

PSGR

Physicians & Scientists for Global Responsibility

January 16, 2023

Submission

Long Term Insight Briefing. How can we help biodiversity thrive through the innovative use of information and emerging technologies?

Submitted to the:

Department of Conservation

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PSGR would welcome an opportunity to speak to this submission.

Physicians and Scientists for Global Responsibility Charitable Trust (PSGR) work to educate the public on issues of science, medicine, technology (SMT). PSGR work to encourage scientists and physicians to engage in debate on issues of SMT, particularly involving genetics and public and environmental health.

The Physicians and Scientists for Global Responsibility welcome the opportunity to submit to the public consultation on the use of emerging technologies to help biodiversity thrive.

This response concerns feedback relating to the November 2022 draft [Long Term Insight Briefing](#).¹²

[A] THE PSGR SUBMIT THAT:

1. The questions in the Long Term Insight Briefing document reflect the fact that this consultation is not primarily concerned with the application of highly relevant scientific and technological processes to understand *key drivers* of biodiversity decline, but rather, illustrate that this document is primarily concerned with securing social, political and cultural licence for the funding and policy integration of a narrow set of technologies named in (3) below.
2. A strategic approach that can more adequately establish a robust and comprehensive approach to environmental science and environmental protection, as suggested by the Parliamentary Commissioner for the Environment (see part [B]), has been ignored.
3. Document authors did not review the relevant scholarly and regulatory literature available that would (a) identify established and new pathways of biological risk to the *ecosystems* that support biodiversity; (b) identify new knowledges of how harm is plausibly occurring (including through combinatory effects of stressors); and (c) explore appropriate scientific and technological approaches that can address the leading variables identified in (a) and (b).
4. This work could then prioritise what work was most urgent for the purposes of policy formulation and investment in science and technology.
5. The question ‘How can we help biodiversity thrive through the innovative use of information and emerging technologies?’ is configured to promote discussion revolving around a narrow set of technologies:
 - 5.1. Satellite imagery and remote sensing (for much greater environmental monitoring and surveillance).
 - 5.2. AI and data-driven technologies (for collecting and analysing vast quantities of data).
 - 5.3. Genetic technologies (for new realms of environmental monitoring and management).
6. These expensive technologies are ***not first order technologies*** suitable for the identification of many scientifically established primary drivers of biodiversity decline.
7. By the selection of the technologies, scientific and analytical research on air, water and soil pollution, a primary driver of biodiversity decline remains out of scope (see part [C] and [E]). I.e. monitoring and analysis of complex chemicals and heavy metals cannot be realistically and meaningfully undertaken ‘remotely’ or by ‘satellite’.
8. Due to absence of reflection of the findings of the Parliamentary Commissioner for the Environment, and the ignorance regarding what drivers actually constitutes hazard and risk (and as such is most appropriate for directing policy), and the seemingly arbitrary selection of a narrow range of technologies, the PSGR recommend that this Long Term Insight Briefing is inadequately informed, inappropriate and premature.

¹ Have your say on how we innovate and shape the future for thriving biodiversity. <https://www.doc.govt.nz/ltib-consult>

² Long Term Insight Briefing <https://www.doc.govt.nz/contentassets/8bb2214f37aa47ffbbba17af76fd5e46/ltib-draft-2022.pdf>

9. The PSGR recommend that a broader consultation across the science and research community, and that analysis by public sector scientists, are instead undertaken to identify priorities for research, consistent with the Parliamentary Commissioner’s recommendations.
10. The word ‘*thrive*’ directs consideration away from a broad range of possible anthropogenic (industrial, agricultural and urban) drivers which stress ecosystems, including the mauri of the ecosystem. A *failure to thrive* as a consequence of overlapping environmental stressors which require much more informed and strategic research trajectories, appear outside the scope of the officials who drafted this document.
11. The questions (part [D]) are awkward to answer as complex, highly specialist and interdisciplinary expertise and technologies, involving a broad range of science and technologies are required to properly assess the drivers of biodiversity decline, and analyse potential policy mechanisms that would ameliorate or halt decline. In addition, the questions appear focussed on techniques to secure social and cultural licence for the specific technologies that appear that officials are focussed on.
12. There can be no doubt that the scope for consideration has been predetermined. This is evident from the background research (see part [F]) which has a narrow remit. The background information has been curated for the purpose of directing research funding to a small range of defined technologies.
13. The Long Term Insight Briefing reflects an historic, political reluctance to strategically address dominant environmental drivers of biodiversity decline and adopt a comprehensive approach to environmental science research that is guided by principles of stewardship and kaitiakitanga, and purposefully dedicated to preventing further environmental harm, rather than principles of technology application.
14. The PSGR request that the government, including elected representatives and officials develop a political will to allocate budgetary funding for environmental science and research funding so that officials and civil society may understand the complex drivers of environmental degradation.
15. Such research must be conducted independently from the powerful ministries and managers which currently predominantly funnel science and research funding to projects with commercialisation or income-related benefit. As scientists that identify the social, industrial and agricultural drivers which threaten biodiversity can come under political pressure, there must be a safe place for this to be done, if the mauri – water, land, flora and fauna – of Aotearoa New Zealand is to be actively protected, and the principles of the Treaty of Waitangi is to be honoured.

