#109

COMPLETE

Privacy - 9(2)(a)

Page 2: Section 1: submitter contact information

Q1

Name

Jan Sheppard

Q2

Privacy - 9(2)(a)

Q3

Can MBIE publish your name and contact information with your submission?Confidentiality notice: Responding “no” to this question does not guarantee that we will not release the name and contact information your provided, if any, as we may be required to do so by law. It does mean that we will contact you if we are considering releasing submitter contact information that you have asked that we keep in confidence, and we will take your request for confidentiality into account when making a decision on whether to release it.

Yes

Q4

Can MBIE contact you in relation to your submission?

Yes

Page 3: Section 2: Submitter information

Q5

Are you submitting as an individual or on behalf of an organisation?

Individual

Page 4: Section 2: Submitter information - individual

Q6

Are you a researcher or scientist?

No

Privacy - 9(2)(a)

Privacy - 9(2)(a)

Privacy - 9(2)(a)

Privacy - 9(2)(a)

Page 5: Section 2: Submitter information - individual

Q11

What is your iwi affiliation?

Respondent skipped this question

Page 6: Section 2: Submitter information - individual

Q12

If you wish, please specify to which Pacific ethnicity you identify

Respondent skipped this question

Page 7: Section 2: Submitter information - individual

Q13

What type of organisation do you work for?

Crown Research Institute or Callaghan Innovation

Q14

Is it a Māori-led organisation?

No

Q15

Which disciplines are most relevant to your work?

Environmental sciences,

Health sciences,

Information and computing sciences

Q16

What best describes the use of Mātauranga Māori (Māori knowledge) in your work?

There is some Mātauranga Māori, but it is not the main science knowledge

Page 8: Section 2: Submitter information - organisation

Q17

Organisation name

Respondent skipped this question

Q18

Organisation type

Respondent skipped this question

Q19

Is it a Māori-led organisation?

Respondent skipped this question

Q20

Where is the headquarters of the organisation?

Respondent skipped this question

Q21

What best describes the use of Mātauranga Māori (Māori knowledge) in your organisation?

Respondent skipped this question

Page 9: Section 3: Research Priorities

Q22

Priorities design: What principles could be used to determine the scope and focus of research Priorities? (See page 27 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q23

Priority-setting process: What principles should guide a national research Priority-setting process, and how can the process best give effect to Te Tiriti?(See pages 28-29 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q24

Operationalising Priorities: How should the strategy for each national research Priority be set and how do we operationalise them?(See pages 30-33 of the Green Paper for additional information related to this question)

Respondent skipped this question

Page 10: Section 4: Te Tiriti, mātauranga Māori, and Māori aspirations

Q25

Engagement: How should we engage with Māori and Treaty Partners?(See page 38 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q26

Respondent skipped this question

Mātauranga Māori: What are your thoughts on how to enable and protect mātauranga Māori in the research system?(See pages 38-39 of the Green Paper for additional information related to this question)

Q27

Respondent skipped this question

Regionally based Māori knowledge hubs: What are your thoughts on regionally based Māori knowledge hubs? (See page 39 of the Green Paper for additional information related to this question)

Page 11: Section 5: Funding

Q28

Core Functions: How should we decide what constitutes a core function, and how do we fund them?(See pages 44-46 of the Green Paper for additional information related to this question)

The opportunity

We are living in a time of exponential change and facing the biggest challenges we have faced as a country and also mankind. These challenges come from the boundaries of human need and our environment being push beyond equilibrium. This manifests in new viruses emerging, existing harmful bacteria becoming resistant to traditional medicines and degradation in the microbial health of our soil and water, the impact of climate change on people and the environment to name a few. These challenges drive opportunities to go further with research to help discover the impact of our harm and ways we can restore a balance, and also in the development of new technologies and techniques such as genome sequencing that applies across environmental health, human health and forensics alike. Indeed, ESR is at the forefront of forensic science and the justice sector demands high levels of services and constant innovation and solutions, and we as the Data Science and Computational Science practices are at the core of this work. To continue to realise these opportunities we need to be great at what we do, not just good, and have a more flexible and aligned research ecosystem so we can find solutions to the causes of the issues and not just the symptoms.

What is stopping us being great

CRIs operate under the company model and are highly competitive for limited funding for research, which limits our ability to innovate in our applied science from what we learn through research.

- ESR has a substantial commercial delivery (around 90%), whereas other CRIs and Universities tend to be more research focused. The majority of ESR's work is delivery to commercial contracts (NZ Police, MoH, MPI and many other government and private organisations). A germane illustration being ESR's genomic and surveillance contribution to the COVID-19 pandemic. However, our innovation in how we deliver our commercial work often times comes from our own investment in research.
- Funding for research is not sufficient to support innovation across the range of domains required, and it encourages short term focus to ensure results are achieved within the funding cycle, therefore undermining medium to long term investment in people and their skills. And very often overlooks data science and computational sciences.

How we can be great

Funding innovation with a longer-term focus and also expanding research funding across data science and computational science which are at the core of the next generation of dry lab science.

