative significance in award assessment of relevance and potential for impact, past performance and the quality of the research proposal and research team.*

The so-called 'MBIE' sector-specific funds of the heading are residues of the original sector-differentiated Public-Good Science and Technology (PGSF) funding combined with a muddle of various historical funding mechanisms. MBIE should first be aware that the funding arrangements involved predate the

supposed 2010 of initiation (p 46) by decades. It should take account of the learning from these decades of operation if it wishes to redesign the fund. (See recommendation 4.)

NZAS considers that it is necessary to have a sector-based split for mission-led funds of this nature. The sector split has been in existence since the reforms of the 1990 and has been there for good reasons:

- it is impossible to define missions (the role claimed by MBIE for itself, or government, on p. 44) without sector splits
- it is exceedingly difficult to weigh up the relative benefits of bids when they apply to very disparate sectors (e.g. established industry sectors vs. say social wellbeing or the environment).

NZAS therefore considers that sector splits should be retained. Simplifications could be achieved within this subdivision by focusing on sectors rather than a muddle of sector impacts and capabilities. Recommended changes are:

- reassigning PGSF residues used for health research to HRC control – the funding involved is now simply the ghost of past Foundation ambitions
- amalgamating the generation of new industries and leading technological capabilities outputs (removing a muddle between end and capability outcomes)
- dropping the policy requirement to give effect to Vision Matauranga; this can be expressed in whatever way makes sense in specific RfPs but is inappropriately a capability requirement in a list of sector splits and, if necessary, can also be met by transferring some funds to the Vision Matauranga Capability Fund.

Simplification can also be achieved by dropping most of the funding-mechanism or 'tool' structure. This is mostly a legacy of the Foundation's attempts to control the composition of research while providing flexibility. There is insufficient space for this sort of central steering now that only residues of the original PGSF remain. NZAS therefore recommends that:

- IRO funding be realigned into an expanded and renamed 'Research organisation core funding'. This will enable core funding for IRO and CRIs to be treated and assessed in a consistent and transparent manner. NZAS notes here that universities get core funding through the PBRF and other tertiary funding and so do not need to be considered as part of this rearrangement.
- Envirolink should be folded into the 'effective management and mitigation of environmental risks' output. Mission-led research in this output should reach out, where appropriate, to regional councils in the same manner as mission-led research reaches out to end users under other Sector-Specific Research Fund outputs. If links with regional councils are a problem this is a matter that MfE should become involved with – NZAS notes that research funding from this agency has been ignored in the draft statement.
- Smart Funding, Enabling Technologies, Targeted Research and Partnership Funding tools should all be dropped in favour of a simple split between

small-scale projects (3 year duration) and large-scale programmes (6 year duration). Particular requirements for technologies and partnerships belong properly to RfPs and do not need to appear as separate funding mechanisms.

### *Q21. Differentiated assessment of quality*

*Should the assessment of quality be differentiated across the spectrum of MBIE sector-specific research funds?*

It is not clear what MBIE means by 'quality'. (See also our responses to questions 2, 11, 18.) The term is often used as a short-hand for scientific quality defined largely in relation to publication in internationally-recognised, peer-reviewed journals. This view of quality is too narrow for the mission-led research that is supposed to take place through the Sector-Specific Research Fund.

NZAS considers that mission-led research requires consideration of at least two dimensions of quality:

- The research should be excellent in the sense that it is challenging and capable of generating high impact outputs. Challenge implies that elements of discovery, integration of new and existing knowledge, and 'packaging' into forms that will be useful to users must all be present. We note that the synthesis involved in these steps may be just as demanding as the narrow, reductive research that appears in scientific papers.
- The research must be fit for purpose. Fitness for purpose means that the work has a credible links to the knowledge and capabilities that have the prospect of meeting objectives.

The first of these dimensions must be assessed through field-related scientific peer review, and will not change significantly across the spectrum of funds. The second may, however, change significantly.

### *Q22. Indicators of scientific quality*

*What indicators of scientific quality should we use in our assessment processes? Should these be the same across all MBIE sector-specific funding tools?*

Peer review is a key indicator of quality. While it tends to be based on metrics of scientific productivity (publications, citations, impact factors and h-indices), only in the context of peer review can such metrics be used appropriately in the context of the work. Using them outside of expert assessment is dangerous and should be absolutely avoided.

### *Q23. Degree of targeting*

*How targeted should Government be in seeking outcomes from MBIE research funding investments?*

NZAS assumes that this question applies to Sector-Specific Research Funds rather than some wider list of investments.

The degree of targeting in mission-led research depends upon the area in question. In some areas, end outcomes are hard to be specific about while research capabilities that are likely to lead to useful outcomes can be specified.

This was why NERF existed and NERF RfPs reflected the stronger emphasis on capability targets.

In other areas targeted end outcomes can be specified with greater precision and the research (and adaptation and uptake) capabilities needed to get there need less emphasis – they will be delivered by those involved.