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[B] PARLIAMENTARY COMMISSIONER FOR THE ENVIRONMENT'S FINDINGS

16. The Parliamentary Commissioner for the Environment (PCE) has undertaken [extensive research and reporting](#),^{3 4 5} starkly condemning government institutions and officials for long term neglect of monitoring and reporting of polluting environmental chemicals. The PCE stated⁶:

I am not confident that there is a coherent basis for our national investment in environmental science. I am particularly concerned that there is no mechanism that links the ongoing demand environmental reporting makes for an understanding of complex ecological processes that evolve over decades, and a science funding system that is constantly searching for innovation, impact and linkages to the ever-changing demands of business and society.

17. The November 2022 Long Term Insight Briefing used the PCE's work concerning the absence of monitoring of polluting, environmental chemicals for political licence, stating (p.33/36):

A recent review of environmental research funding in Aotearoa New Zealand identified the need for defined research priorities, informed by regular monitoring, the right research approaches to deliver on these priorities, and adequate investment in environmental research that secures critical research capability – both human and technical.⁷

18. However, the Long Term Insight Briefing has made no effort to focus on the most critical gaps identified by the PCE. Nor has it made any effort to articulate the PCE's strong emphasis on our long term ignorance regarding pollution from industry, agriculture and urban sources, including waste streams.
19. However, no similar national monitoring programmes of pesticides and emerging organic contaminants exist for other receiving environments, like rivers, lakes or the coast. All we have are one-off data points. Most importantly, we have no idea what volume of these substances is used or where they are used.⁸

My review of environmental reporting in New Zealand found that the broader environmental system suffers from numerous gaps in data; that it is fragmented, relying on data acquired by different organisations for different purposes using different methodologies; and that even where data do exist, they are often inaccessible to decision makers. Furthermore, Aotearoa's environmental reporting is opportunistic. It passively harvests existing data from many organisations that happen to have collected them, as opposed to setting about systematically generating the data that are needed to address the key environmental issues of concern to New Zealanders.

20. The PCE is challenging officials and Ministers to develop 'a comprehensive, nationally coordinated environmental monitoring system'. The PCE recommends a nationally coordinated approach with 5 separate domains. The PCE particularly selects pollution and waste for research. He has also emphasised

³ Parliamentary Commissioner for the Environment (PCE), 2019. Focusing Aotearoa New Zealand's environmental reporting system. Wellington: Parliamentary Commissioner for the Environment

⁴ Parliamentary Commissioner for the Environment (PCE), 2020. A review of the funding and prioritisation of environmental research in New Zealand. Wellington: Parliamentary Commissioner for the Environment

⁵ Parliamentary Commissioner for the Environment (PCE), 2022b. Knowing what's out there: Regulating the environmental fate of chemicals. Wellington: Parliamentary Commissioner for the Environment

⁶ Parliamentary Commissioner for the Environment (PCE), 2019. Focusing Aotearoa New Zealand's environmental reporting system Wellington: Parliamentary Commissioner for the Environment. P.6

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⁸ Parliamentary Commissioner for the Environment (PCE), 2022. Environmental reporting, research and investment. Do we know if we're making a difference? P.37/106

that work is undertaken to establish the value of our natural assets, so as to recognise the future cost of liabilities when harms remain unaddressed.

21. This Briefing document, and the October/November 2021 consultation neglected to meaningfully explore the findings of the Parliamentary Commissioner for the Environment (PCE). Identification of the drivers of biodiversity loss are most critical and warrant the *most* urgent focus if funding and investment is *limited*. The PCE outlined 5 criteria to judge the pertinence of an issue – by assessing whether it is⁹:
 - irreversible
 - cumulative – building up over time
 - large in scale or pervasive
 - increasing or even accelerating in scale and/or distribution
 - likely to tip a natural system over a threshold into another state
22. This consultation dives straight into AI and biotechnology – without any structure or proposal that demonstrates both coherence and an understanding of the issues that the PCE demand are addressed. To date AI and biotechnology have not offered any long-lasting and environmentally beneficial solutions to problems in biological communities, as they are disruptive and potentially damaging at the molecular and gross structural levels.
23. The selected technologies (which would receive increased funding and investment) are narrow in scope and principally unsuitable to identify *pollution*, which is a dominant driver of biodiversity decline. Over time, damage caused by pollution results in the destruction of flora and fauna, which results in the decline of biodiversity. Toxins and persistent/accumulative chemicals disrupt and deplete terrestrial and aquatic food chains. Toxic and carcinogenic chemicals harm neurodevelopment, affecting intelligence and behaviour. This in turn disrupts predator prey relationships; reduce fertility across populations; increase the susceptibility to diseases and reduces the resilience of populations, making them more vulnerable to collapse.
24. The Parliamentary Commissioner for the Environment’s (PCE) environmental papers have been effectively overlooked in the consultation documents.
25. While the October 2021 Insights Briefing drew on the PCE’s work, it evidently drew from the document to serve a purpose of securing political licence for the funding of investment and deployment of biotechnological and a narrow set of biotechnological and digital technologies.

