

Submission on Te Ara Paerangi Future Pathways Green Paper

To the Ministry of Business, Innovation and Employment

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Submitter details

This submission is from the Parliamentary Commissioner for the Environment, Simon Upton.

Phone: 04 471 1669

Email: pce@pce.parliament.nz

The Parliamentary Commissioner for the Environment

The Parliamentary Commissioner for the Environment was established under the Environment Act 1986. As an independent Officer of Parliament, the Commissioner has broad powers to investigate environmental concerns and make recommendations to improve environmental outcomes. The Commissioner is wholly independent of the government of the day. The current Parliamentary Commissioner for the Environment is Simon Upton.

Key points

1. This submission is based on the research undertaken for three investigations I published in 2019, 2020 and 2021, and the recommendations therein.¹ This submission focuses on how the environment should fit into any new system for science priorities, funding and governance.
2. The environment both provides life-supporting capacity and is a critical enabler of New Zealand's economy. Research that can help us understand and protect the natural environment is therefore a fundamental element of New Zealand's public research system and must constitute a core element of at least one overarching priority area envisioned in *Te Ara Paerangi Future Pathways Green Paper*.²
3. A **national environmental research strategy** needs to be developed. It must be informed by a governance group that brings together researchers, government officials, Māori and key stakeholders.
4. The environmental research strategy needs dedicated funding over a time horizon that matches the long-term nature of much environmental research. A significant proportion of that funding should be non-contestable, secured for a term of 10 to 15 years.
5. The establishment of an independent funding agency, such as an **Environmental Research Council**, along the lines of what I proposed in my 2020 review of the prioritisation and funding of environmental research in New Zealand, should be tasked to deliver on the environmental research strategy.
6. Large scale institutional reform should be avoided, especially with respect to Crown Research Institutes (CRIs) that are the only publicly owned entities whose mission is to address key environmental research domains. While there will always be ways to improve the efficiency,

¹ PCE, 2019, Focusing Aotearoa New Zealand's environmental reporting system; PCE, 2020, A review of the funding and prioritisation of environmental research in New Zealand; PCE, 2021, Wellbeing budgets and the environment: A promised land?

² MBIE, 2021. Te Ara Paerangi Future Pathways Green Paper.

effectiveness and collaboration of CRIs, the problems facing environmental research are not principally rooted in issues of institutional design. Having clearer national priorities and dedicated funding, including more non-contestable funding, will go a long way to improving the system without the potential upheaval an institutional reorganisation would invariably bring.

7. In the second half of 2022, I will publish a synthesis report outlining how the connections between environmental reporting, environmental research and budget setting can be strengthened. It will be of direct relevance to any reorganisation of the science system envisaged downstream of the Green Paper.

Introduction and background

Thank you for the opportunity to submit on your Green Paper *Te Ara Paerangi Future Pathways* published in December 2021.

My mission as stated in the Environmental Act 1986 is “*to maintain or improve the quality of the environment*”. Given that, my submission touches only on those issues that relate to the contribution research makes to the natural environment. Other research fields may well involve different considerations. The temptation of policy makers and managers to view scientific enquiry and research endeavour as uniform and homogeneous should be resisted.

This submission is grounded in three reports I have published over the last three years:

1. *Focusing Aotearoa New Zealand’s environmental reporting system* published in November 2019.³ This report reviewed how well New Zealand reports on the state of its environment, as required under the Environmental Reporting Act 2015, and provided recommendations to help ensure that the stewardship of our environment is focused on the right places.
2. *A review of the funding and prioritisation of environmental research in New Zealand* was published in November 2020.⁴ This report examined how public funds are invested in environmental research in New Zealand and whether the research done is sufficiently focused on responding to the many environmental challenges New Zealand faces.
3. *Wellbeing budgets and the environment: A promised land?* was published in December 2021.⁵ This report looked at what we know and don’t know about the link between the environment and wellbeing, and how successfully data and knowledge about the state of the environment informs budget decisions relating to the environment.

The common thread between these reports is our reliance on data and research outputs to tackle the pressing environmental problems New Zealand faces. They cut across a wide spectrum of issues, including environmental monitoring, databases and collections, the mechanisms used to allocate public funding for environmental research and the extent to which these investments in knowledge generation inform the Government’s spending decisions.

³ See <https://www.pce.parliament.nz/publications/focusing-aotearoa-new-zealand-s-environmental-reporting-system>.

⁴ See <https://www.pce.parliament.nz/publications/environmental-research-funding-review>.