Q29

Establishing a base grant and base grant design: Do you think a base grant funding model will improve stability and resilience for research organisations?(See pages 46-49 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q30

Establishing a base grant and base grant design: How should we go about designing and implementing such a funding model?(See pages 46-49 of the Green Paper for additional information related to this question)

Respondent skipped this question

Page 12: Section 6: Institutions

Q31

Institution design: How do we design collaborative, adaptive and agile research institutions that will serve current and future needs?(See pages 57-58 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q32

Role of institutions in workforce development: How can institutions be designed to better support capability, skill and workforce development?(See page 58 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q33

Better coordinated property and capital investment: How should we make decisions on large property and capital investments under a more coordinated approach?(See pages 58-59 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q34

Institution design and Te Tiriti: How do we design Tiriti-enabled institutions? (See page 59 of the Green Paper for additional information related to this question)

Respondent skipped this question

Q35

Knowledge exchange: How do we better support knowledge exchange and impact generation? What should be the role of research institutions in transferring knowledge into operational environments and technologies?(See pages 60-63 of the Green Paper for additional information related to this question)

Respondent skipped this question

Page 13: Section 7: Research workforce

Q36

Workforce and research Priorities: How should we include workforce considerations in the design of national research Priorities?(See pages 69-70 of the Green Paper for additional information related to this question)

The opportunity

We are living in a time of exponential change and facing the biggest challenges we have faced as a country and also mankind. These challenges come from the boundaries of human need and our environment being push beyond equilibrium. This manifests in new viruses emerging, existing harmful bacteria becoming resistant to traditional medicines and degradation in the microbial health of our soil and water, the impact of climate change on people and the environment to name a few. These challenges drive opportunities to go further with research to help discover the impact of our harm and ways we can restore a balance, and also in the development of new technologies and techniques such as genome sequencing that applies across environmental health, human health and forensics alike. Indeed, ESR is at the forefront of forensic science and the justice sector demands high levels of services and constant innovation and solutions, and we as the Data Science and Computational Science practices are at the core of this work. To continue to realise these opportunities we need to be great at what we do, not just good, and have a more flexible and aligned research ecosystem so we can find solutions to the causes of the issues and not just the symptoms.

What is stopping us being great

Lack of people with the right skills to drive innovation, due to the specialised work we do at the intersect between genomics and bioinformatics; computational science, data science and other emerging leading-edge sciences.

- The sciences we cover demand highly specialist skillsets that are hardly available in NZ and yet we are massively dependant on these skill sets for research, experimentation and commercial delivery.
- The people with these skills are rare, and the current workforce is in shortage, with some retiring and others rotating within the very small NZ community or being hired overseas. In effect we are creating competition for ourselves with a scarce resource.

How we can be great

In the short-term collaborate and share where there is a mutual interest and benefit. And in the medium-term invest in skill development for the future.

This includes:

- Collaboration between entities.
- Sharing knowledge bases.
- Sharing staff where possible. Noting however, that there is the risk that the needs of larger entities quickly outweighing the needs of small entities and therefore re-introducing the same problems we face now.
- Ensuring that staff are given opportunities to develop.
- Ensuring that staff are properly compensated for their skills and delivery.
- Taking a long-term view to training and developing new and emerging talent and retaining them in the face of competition from overseas.
- Having solid plans and management to develop and keep great talent and trying to avoid relying on serendipitous staffing outcomes.
- Encouraging staff development in Computational Science by supporting PhDs, publications and innovation.
- Positioning to attract scientists to Computational Science from the current organisation, the NZ science community and internationally. And avoiding as much as possible, losses of scarce staff to the international community.
- Investment in training graduates for the ‘long-haul’, an expected 5+ year development cycle.

Q37

Respondent skipped this question

Base grant and workforce: What impact would a base grant have on the research workforce?(See pages 70-71 of the Green Paper for additional information related to this question)

Q38

Better designed funding mechanisms: How do we design new funding mechanisms that strongly focus on workforce outcomes? (See page 72 of the Green Paper for additional information related to this question)

Respondent skipped this question

Page 14: Section 8: Research infrastructure

Q39

Funding research infrastructure: How do we support sustainable, efficient and enabling investment in research infrastructure?(See pages 77-78 of the Green Paper for additional information related to this question)

The opportunity

We are living in a time of exponential change and facing the biggest challenges we have faced as a country and also mankind. These challenges come from the boundaries of human need and our environment being push beyond equilibrium. This manifests in new viruses emerging, existing harmful bacteria becoming resistant to traditional medicines and degradation in the microbial health of our soil and water, the impact of climate change on people and the environment to name a few. These challenges drive opportunities to go further with research to help discover the impact of our harm and ways we can restore a balance, and also in the development of new technologies and techniques such as genome sequencing that applies across environmental health, human health and forensics alike. Indeed, ESR is at the forefront of forensic science and the justice sector demands high levels of services and constant innovation and solutions, and we as the Data Science and Computational Science practices are at the core of this work. To continue to realise these opportunities we need to be great at what we do, not just good, and have a more flexible and aligned research ecosystem so we can find solutions to the causes of the issues and not just the symptoms.