[C] THE BRIEFING DOCUMENT CANNOT EFFECTIVELY ADDRESS BIODIVERSITY DECLINE.

26. The questions in the Long Term Insight Briefing document reflect the fact that this consultation is *not primarily concerned with preventing the decline of biodiversity* but rather, it is primarily concerned with securing social, political and cultural licence for the funding and policy integration of a narrow set of technologies named in (2).
27. The October/November 2021 consultation targeted biotechnologies and gene editing; and data management focussing on satellite imagery and remote sensing technologies; and artificial intelligence to analyse data.

⁹ Parliamentary Commissioner for the Environment (PCE), 2019. Focusing Aotearoa New Zealand’s environmental reporting system. P. 21/106

28. This second January 2023 Briefing Document, amends the topic slightly but continues to focus ‘use of information and emerging technologies’.
29. The current proposal exclusively encourages consideration of technologies that may be appropriate to monitor introduced and invasive species e.g., for monitoring and analysing population movements.
 - 29.1. The feedback¹⁰ from the November 2021 consultation demonstrated:
 - 29.2. That there not a large appetite for investment in biotechnologies for use in the environment. The main political will arises from officials persistently proposing investment in biotechnology through these consultations/Briefing Documents.
 - 29.3. That there is a broader scientific appetite for environmental data collection (monitoring) and analysis beyond the narrow scope under consultation.
30. A determined persistence with biotechnology in the consultation complements the Ministry of Business, Innovation and Employment’s focus on IP-related innovation (the purpose of innovation) and the dual-purpose potential from scaling up expertise in this highly risky but possibly lucrative field. It is inappropriate for the task at hand.
31. The current Long Term Insight Briefing refers to five main drivers of biodiversity loss, of which two receive vastly more political and media attention and are more frequently targeted for funding:- invasive species and climate change.
 - 31.1. Invasive species.
 - 31.2. Climate change.
 - 31.3. Pollution.
 - 31.4. Exploitation.
 - 31.5. Changing land and sea use.
32. Extensive funding and policy work has been directed to invasive species and climate change; while funding and policy supporting the identification of pollution has stagnated for decades.
33. The technologies identified for this consultation reflect the policy ‘darlings’ of invasive species and climate change. The technologies listed for the purposes of this consultation (5 above) are unsuited for effectively monitoring and identifying pollutant threats but compliment the other four listed concerns.
34. It is no secret that advancements in these attractive tech sectors (see (2)) present possible lucrative opportunities for states and industries in terms of return on investment from ownership of intellectual property rights and potential royalties. These technologies contain dual purpose potential, not only for targeting species and landscape shifts. They can be repurposed to track population shifts, human behaviour, in peacetime or in times of social unrest. Therefore, the dual purpose application broadens the potential revenue outcome for government institutions such as Crown Research Institutes (CRIs).
35. CRIs are increasingly dependent on such forms of income to fund research.

¹⁰ Long-term Insights Briefing Summary of Consultation from 18 October to 14 November 2021

36. Perhaps the ‘use of information and emerging technologies’ has been prioritised because of the potential for IP-related income and their dual-purpose potential; while the potential to draw attention to the drivers of pollution may threaten certain economic activities.
37. New Zealand is unique in having a science system directed by a Ministry focussed on economic growth through science innovation. Biological problems are not necessarily solved by technological innovation and such innovation could create downstream problems in the long run. Conflicts of interest can inhibit the progress of scientific knowledge that is drawing attention to drivers of ecosystem, and biodiversity decline.

[D] QUESTIONS IN THE LONG-TERM INSIGHTS BRIEFING

38. These questions are extraordinary as environmental science is highly variable, complex and situation dependent.

38.1. Questions on P.29/36.

We suggest that these technologies (satellite imagery and remote sensing, artificial intelligence and data-driven technologies, and genetic technologies) provide potential to support the protection of biodiversity.

What other technologies could be game changing for biodiversity?

This question is so broad as to be impossible to answer logically as technologies applied by scientists and researchers are changing by the week.

This question downplays the extent to which science and knowledge then informs the public sector, so that social, political, cultural and legal decisions are then made to limit harms and change practices. The consequences of these decisions become ‘game changing’.