⁵ See <https://www.pce.parliament.nz/publications/wellbeing-budgets-and-the-environment>.

The recommendations from these three reports that are most pertinent to this submission can be summarised as follows:

1. The Ministry for the Environment should establish a **standing science advisory panel**, to provide independent expert advice on emerging and priority environmental issues to be included in state of the environment reports and commentaries, and provide advice on further research, monitoring and data needed to provide robust and comprehensive environmental reporting, including advice on environmental indicators.
2. A clear and unambiguous **national-level environmental research strategy** should be developed under the leadership of the Ministry for the Environment, along with key stakeholders.
3. Public resources for environmental research should be ringfenced and explicitly linked to the environmental research strategy.
4. An **Environmental Research Council** should be established to allocate research funding. The council should be at arm's length from officials and be held accountable for investing resources in a way that will deliver the environmental research strategy. It should be run by people who understand what environmental research entails and the characteristics of New Zealand's highly dynamic environment.
5. The allocation of funding should allow for mātauranga Māori to fully contribute in a way that enables both mātauranga and science to benefit from one another.
6. Public expenditure on environmental protection and restoration should be informed and prioritised on the basis of data gleaned from state of the environment reporting and the results of research.

In the second half of 2022 I will publish a synthesis report outlining how the connections between environmental reporting, environmental research and budget setting can be strengthened. This synthesis report will be of direct relevance to any reorganisation of the science system envisaged downstream of the Green Paper and should contribute to the ongoing consultation initiated with this Green Paper.

Te Ara Paerangi Future Pathways Green Paper

The Green Paper provides an account of many issues and concerns about the science system that have been raised over the years by various stakeholders, including research organisations and scientists. It shares some of the conclusions I have reached in my reports, including significant fragmentation in governance and funding streams, a proliferation of strategies and difficulties in directing resources towards the areas of highest importance.

The wide range of issues covered in the Green Paper raises the potential for a far-reaching reorganisation of the science system, with a particular focus on a reorganisation of CRIs. This seems at odds with the fact that *the way* in which research is funded offers more levers to different behaviour by researchers than redesigning institutions. I have three high-level concerns:

1. The potential impact of any reorganisation on our ability to understand and manage the natural environment. Environmental science has to have a central place in any public research system.
2. The costs that any major reorganisation would impose. Funds for many long-run, core environmental research programmes have not been adjusted in many years. Spending money

on reorganising the science system is arguably a lower priority than securing some of the collections and databases on which environmental science and environmental management rely.

3. The potential for upheaval in the science workforce. Most scientists want to get on with the job in hand. More so than in many fields of research, environmental scientists need funding mechanisms that provide long-term stability that match the nature of the subject matter they are investigating. While they have had relative institutional stability, that has been matched with funding sclerosis.

The following sections provide more specific commentary on key chapters in the Green Paper.

Research priorities

As Parliamentary Commissioner for the Environment, my comments on national research priorities are confined to environmentally related research.

While there are many ways that national research priorities can be elaborated, the environment has to be one of those priorities. The environment is foundational. It provides life-supporting capacity for humans (for example, clean water and food) and the biodiversity we value. It is an intrinsic part of both western and te ao Māori world views. Our economy is inextricably linked to the environment, including our primary industries, electricity sector and the wider economy, especially as we decarbonise and move to a circular economy.

From my perspective, a rationale for investment in environmental research might be stated along these lines:

- Most of the vast continental landmass of Zealandia from which Aotearoa New Zealand emerges is underwater. The life and mineral forms that inhabit its terrestrial and marine environments are the unique sovereign responsibility of the New Zealand Government. No other entity is charged with taking responsibility or stewardship for human interference with this part of the world's geo and biosphere. It follows that if the New Zealand Government is to exercise its sovereign and stewardship responsibilities, it has to have a comprehensive understanding of the biogeochemical and ecological processes that pertain here. In the absence of this, the effective exercise of those stewardship responsibilities would be serendipitous at best.
- Given that those processes are a subset of planetary-level systems, the New Zealand Government also has an interest and a responsibility to contribute to global efforts to understand earth systems.
- As a result of the history of human settlement in New Zealand, in particular European colonisation, significant ecological perturbations were set in train that continue to the present. These have consequences for the ongoing wellbeing of citizens that cannot be either interpreted or managed through the agency of private individuals. The Government of New Zealand is uniquely placed, through taxation, to deliver knowledge from public good research that can enable individuals and businesses to:
 - understand the place of human agency in this land, and in particular protect the special relationship of Māori who were its first settlers
 - make sustainable use of the country's biological and geological resources

- manage the consequences of past unsustainable use of those resources
- understand and manage local consequences of environmental changes that flow from environmental disruptions at the planetary level.