What is stopping us from being great

The Green Paper quote below best explains that the NZ research model does not enable innovation or flexibility at the rate needed to stay relevant. Nor does it enable a thriving symbiotic relationship between research and commercial delivery, as there is an assumption the diversity of needs can be best met within one solution.

- As cited in the Green Paper - 6.1.1, Page 74: “New Zealand’s large national research infrastructure mostly relies on joint funding, where government shares the costs with research institutions or, in some cases, users. However, these models are unstable and vulnerable to changing research technology advancement, user requirements or costs, particularly with varying needs across the research system. If research institutions and users do not feel they are receiving fair value relative to the cost of ‘membership’ they become dissatisfied. At a minimum, this creates tensions in the system, and, if a user leaves, it can create a funding gap for the facility. We hear dissatisfaction from research institutions about not being able to influence direction.”

How we can be great

Share infrastructure where there is a common value proposition, utilising federated models and centres of excellence where possible. Where there is not a common value proposition in the work, there are still opportunities to formalise investment across some common generic services as REANNZ has proven.

- ESR provisions our own HPC infrastructure very efficiently and economically. Indeed, ESR’s Computational Science delivery is less about HPC infrastructure and more about expert skills, experience, and knowledge in our science domain.
- REANNZ is an excellent service we use extensively, and it provides value across all, therefore continue investment in this service.
- NeSI’s services are currently not suitable for ESR’s largely service delivery oriented and agile research, experimentation and innovation requirements. Dividing our research off from our service delivery to run them on separate infrastructures would result in duplication, add cost and limit innovation without any offsetting benefit.
- We already collaborate with a number of other CRIs and universities, sharing our expertise, advising and use of our Computational Science capability and High Performance Compute (HPC). This model is successful in building capability and creating an efficient and effective ecosystem. To this end we support a collaborative approach to Computational Science domain skillsets and collective centres of excellence. This would include the possibility of sharing HPC and using federated storage, shared procurement processes, developing virtual centres of excellence of staff, tools and capability, scientific instrumentation, and many other opportunities.
- Taking a community approach with federation of resources where possible would give more flexibility than a consolidated approach would, and mitigate the risk of the needs of larger entities outweighing the needs of small entities like ESR.

o Carefully considering all options for HPC (High Performance Compute) resource provisioning and choosing the best value for money, performance, accessibility, an agile response to innovation, experimentation, service delivery and research. This has resulted in ESR purchasing and hosting HPC hardware. Any purchases are re-evaluated for alternative technologies such as cloud. Cloud resources are typically many times more expensive, not fit for purpose, and true costs are opaque and unpredictable.

o Only buying what we need when we need it. This requires an on-going commitment by ESR to invest in emerging Computational Science systems and tools but delivers the right capability when it’s needed to advance research, experimentation, innovation and service delivery. It also means that delaying investment until its needed results in better more up to date technology and minimises over-investment in technology that soon becomes out of date.

o This approach has allowed ESR to meet our substantial, ever changing HPC demands for service delivery while properly and

o This approach has allowed ESR to meet our substantial, ever changing HPC demands for service delivery while properly and adequately providing HPC resources for research. This HPC approach is agile and is unincumbered thus allowing freedom to experiment and innovate, both in research and service delivery.
o An active dialog with cloud HPC cloud services vendors to ensure future opportunities are recognised early.
o Actively managing resources to ensure best use and to delay future investment where feasible, especially for data storage.

• Data and Compute Security. Unlike other CRIs, in delivering forensic services to Police, patient-oriented disease services and Maori data, ESR has specific data security requirements that applies to the complete process from sampling to laboratory processes to data science and genomic HPC and storage.
o Data must be highly secure and controlled.
o Considerations such as whether data can be stored on backup tape become crucial.
o Maintaining Maori sovereignty of data is crucial.
o Using shared infrastructure poses data security issues and risks.
o With the explosion of novel uses of DNA, such as Police forensic identification, personalised medicine, disease predication, genealogy (exploitation), and many more no doubt, controlling access to parts of a persons' DNA rather than just the entire sequence is likely to become an important requirement. This will demand storage complexity not yet encountered.
• A shared government service of cheap, integrated, appropriately accessible, and secure archive storage would be of value. ESR's data archiving demands are insignificant when compared to other CRIs and Universities, and ESR would benefit greatly from a shared archive infrastructure, or AoG volume discounted storage deals with commercial cloud providers. The operative word being 'cheap'.
• Being able to influence cloud providers such as AZURE and AWS to provide the right and cost effective HPC resources for CRIs and Universities. Currently specifications are limited and expensive. Having these onshore and with multiple data centres for resilience would be important. An AoG approach could help ESR.
• Being able to utilise NeSI HPC as an economic resource for non-research workloads, just as REANNZ made that transition years ago, would be useful. However, ESR would need the choice to select services from other providers such as AZURE or AWS, and to also choose to provision our own infrastructure. ESR would need the right specifications, the right performance, the right availability and the ability to add different resources when the demand arises. ESR needs the right compute accessibility and storage capacity exactly when it's required and cannot wait for long compute job queues to clear from other customers. By the same token, ESR cannot wait for long funding and procurement cycles to provision new resources.