This question is highly specific and depends on the scientific and research field. We recognise that funding for environmental research (which is specifically tied to identifying understanding drivers of pollution) has been limited and precarious for a long time. Science policy has resulted in precious few schemes not tied to innovation and the production of IP. This has resulted in limited and short-term approaches, restricted skills and frustrated scientists. Many technological modalities could be harnessed to evaluate the degree to which environmental stressors represent a risk to ecosystems and the mauri of rivers, soils, forests and air. It depends on the field.

In an attempt to answer this question, a wide range of exciting and sophisticated technologies can be applied to analyse pollutant stressors which can act on species to erode intergenerational resilience and set in place the conditions for biodiversity decline.

The monitoring and data-gathering processes could be undertaken by local groups, with ongoing education and funding.:

- Basic, consistent, strategic monitoring over time across agrichemicals, industrial pollutants and urban waste emissions should be put in place. Substances that are ‘politically inconvenient’ should not be excluded.
- Birds and fish (for example) can be tagged with silicon sampler tags. These can be analysed to identify the chemical signatures from their environments. Cell lines of those species can then be

exposed to that samples' chemical mixture in the laboratory. Hormone cell assays can identify which hormones, such as sex- or thyroid hormones, are disrupted.¹¹

- Endocrine disruption in vertebrate populations is broadly ignored in New Zealand. Sensitive assays exist to test a broader number of nuclear receptors, and other receptor types, and to assess some of the more diverse mechanisms of action for EDCs. Assays to examine these mechanisms, such as receptor expression, hormone transport, hormone synthesis, and epigenetic alterations, can be validated for inclusion in regulatory requirements.¹²
- Future data analysis would involve toxicological analyses and biomarker testing to mimic environmental exposures in key (sentinel) species.
- Predictive analytics and statistical techniques, including data mining, machine learning and predictive modelling, can harness an extraordinary range of complex data points in order to draw attention to recurrent patterns. E.g. ToxCast-Based predictive models.

What aspects of these technologies should be taken into account when considering their use?

Technology which is engaged in understanding and evaluating environmental stressors in such a way that is not extractive and invasive i.e., in place for commercial and financial gain by the research institutions, perpetuate relations of power. They are also likely to produce off-target and unexpected harmful effects, which pose bioethical questions. Such 'aspects' need not be considered in a public consultation.

How could these tools be used at an iwi or community level?

How can a question like this be asked, when processes of monitoring and analysis are highly variable and situation dependent?

38.2. Questions on P.29/36.

How should we build stronger international relationships?

What areas could Aotearoa New Zealand provide global leadership in?

Are you aware of any particularly good work underway overseas that we could think of adopting or adapting here in Aotearoa New Zealand?

These questions are quite vague and not necessarily relevant. They could be directed to the science community, but the responses vary for different areas of monitoring and research. It is uncertain specifically what 'work' is being discussed as this is specific to different scientific disciplines. Protection of biodiversity covers enormously broad disciplinary areas.

Building stronger international relationships is a consequence of international collegiality and resourcing for scientists.

Some suggestions are as follows:

¹¹ Young, A.S. et al 2023. Hormone receptor activities of complex mixtures of known and suspect chemicals in personal silicone wristband samplers worn in office buildings. *Chemosphere*. 315:137705 <https://doi.org/10.1016/j.chemosphere.2022.137705>

¹² Kassotis et al 2020. Endocrine-disrupting chemicals: economic, regulatory, and policy implications. *The Lancet* 8:719-730

- Funding to attend independent, expert international conferences on subjects of scientific and technological importance related to the field of scientists researching the causes of environmental degradation and biodiversity decline.
- No funding directed to attending events funded by political and industry lobbyists such as the World Economic Forum.
- Funding for block science so that scientists can engage in collegial research activities with relevant expert communities.

38.3. Questions on P.29/36.

If we decide to use emerging technologies, how can we build social licence, cultural licence and trust to support their safe and effective use for biodiversity?

Emerging technologies have no historic records of safety. This question demonstrates the absence of scientific communities with the freedom to discuss, debate and talk about scientific research. It demonstrates how captured this consultation is, as the consultation is focusing on a narrow range of technologies for which social, cultural and political trust is low. These technologies can be used for dual purpose application, and are largely unmonitored and unstewarded. It speaks to New Zealand's historic inability to appropriately steward technology and the emissions from technology which often arise as environmental pollution. This history coupled with a failure to address biodiversity disruptors, e.g. pollution - contributes to widespread scepticism.

The question also ignores the issue of what is most required to address biodiversity decline, which should arise from long-term funding for scientists and researchers. The consultation appears to exclusively focus on manufacturing public licence for high tech, second order analysis for potentially profitable, but possibly harmful technologies.

38.4. Questions on P.32/36.

How much of a role should government have in biodiversity protection?
How involved do you think community and iwi groups should be?
How can government best collaborate with others?