These reasons go not just to the heart of national identity but our relationship with planet Earth, which is our only home. It is important to state that, because not all research endeavours have quite such primordial roots. Much research responds to fast-changing technological, social and geopolitical trends. These are amenable to continual review and significant changes of direction. The subject matter of environmental research operates on much longer time frames, and in many cases observes processes that take place over decades or even millennia. A very different – and in some ways more patient – dynamic applies. Any research strategy for the environment must embrace these differences. This has implications for the way priorities are determined and the way research is funded.

Setting priorities within an environmental research strategy

The development of a clear and unambiguous national-level **environmental research strategy** is one of the main recommendations I made in my 2020 environmental research review.⁶ I also recommended that funding for environmental research be ringfenced and that the implementation of the strategy be overseen by an **Environmental Research Council**. There is a nice alignment between those recommendations and the Green Paper's proposal for dedicated funding for priorities and questions around governance of each strategy.⁷

The environmental research review, along with the reporting system review and wellbeing report, provides further details on what to consider when developing an environmental research strategy, including identifying the priorities within it, and the governance issues associated with its implementation.

1. The strategy needs to be developed by a knowledgeable group, representative of the various stakeholders of the science system. At least the following three categories of stakeholders should be considered:
 - The Ministry for the Environment should lead and be responsible for the development of the strategy. This includes managing the process to identify the priorities.
 - The standing science advisory panel – recommended in my previous reports and currently being developed in the context of proposed changes to the Environmental Reporting Act – should play a key role in developing the strategy. It would help: (1) ensure that environmental data gaps identified through the domain and synthesis reporting process are clearly accounted for in the strategy so they are progressively filled; and (2) advise on further research and monitoring needed to address the environmental priorities and data gaps.
 - Suitable experts from local and central government agencies, Māori organisations and the research community should be involved. There will inevitably be divergence between those who want a high-level strategy that enables funders to discriminate between claims to priority, and those who want a specific strategy written to advance the interests of restricted parties that descends into operational research. Both top-down and bottom-up approaches

⁶ PCE, 2020, pp.57–59.

⁷ MBIE, 2021, pp.26–27.

are needed and warranted to engage stakeholders without allowing either approach to dominate.

2. A national-level environmental research strategy must remain at arm's length from day-to-day government decision making. While it must recognise and address the vision that the Government has for Aotearoa New Zealand, the election cycle is too short to suit the development of a long-lasting strategy that needs to take account of the timeline of environmental issues.
3. An environmental research strategy must also account for the potential that all actors in the research system can play. While CRIs and universities may contribute to the bulk of environmental research, in 2018 and 2019 the sixteen regional councils together funded approximately \$70 million of research, excluding monitoring. This is on a par with central government organisations such as the Ministry for Primary Industries.
4. Given the myriad ways and rapidity with which both the environment and environmental science can evolve, a national environmental research strategy will need to be both reactive and dynamic. For this it will need to be rooted in a constantly updated evaluation of what environmental monitoring and environmental science are telling us. In other words, it should be informed by research insights and should reflect the evolving concerns and interests of iwi, the community and all users of research. This means it must be a living document under permanent review rather than yet another aspirational statement that is filed.
5. There needs to be a clear line of sight between strategy, funding and research infrastructure. In particular, the maintenance and development of collections and databases must be secured. This has been repeatedly urged but no progress has been made to date. My environmental research review provides an extensive commentary on the importance and state of databases.⁸
6. An independent **Environmental Research Council** should be established, with specialist, dedicated staff to:⁹
 - work within the environmental research strategy framework to define priorities and key research goals
 - ensure that the role of mātauranga Māori, as envisaged by the environmental research strategy (see below), is supported through funding decisions
 - set the criteria for funding allocation
 - develop and negotiate research platforms or programmes with long-term (7–15 year) time horizons
 - allocate a contestable funding pool to provide for emerging issues and opportunities
 - run both the negotiated and contestable allocation processes in transparent consultation with the research community. This includes putting out bounded requests for proposals and, where appropriate, conducting meetings to facilitate collaboration
 - monitor the research it is funding and conduct outcome evaluations.

⁸ PCE, 2020, chapter three.

⁹ PCE, 2020, p.63.