NZAS recommends that targeting within the Sector-Specific Research Fund be tailored to the requirements of specific areas with greater flexibility specified in RfPs for areas where end outcomes are harder to specify. (See recommendation 3.)

### *Q24. Gaps in funding mechanisms*

*Are there gaps or deficiencies in the current range of funding mechanisms available?*

- The increased expectation for industry co-funding in the Sector-Specific Research Funds (due to the loss of the NERF) has meant that research programmes that could have previously existed in this space have little mechanism for funding beyond that of Marsden, which, perversely, has created a larger gap between some investigator-led programmes and industry. (See recommendation 3.)
- TEC uses success in obtaining competitive funds in PBRF. This creates perverse incentives. (See recommendation 4.)
- The absence of a nationally-competitive postdoctoral funding scheme, in addition to the perverse incentives in the PBRF, have led to a serious gap which will impact on a generation of NZ scientists. Also affected are mid-career researchers who find it difficult to employ postdocs in their labs. (See recommendation 1.)

### *Q25. Monitoring and evaluation*

*How could we improve the way we monitor and evaluate the performance of MBIE's research contracts? Are there any features that are particularly relevant or useful for benchmarking or monitoring performance of contracts?*

See our answer to question 6.

### *Q26. Encouraging industry co-investment*

*What are the best ways to encourage industry to make greater co-investments in R&D, where appropriate, and ensure an appropriate focus on research of relevance to industry, social and environmental needs?*

MBIE appears still to be operating from the mindset of the Foundation. That organisation did not understand why CRIs were formed and did not get past the idea that co-funding was a necessary ingredient for there to be impacts from the research contracts it funded, not to mention a return on investment (another perverse incentive?). In actuality, CRIs were set up to enable technology transfer by attracting industry co-funding. The original idea was that public funding would enable CRIs to maintain and build stocks of knowledge and capabilities, and that impacts would arise when other entities, private and public, tapped into these stocks and capabilities by contracting for work in areas of application. This

model worked despite the intrusion of Foundation policies. CRIs have got more than half their income from users of various sorts for many years. This suggests that CRIs operate with appropriate foci on industry, social and environmental needs – otherwise why would users be prepared to invest so much money in them?

NZAS assumes that some IROs and, to a lesser extent, universities also operate with appropriate focus on industry needs.

Under this argument, the best way to encourage co-investment is through adequate funding of mission-led and investigator-led research. This will enable research organisations to develop and maintain research capabilities of interest to users. The commercial pressures will ensure that these are deployed. MBIE should understand this arrangement and not attempt to make co-funding a universal requirement. (See recommendation 3.)

### *Q27. Increasing industry-led research*

*What are the implications of increasing the proportion of industry-led research in MBIE funds?*

*a. Should leveraging private investment be a more heavily weighted goal for our science investments? Why or why not?*

*b. If so, what are the current barriers to increased private investment and how might they be overcome?*

*Question a: increased private sector leverage*

The funds in question are government funds, not MBIE funds. This matters because the government probably intends the research funded to be useful to more than just industry and the private sector and this offsets MBIE's unthinking bias in those directions - the Sector Specific Research Fund is only partly about economic sectors.

The answer to Question 27a has been provided under Question 26: sector-specific funding should be directed towards mission-led research so that internal capabilities that can be leveraged through user-funded are supported and developed.

Attempting to leverage ever more funding out of users by co-funding will have two main consequences:

- there will be a continuing and progressive erosion of the underpinning research capabilities as longer-term, mission-led research effort is shifted towards the short time horizon research typically required by industries
- the ability of universities to compete for Sector-Specific Research Funds will be decreased because they are generally less able to assemble the teams of researchers.

### *Q28. Improving uptake of research*

*What could be done to improve uptake of research outcomes with users?*

The fact that CRIs earn more than half their income from users suggests that uptake is occurring. The question that should be thought through and much

better understood is: when does this uptake occur? It is probably safe to assert that a high proportion of current uptake stems from research that has taken many years to develop and that there is every prospect that a similar proportion of current research is likely to find users well into the future. The direct relationship between current research and current uptake is low.

### *Q29. Other issues*

*Is there anything else we should consider about proposed changes to the structure of MBIE's sector-specific research funds?*

MBIE appears to lack an adequate model for thinking about the structure of the government's Sector-Specific Research Fund. An adequate analysis would:

- explain how the Sector-Specific Research Fund (SSRF) fits with all other sector-specific research funds in the three Votes covered in the draft statement
- provide an analysis of other sources of sector-specific research funding provided through ministries and agencies not mentioned in the draft statement (Other government, p19) so that the adequacy and fit of the Vote Science and Innovation SSRF can be assessed against these sources
- provide a clear explanation of how SSRF funds relate to NSC and the impacts narrowed NSC objectives are going to have on the span of work once possible under SSRF.

See recommendations 4 and 8.