This demonstrates the extent to which the scientific and white literature has been ignored in the preparation for this consultation. It also demonstrates the extent to which principles of constitutional and administrative law appear to be unknown or dismissed by the drafters of these questions.

The drivers of biodiversity decline are highly political as they involve emission outputs from industrial and agricultural activities. Controlling these emissions requires not just the identification of their risk based on up-to-date scientific knowledge,¹³ but an enforceable legal framework to be in place. They also are driven by emissions from waste water and other waste sources, where the public sector operator must operate on restrictive budgets. Such budgets may not enable operators to integrate cleaning technologies, for example, which filter toxic chemicals.

The government has an obligation to fund science and research and then apply these knowledges in policy, so as to protect human and environmental health.

¹³ Iorns Magallanes, C 2018. Permitting Poison: Pesticide Regulation in Aotearoa New Zealand. *EPLJ*, 456-490.

Collaboration can occur between scientists in similar fields and across interdisciplinary boundaries. For example, understanding drivers and actioning them can require a mix of *in vivo*, *in silico* and *in vitro* scientific and technical work, as well as integration of knowledge in the policy, legal and social science fields.

Once the knowledge of how harm occurs, policy and collaboration at local, regional and national level can occur to support change.

Innovation and technological development can occur along the scientific and data research and analysis chain. Increasingly sophisticated equipment can be an outcome of this research, and new practices and technologies that can be developed to assist industry, agriculture and public sector utilities to reduce and eliminate emissions.

38.5. Questions on P.32/36.

How can we ensure the diverse voices and views of the community are represented in biodiversity conversations?

What could the guiding principles for decision-making about information and biotechnology look like, and who should be involved in developing these?

This question assumes there is social licence for releasing biotechnology into the New Zealand environment, which there isn't.

There is plenty of social and scientific literature discussing citizen participation in biodiversity conversation. However, it appears the 'conversation' this Briefing Document refers to is about exclusively referring to harnessing a licence for these technologies, before other highly urgent and important work is undertaken.

38.6. Questions on P.33/36.

What are the key data issues that the government will need to think about to get the foundations right for using data-driven and emerging technologies?

This is yet another question which fails to highlight that much work is first required to understand the drivers of biodiversity decline. Such work should involve completely autonomous scientists and researchers who have freedom to undertake long-term work. Such work should include basic and applied research which exclusively focuses on the drivers of biodiversity decline. Scientists should be under no pressure to produce siloed discoveries tied to 'innovation', or the potential production of intellectual property.

Data driven analysis can be looked into, but need to be relevant to knowledge and understanding of the causes of environmental decline. These key issues appear over time and depend on what is scientifically appropriate to the issue at hand.

38.7. Question on P.33/36.

What areas should we put funding or resourcing into, and why?

This question is answered via the discussion below.

[E] POLLUTION AS DOMINANT DRIVER OF BIODIVERSITY DECLINE

39. Chemical pollution is a worldwide crisis that threatens global ecosystems, food security, and human health and reproduction.^{14 15 16}
40. Failure to steward anthropogenic pollution (release of novel entities¹⁷) has been proposed by Stockholm Institute scientists as Pollutant emissions represent a planetary boundary threat. Stockholm Institute scientists have identified that the planetary boundary for anthropogenic pollutants – novel entities¹⁸ – has been exceeded as monitoring and risk analysis has failed to keep pace with release and accumulation of pollutants in the environment.
41. The PSGR emphasise, there is no routine monitoring of water, soil or air to identify pollutant (novel entities) drivers across the motu, other than in groundwater. Public laboratories are poorly equipped and run on a commercial basis. For example, scientists researching contamination of mammalian blood with pollutants must send samples to laboratories in Australia. University facilities here are poor, while commercially operating laboratories limit detection of pollutants limited to a narrow range of contaminants that are economically viable.
42. Ultimately this consultation focusses on technologies that cannot appropriately firstly *identify pollution*. Pollution as a cause of biodiversity loss has a long history of being ignored and downplayed by New Zealand governments.
- 42.1. Monitoring and analysis of novel entities (synthetic chemicals, heavy or trace metals and the products of biotechnology) are vastly under-resourced.
- 42.2. Such work can involve highly sophisticated technologies which are outside the scope of this consultation.
43. We have previously noted¹⁹ that the mooted Resource Management Act replacement could only refer to greenhouse gas emissions, while novel entities emissions such as chemicals, heavy metals and the products of biotechnology, were omitted.
44. In 2019 the PSGR and the Soil and Health Association produced a White Paper which drew attention to long-term evasion of discussion and research regarding environmental chemicals in freshwater, despite the threatened status of many aquatic species.²⁰
- 44.1. The 2019 paper New Zealand Policy on Freshwater: Is it fit for Purpose²¹ demonstrated that the New Zealand government has consistently avoided investment and monitoring of environmental chemicals in freshwater environments for years, if not decades. Instead, a policy focus on nutrient,

¹⁴ Woodruff T et al (2023). A science-based agenda for health-protective chemical assessments and decisions: overview and consensus statement. *Environmental Health* 21:132. <https://doi.org/10.1186/s12940-022-00930-3>

¹⁵ Persson, L. et al. (2022) Outside the Safe Operating Space of the Planetary Boundary for Novel Entities. *Env Sci. Tech.* <https://doi.org/10.1021/acs.est.1c04158>

¹⁶ Naidu R et al. (2021) Chemical pollution: a growing peril and potential catastrophic risk to humanity. *Environ Int.* 2021;156:106616.