The essential point to stress is that this structure clearly delineates the roles of the various parties. As one of the biggest users of environmental research and with an environmental responsibility, the Government (advised by the ministry and drawing on input from the wider community), alongside Māori, would be responsible for the strategy. Responsibility for delivery of the strategy would rest with the Environment Research Council, with the allocation of research funding remaining at arm's length from political interference. The standing science advisory panel would inform both processes.

Te Tiriti, mātauranga Māori and Māori aspirations

As the Parliamentary Commissioner for the Environment, I am not an expert in Crown–Māori relationships, nor can I speak on behalf of Māori. I do know, however, that there is a special connection between Māori and te taiao that should be addressed in all environmental legislation and policy.

In my 2020 environmental research review I wrote that:

“an approach is needed to change the current system that has been built largely from a western view of individual endeavour, and excellence essentially defined by international peer review, publications and citations. In te ao Māori, collective activity and community endorsement appear to be much stronger drivers of excellence. This might require rethinking how we invest in research in a way that allows both approaches to prosper.”¹⁰

In my 2022 submission to the Ministry for the Environment’s consultation on proposed amendments to the Environmental Reporting Act,¹¹ I suggest that the ministry “assemble a separate mechanism to work with Māori – for example, a separate mātauranga advisory panel”. A separate panel would ensure that Māori are in control of their knowledge and can use it to reach their own assessment of how research priorities should be advanced.

In effect this would result in two panels (a mātauranga advisory panel and a science advisory panel). Both panels would contribute to the environmental research strategy and priorities set under it.

The best model – or models – for delivery and implementation of a fully developed mātauranga Māori programme of work must be explored with Māori leaders.

Funding

The Green Paper proposes that each national research priority has its own dedicated funding.¹² What follows treats the environment as a meta-level priority (to be distinguished from the discussion of priorities above in the context of an environmental research strategy), for which funding would be (largely) channelled through an Environmental Research Council.

Funding needs to be stable, predictable and long term. The larger part of that funding should be attached to long-term, negotiated programmes with a smaller proportion made available competitively to allow research paradigms to be contested and researchers outside of established teams to emerge.

¹⁰ PCE, 2020, p.58.

¹¹ Improving Aotearoa New Zealand’s environmental reporting system – consultation document on proposed amendments to the Environmental Reporting Act 2015; submitted by PCE on 18 March 2022.

¹² MBIE, 2021, p.26.

Environmental issues are complex, often persistent and usually long-lived. Good knowledge of physical, chemical and biological processes is needed to understand, quantify and mitigate the impact of anthropogenic activities on our natural environment.

Environmental data acquisition, time series and monitoring are critical to identifying and developing a proper understanding of environmental issues and developing solutions to address them. Time series necessitate, by definition, the sustained collection of data over long time frames to be statistically and scientifically robust. Activities of this nature need to be funded on time frames with at least 15-year time horizons and are not suited to a competitive model. Similar time frames should govern the funding of the research that underpins these data-seeking enterprises. Five-year funding time frames cannot be considered long term for most environmental research.¹³

However, there should be a place for shorter term, contestable or competitive funding. A certain level of competitive funding, possibly aimed at innovation and blue-sky science, is necessary in any research system. It provides a way to enable emerging issues to be addressed. The Endeavour and Marsden funds seem well adapted to this approach. When it comes to environmental research, it is the ratio of contestable to non-contestable funding that needs to be reconsidered in favour of the latter given the long-term horizons of much environmental research.

The proposal to increase 'base funding', particularly for CRIs, seems a sensible place to start in redressing this balance.

I provide a detailed account of the way funding should be allocated in my 2020 environmental research review, of which I repeat the key points: *"The funding entity should be accountable for how its allocation of funds brings the environmental research strategy to life, and fully transparent about how it makes its funding decisions."*¹⁴

To do this, I proposed a specialist funder of environmental research such as the Environmental Research Council, noting that: *"Funding should be allocated by people familiar with environmental research and the environmental challenges that we are seeking to address. In other words, they need to understand not just 'how' research is conducted and managed but also 'what' is being funded."*¹⁵

I also noted that, *"The criteria used to allocate funding should be relevant to the particular characteristics of environmental research."*¹⁶

No one will argue that publicly funded science should not seek to be, and be, excellent. But the current definition of 'excellence' within our research system is heavily influenced by a particular culture of publications and citations. Excellence may well be assessed somewhat differently where international peer review is not the overriding judge. For instance, the maintenance and development of collections and databases relies on meticulous processes, state-of-the-art infrastructures and a highly specialised, dedicated workforce. An initiative to maintain or amend assets like these may not be judged 'excellent' in the way that a research proposal may be. Yet, these fundamental underpinnings make 'excellent' research possible, which will, in turn, benefit collection curation.