¹⁷ Persson, L. et al. (2022) Outside the Safe Operating Space of the Planetary Boundary for Novel Entities. *Env Sci. Tech.* <https://doi.org/10.1021/acs.est.1c04158>

¹⁸ Novel entity means new substances, new forms of existing substances and modified life-forms that have the potential for unwanted geophysical and/or biological effects.

¹⁹ PSGR (2021) Inquiry on the Natural and Built Environments Bill: Parliamentary Paper. <https://psgr.org.nz/component/jdownloads/send/1-root/72-21nba>

²⁰ Soil and Health Association and Physicians and Scientists for Global Responsibility New Zealand Charitable Trust. 2019 Aotearoa New Zealand Policy Proposals on healthy waterways: Are they fit for Purpose? (2019). ISBN 978-0-473-50130-3

²¹ The Soil & Health Association and PSGR. (2019) Aotearoa/New Zealand Policy Proposals on healthy waterways: Are they fit for purpose. ISBN 978-0-473-50130-3

sediment and bacteria has effectively captured the public narrative, while pollution from synthetic chemicals and biological contaminants and heavy metals are persistently ignored.

44.2. Nutrient data does not correlate with chemical loads in freshwater.²² Anthropogenic pollutants require separate suites of tests, and screens that can signal cumulative pressures.

44.3. The proposed replacement Resource Management Act²³ contained detailed reference to greenhouse gas emissions, while keeping pollutant emissions outside the scope. Our submission outlined that if the government cannot define pollution, it cannot be monitored.

44.4. We have noted previously²⁴ that World Health Organization standards for drinking water and pesticides rely on decades old private industry studies that lock in outdated science. New knowledge on persistence, bioaccumulation and toxicity are excluded from WHO assessments which weight decisions on industry selected data. These drinking standards are used by New Zealand to derive safe levels in drinking water.

45. Science to identify the extent of pollutant threats arises firstly, from effective monitoring (sampling) of soil, water and air and protected species to identify novel entities (substances and modified life-forms) by chemical/metal/biological entity class, by mixture, and the extent of pollution. Secondly, analyses can then be undertaken to identify the extent to which pollutants are persistent, bioaccumulative and toxic. Thirdly, drivers of pollution can then be identified, and limits placed on their emissions.

[F] BACKGROUND TO THE BRIEFING

46. DOC and Toitū Te Whenua Land Information New Zealand (LINZ) are asking the New Zealand public, whether they

‘think the draft Long-term Insights Briefing covers the key components needed to support a national conversation about potential tools for biodiversity management in the future.’

47. The draft briefing was confirmed following the October/November 2021 consultation²⁵:

How can innovation in the way we use information and emerging technology help biodiversity thrive?

The areas of focus concerned:

- new and improved information
- the use of biotechnology

48. The draft briefing was confirmed following the October/November 2021 consultation²⁶:

The information selected to justify the consultation, which acts as background information, poorly review the literature on new and emerging technologies that can be strategically engaged by global governments for the protection of human and environmental health.

²² Hageman, K., Aebog, C., Luong, K., Kaserzon, S., Wong, C., Reeks, T., . . . Matthaei, C. (2019). Current Use Pesticides in New Zealand Streams: Comparing Results from Grab Samples and Three Types of Passive Samplers. *Environmental Pollution*, 254, 112973. Retrieved from <https://doi.org/10.1016/j.envpol.2019.112973>

²³ Inquiry on the Natural and Built Environments Bill: Parliamentary Paper

²⁴ (2019) Aotearoa/New Zealand Policy Proposals on healthy waterways: Are they fit for purpose

²⁵ Department of Conservation Te Papa Atawhai (DOC) and Toitū Te Whenua Land Information New Zealand (Toitū Te Whenua) Long-term Insights Briefing October 2021 <https://www.doc.govt.nz/contentassets/4a6414ec062949aaaa998ae59163d04/ltib-consultation-document.pdf>

²⁶ Department of Conservation Te Papa Atawhai (DOC) and Toitū Te Whenua Land Information New Zealand (Toitū Te Whenua) Long-term Insights Briefing October 2021 <https://www.doc.govt.nz/contentassets/4a6414ec062949aaaa998ae59163d04/ltib-consultation-document.pdf>

By exclusively drawing attention to this narrow range of technologies, officials rhetorically frame and manufacture consent to invest in these particular technologies, while other more urgent scientific work remains unfunded and neglected.