Put simply, much environmental research relies on existing techniques that innovate through

¹³ MBIE, 2021, p.27.

¹⁴ PCE, 2020, p.59.

¹⁵ PCE, 2020, p.58.

¹⁶ PCE, 2020, p.58.

evolution rather than being novel. This suggests that emphasis in funding criteria should find a better balance between 'excellence' and 'impact' in addressing the environmental issues we need to resolve rather than novelty dressed up as 'excellence'. In my 2020 report I recommend that *"The allocation criteria, including 'excellence' (whether for negotiated or contestable funds), should be tested for their fit with the sort of research that is required to understand our highly dynamic natural environment over appropriate time frames."*¹⁷

While the above commentary focuses specifically on the environment, I am conscious that environmental research is only part of a wider research ecosystem. The quantum of investment in environmental research will not be determined in a vacuum. It is impossible not to look across the entire research envelope and ignore the relative shares devoted to research supporting different elements of New Zealand's economy and society. It would be a mistake, however, to start from some targeted level of research investment and seek to apportion 'fair shares' within that.

The reasons that underpin decisions to invest public resources in research are heterogeneous. Looking for common principles that can underpin all public research is likely, at best, to yield uninteresting generalities. I am similarly sceptical of research investment targets such as a given percentage of gross domestic product. Such aspirational aims have been repeated for over three decades in New Zealand without any appreciable change in the share of resources devoted to research and development. Such goals should be jettisoned in favour of clearly articulated reasons for devoting resources at particular levels to particular types of research investment.

Institutions

As Parliamentary Commissioner for the Environment, my principal concern is with the output of research institutions, not how they are arranged. However, as a regular purchaser of research from research institutions I am not indifferent to the different contributions they make.

I look primarily to universities and CRIs for research inputs to my work. I am aware that they are driven by very different imperatives. Universities are homes to large numbers of individual researchers whose impact is professionally measured in published papers. The institutions have a role as 'critics and conscience' of society, but in the absence of funding mechanisms that cause them to collaborate and focus their work around a particular theme or mission, universities cannot provide an institutional foundation for dedicated environmental research.

CRIs by contrast are by definition mission-focused. They were established to provide a critical mass of research around broad sectors or fields of related inquiry. One CRI – Manaaki Whenua – Landcare Research – could be described as largely environmental being focused on the terrestrial and human environment. Environmental research related to the ocean–atmosphere interface accounts for a significant fraction of the National Institute of Water and Atmospheric Research's mission. In the same way, GNS Science conducts important elements of environmental research in the context of an earth sciences mandate. But environmental research is also spread through CRIs focused on economic sectors and lies at the heart of some of the Institute of Environmental Science and Research's work. On the whole their work is excellent and a critical informant to our environmental management system.

The long-term nature of much environmental research will benefit from research institutions that can provide a stable long-term approach to research and can be a long-term home to the necessary

¹⁷ PCE, 2020, p.60.

infrastructure, especially databases and collections. The Government, as the biggest user of long-term environmental research and continuous environmental data, needs environmental research institutions that can easily respond to government priorities and needs, and be agile as they change.

As publicly owned institutions, CRIs are best-placed to respond to and deliver on environmental priorities and strategies. As mission-led organisations they can provide a dedicated, continuous and long-term focus to environmental research. While universities undertake a significant amount of environmental research, their research priorities are more driven by the academic interests of their staff at any given time and academic freedom gives government less influence over the research conducted there.

The extent to which these different institutions can be “collaborative, adaptive and agile” has,¹⁸ in the context of environmental research, little to do with their *raison d'être* and much more to do with how they are funded – hence the importance of what I have said in the preceding section on funding.

I agree with analysis in the Green Paper suggesting that current arrangements sometimes lead to too much competition to the detriment of the delivery of science excellence and impact. The answer to that is to turn down the level of contestability on the funding side. My view is that getting the priorities and funding settings right will go a long way towards the changes needed in the science system, without the potential upheaval institutional change would create. From an environmental point of view, I think that New Zealand is well-served by having CRIs dedicated to coherent aspects of the biophysical environment.