49. The backgrounder document for the November 2021 [How we developed this draft Long-term Insights Briefing](#)²⁷ explained that information was drawn from:

- IPBES 2019. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
- Department of Conservation. (2020). Biodiversity in Aotearoa: An overview of state, trends and pressures.

49.1. These papers were inappropriate for the purposes of the DOC consultation as they did not provide a scientific overview of the scientific literature in New Zealand, to illustrate which *pressures* on soil, water and air, as well as flora and fauna from anthropogenic activity are most pressing.

49.2. The New Zealand biodiversity report by the Department of Conservation does not provide an analysis of dominant drivers of biodiversity decline, so as to inform which technologies would be most appropriate.

49.3. General documents such as the IPBES (2019) fail to accurately illustrate that government and regulatory agencies actively contribute to biodiversity decline by failing to keep up with scientific advances, suppressing research into pollution and ignoring new pathways of risk. The IPBES downplays the role of independent science and regulatory agencies in drawing attention to persistent, bioaccumulative and toxic pollutant mixtures. The IPBES does not challenge regulatory processes that persist with outdated scientific approaches. These include ignorance of synergies and mixtures, and failure to incorporate risk from hormone disruption at high level in regulation.

50. Other selected papers emphasise ‘trends’, but do not appropriately reflect the complex, interdisciplinary scientific work required to inform both policy-makers and the public of the damage to humans and the environment that is caused by anthropogenic activities.

50.1. The documents arise from politically and economically networked actors. These are inappropriate for assessing what technologies are appropriate to understand the drivers of biodiversity loss in Aotearoa New Zealand.

World Economic Forum (WEF), a global lobbyist alliance of industry partnerships. The WEF’s imaginary of ‘strategic intelligence’ does not encompass protection of human and environmental health. The WEF does not promote closed loop, low chemical emissions agriculture, the local provision of safe and nourishing food. Its idea of strategic intelligence does not extend to digital tracking and biomarker assays of wildlife or humans to survey harms from non-greenhouse gas anthropogenic emissions. The WEF is concerned with dual-purpose surveillance, digital architecture and biomedical/biotechnological solutions that benefit WEF partner organisations. The only NGO’s that can participate are globally financed by WEF affiliates. Grass-roots and indigenous, local agriculture movements are unable to, or choose not to participate. WEF events are not broadly representative of civil society.

In a September 2020 UN Economist Network white paper²⁸ the conversation revolved around megatrends, digital technology solutionism and inequalities. Pollution from industry, urban run-off and

²⁷ How we developed this draft Long-term Insights Briefing. Long-term Insights Briefing supplementary notes <https://www.doc.govt.nz/contentassets/8bb2214f37aa47ffbba17af76fd5e46/supplementary-document---process-of-ltlib.pdf>

²⁸ Report of the UN Economist Network for the UN 75th Anniversary Shaping the Trends of Our Time. [20-124-UNEN-75Report-2-1.pdf](#)

agriculture, as a driver of biodiversity loss were ignored. The content on inequalities failed to address pervasive and ongoing harms from pollution, nutrient deprivation and disproportionate industry power. It also failed to address the failure of governments to provide resources to local communities. These imagined harms are unlikely to be fixed by IMF injections and increasing digital technology instruments.

EY.(Ernst & Young) (2020). Megatrends 2020 and beyond. EY is a partner organisation of the WEF. EY's consultancy work, as a 'multinational professional services partnership' predominantly concerns transformational business opportunities for the private sector, as well as contract work in policy development with consultant nation states. EY is a partner of the WEF. EY is not an environmental science organisation and is predominantly concerned with the deployment of technologies in such a way that will benefit clients and partners.

OXFAM Global Megatrends discussion paper. This paper predominantly concerned poverty and technological innovation, not the management of the natural environment. The focus on 'environmental pressures' concerned climate change and resource scarcity.

United Kingdom Government. (2021). Trend Deck Spring 2021. This series of papers included one paper which considered [Natural Resources Trends](#). Again there was no discussion of non-greenhouse gas emissions. For example, the document mentioned pollinator decline but did not focus on the demonstrable drivers of intensive pesticidal use which has been demonstrated to drive these declines.

51. The information concerning the adoption of technology focused on a select range of Emerging Technologies. The 'Emerging technologies'²⁹ papers used as the underpinning rationale were patently selectively picked by officials in support of a predetermined focus on AI and biotechnology.
 - 51.1. No white papers or documents were selected which critically reviewed biotechnology or AI to identify potential problems, offtarget risks or ethical issues. Instead, the documents overwhelmingly praised and supported adoption of these technologies.
 - 51.2. It is of note that the Hudson paper does not ask participant subjects what their opinions might be concerning who and how would the ownership of the potential invention (engineered/edited technology) be structured, and for whose benefit.
 - 51.3. Hudson paper questions did not address controversial issues such as horizontal gene transfer, such as through pollen flow of an edited plant back to the unedited species, and the contamination of plants. While 'whakapapa', 'kaitiaki', and 'mana' are claimed to be enhanced, the consultation did not ask politically difficult and contradictory questions.
 - Chui, M., Roberts, R., Lareina Yee. McKinsey Technology Trends Outlook 2022.
 - AI Forum New Zealand. (2022). Artificial Intelligence for the Environment in Aotearoa New Zealand
 - European Policy Centre. (2020). Improving biodiversity: How can digitalisation help?
 - Royal Society Te Apārangi. (2022). Gene editing in Aotearoa.
 - Segelbacher, G., Bosse, M., Burger, P. et al.(2022). New developments in the field of genomic technologies and their relevance to conservation management. *Conserv Genet* 23, 217–242
 - Hudson, M., et al. (2019). Indigenous Perspectives and Gene Editing in Aotearoa New Zealand. *Frontiers in bioengineering and biotechnology*, 7, 70.
 - OECD AI Policy Observatory. (n.d). Policies, data and analysis for trustworthy artificial intelligence
 - Global partnership on Artificial Intelligence (GPAI)

²⁹ Links available at: <https://www.doc.govt.nz/contentassets/8bb2214f37aa47ffbbba17af76fd5e46/supplementary-document---process-of-ltlib.pdf>

[G] SCIENCE THE RIGHT WAY ROUND – IDENTIFYING THE KEY DRIVERS *FIRST*

52. This consultation cannot protect biodiversity due to its uninformed and ad hoc approach. Officials that have set the scope for this Briefing, have not made satisfactory attempts to identify what is most important to target – to prioritise - so as to strategically address the major drivers of harm.
53. The New Zealand government and its regulatory institutions have been historically reluctant to fund research on pollution. All too often these agencies fail to monitor, and fail to remain informed as to scientific advances in order to proactively identify pathways of harm.^{30 31 32}
54. Strategic steps can be taken to identify established and new pathways of biological risk to the *ecosystems* that support biodiversity; (b) identify new knowledges of how harm is plausibly occurring (including through combinatory effects of stressors); and (c) explore appropriate scientific and technological approaches.
55. In failing to approach this policy issue methodologically and reflect scientific advances in defining and understanding risk and hazard, the government fails to act responsibly to actively protect, as a ‘double trustee’ (reflecting power imbalances such as access to scientific expertise and scientific resources)³³ so as to protect Māori interest in the health of land and water, and honour the principles of the Treaty of Waitangi.
56. This briefing shows that the New Zealand government favours funding ‘trendy’ technology that has potential economic benefit, while failing to do the ‘tough’ work to set in place a solid platform for pursuit of environmental research with a mandate and a goal of informing policy which will demonstrably protect the ecosystems and habitats – and especially the mauri - of our flora and fauna.
57. This briefing is inappropriate as a policy document as it ‘puts the cart before the horse’ and cannot assure the technologies discussed can effectively protect Aotearoa New Zealand. The consultation provides no guarantee that investments in these technologies will not present an unjustifiable financial burden in the process that then prevents investment in monitoring and other research more.
58. The financial investment required for a functioning environmental science research system is considerable – therefore all policy and strategy must be cautiously balanced and considered in order to fill in the gaps and follow the recommendations of the PCE.
59. Underfunding of pollution related science is pervasive. Funding schemes are short term and precarious. There is no long-term block funding to analyse chemical mixtures, to identify endocrine disrupting chemicals, and to understand which pollutants are most persistent, toxic and bioaccumulative. This is one issue, but it is historically neglected by policymakers.
60. The Parliamentary Commissioner for the Environment has provided a path forward, and his key recommendations include substantial investment in science and research to monitor and evaluate the causes of ecosystem harms that drive biodiversity loss.

³⁰ Woodruff T et al (2023). A science-based agenda for health-protective chemical assessments and decisions: overview and consensus statement. *Environmental Health* 21:132. <https://doi.org/10.1186/s12940-022-00930-3>

³¹ Maffini MV & Vandenberg LN (2022). Failure to Launch: The Endocrine Disruptor Screening Program at the U.S.Environmental Protection Agency. *Frontiers in Toxicology*. 4:908439 doi: 10.3389/ftox.2022.908439

³² Persson, L. et al. (2022) Outside the Safe Operating Space of the Planetary Boundary for Novel Entities. *Env Sci. Tech*. <https://doi.org/10.1021/acs.est.1c04158>

³³ The Principles of the Treaty of Waitangi as expressed by the Courts and the Waitangi Tribunal. <https://waitangitribunal.govt.nz/treaty-of-waitangi/principles-of-the-treaty/>