The Green Paper seems to imply– in several places and without being particularly specific – that there is a problem with CRIs, through statements such as “the structural limitations of the current operating model for CRIs are becoming increasingly evident”,¹⁹ “the current system is not well suited to pursuing opportunities that cross institutional boundaries”,²⁰ “CRIs may prefer to lean towards commercial gains ... rather than maximising the public good”,²¹ and “the current model ... constrains CRIs’ ability to respond to strategic priorities ... due in part to its narrow institutional design”.²²

While there are undoubtedly ways in which the effectiveness, efficiency and collaborative-ness of CRIs can be improved, I caution against any wholesale reorganisation or merging of the CRIs principally involved in environmental research. In my view the risks outweigh any benefits.

- Long-term research requires stable long-term capability (primarily staff). Institutional reorganisation, no matter how well signalled, brings with it uncertainty for staff. That capability, if unsettled during any reorganisation, will be hard to replace.
- CRIs have built a substantial international reputation for quality science under their current brands. Any reorganisation risks setting that back and requiring new entities to build new brands.
- The current ‘company’ structure of CRIs means they can manage their own balance sheets and borrow against them to fund capital improvements. The CRIs themselves are best placed to understand the capital requirements needed to support their research, and pricing this into the costs of the research they conduct allows for efficiency and accountability. A move back to effectively involving the Treasury in capital bids through the budget process, without the

¹⁸ MBIE, 2021.

¹⁹ MBIE, 2021, p.52.

²⁰ MBIE, 2021, p.54.

²¹ MBIE, 2021, p.54.

²² MBIE, 2021, p.55.

appropriate science expertise, would be risky and a significant backward step. The government departments that preceded CRIs were woefully provided for on this front. That said, the case for separately funding very large capital items of system-wide significance makes sense.

I would further caution against the idea that the co-location of CRIs and universities should be encouraged. If this makes sense to both parties, it will happen. Funding incentives may well precipitate decisions about where campuses develop. But researchers and their managers rather than officials are best placed to decide what is essentially an operational matter.

Research infrastructure

The research infrastructure most important to my work is collections and databases and the monitoring networks that help keep them up to date and relevant. These are every bit as important as expensive *matériel* but seem to arouse less passion on the part of policy makers. Yet a recurring theme of all of my reports, is the importance of information to identifying and solving the key environmental challenges. New Zealand suffers a relative poverty of information when it comes to making decisions about environmental management.

The science and research system has an important role to play in maintaining existing databases, collections and monitoring networks, and filling the gaps in them.

To achieve all of this the environmental research system needs:

- Continued funding for existing databases, collections and monitoring networks, with provision for increased funding to cover cost increases over time.
- A funded programme of work for progressive improvements to those databases, collections and monitoring networks for one-off improvements and innovations (and funding for any increased operational costs those improvements generate)
- A programme of work to identify new databases, collections and monitoring networks that are needed to help solve the priority environmental issues on which we need more information. These might be identified in regular state of the environment reporting or identified by the environmental research system itself as our knowledge of New Zealand's environment increases. Science researchers and environmental regulatory agencies, such as the Environmental Protection Authority and regional councils, all need to be actively involved in this process.

Financial resources are finite and we cannot fund everything we would like. But while there is a case for reviewing the current nationally significant databases and collections, I caution against there being a capped number or simply discontinuing one database or collection to fund another. Once interrupted a time series value drops significantly and cannot easily be recreated.

Databases, collections and monitoring networks need more financial resources. This is probably an even higher priority than new research. A long-term investment in information collection and storage provides value in being able to solve environmental problems before they reach the point of no return. Given how central the environment is to supporting the biophysical environment and our economy on which it depends, that is an investment worth making.

When thinking about our system for environmental (and other) databases, collections and monitoring networks, further work is also needed.

- The issue of data sovereignty needs to be made clear right from the start. Examples worldwide

abound of publicly funded data and datasets that are only funded on the condition that their access is genuinely free. Federated data infrastructure that enhances information accessibility for all users of research information, including government agencies, iwi and the community may be a solution to investigate.

- Māori interests in relation to data access and data sovereignty should be represented and incorporated in these activities. These should be maintained in a way that enables them to evolve through time as new research foci and technologies emerge.
- Digital infrastructure needs better strategising and funding (see my comments in the priorities and funding sections).

A handwritten signature in black ink, consisting of a long, sweeping horizontal stroke followed by a vertical line and a small horizontal tick at the top.

Rt Hon. Simon Upton

Parliamentary Commissioner for the Environment