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Tēnā koe,

Waikato Regional Council Feedback on the Long-term Insights Briefing

Thank you for the opportunity to provide feedback on the Long-term Insights Briefing. Please find attached Waikato Regional Council's (WRC) staff feedback.

Should you have any queries regarding the content of this document please contact Annika Hamilton, Policy Advisor, Policy Implementation directly on (07) 859 0990 or by email Annika.hamilton@waikatoregion.govt.nz.

Ngā mihi nui,

LBalsom

Lisette Balsom
Manager, Strategic and Policy Implementation

Feedback from Waikato Regional Council on the Long-term Insights Briefing

Introduction

1. We appreciate the opportunity to make a submission on the Long-term Insights Briefing (the Briefing).

2. WRC staff recognise the important role that emerging technologies will play in helping biodiversity thrive in Aotearoa New Zealand. We therefore encourage continued focus on the three key areas of transformation identified in the Briefing.

3. We consider that the Department of Conservation (DOC) and Toitū Te Whenua Land Information New Zealand (Toitū Te Whenua) should further explore opportunities to collect and store biodiversity data in a central repository managed by lead agencies. Combining datasets from different sources and technologies will create efficiencies, enable collaboration, and lead to improved biodiversity outcomes. We also support investment in the interoperability of technologies.

4. We acknowledge that genetic technologies could address biodiversity challenges, however building a social license will be key to their successful implementation. We consider social license and public education should occur alongside the development, and precede the use, of genetic technologies.

5. We highlight the importance of investing in technologies that are best suited to the New Zealand context and that will target specific problems. Investment in upskilling the workforce to use these innovative technologies will also be essential to their success.

6. WRC staff have provided examples of technologies that could be game changers for biodiversity in Aotearoa New Zealand. These are set out in Table A (attached below) with our responses to some of the specific consultation questions.

7. We welcome the opportunity to comment on any further issues explored during the development of the Briefing.

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Feedback on the Long-term Insights Briefing – How can we help biodiversity thrive through the innovative use of information and emerging technologies?

General Comments

8. We recognise the important role that emerging technologies will play in helping biodiversity thrive and sustain life in Aotearoa New Zealand. We therefore encourage continued focus on the three key areas of transformation identified in the Briefing. We have provided general comments and we have also addressed some of the specific consultation questions in Table A.

Data repository and data management

> We recommend that DOC and Toitū Te Whenua should further explore opportunities to collect and store biodiversity data in a central repository managed by lead agencies. Combining datasets from different sources and technologies will create efficiencies, enable collaboration, and lead to improved biodiversity outcomes.

9. At present, datasets are collected and stored on different platforms creating a disconnect between the data gathered by central government agencies, district and regional councils and community and iwi groups. This results in inconsistencies amongst datasets, data duplication and modification that makes it difficult to identify the source and truth. It also limits collaboration.

10. We encourage DOC and Toitū te Whenua to explore existing datasets that could be managed into a central repository. Alternatively, investment could be made into the creation of a new repository structure and data management system that will enable input from multiple stakeholders. Privacy obligations will be paramount, and we recommend the central repository is owned and managed by a central government agency. This will reduce the risk of information being used by private providers for alternative commercial purposes.

11. We consider ease of access will be integral to incentivising the voluntary use of a central repository. Simple and consistent methods for uploading/recording data will be important. The data will also need to be accessible to a wide range of audiences, subject to privacy considerations.

12. We do however recognise the challenges that coordinating the use of a central platform may present, particularly when integrating different datasets. For example, it may be difficult to get consistency in colours across aerial photography. Any such framework will also need to account for different technological properties and qualities. We encourage ongoing work to define standards and guidance on how to store and use the data. We consider data should be stored in in its most "raw" type, which will enable its use for different applications.

13. At a minimum, we consider central government agencies should provide leadership in this space and direct and advocate for the use of certain platforms. It will be important for government agencies to share knowledge about the existence of available platforms and technologies so that councils and other organisations can assess them for use at regional levels.

14. We recommend further work is included on data guardianship, such as the importance of determining who will be responsible for safeguarding and protecting the biodiversity data collected, stored, and accessed in a repository. This will require clear management, oversight, and regulation. Data repositories or platforms that are used to collect and store biodiversity data will likely be contributed to and accessed by different organisations and community groups with differing and overlapping data and privacy responsibilities. A central repository will need to account for these obligations. Data

collected and used by central government and councils will be subject to obligations under the Privacy Act 2020, the Local Government Official Information and Meetings Act 1987, Public Records Act 2005 and the Official Information Act 1982. In addition, as outlined in the Briefing, Māori will have systems and protections around the sharing of existing knowledge and may wish to adapt this tikanga to digitised data. We consider these will be key considerations when developing long-term and sustainable data repositories or platforms.

Satellite imagery and remote sensing

15. Satellite imagery is a significant source of data for biodiversity analysis. We encourage the development of a remote sensing data repository for Aotearoa where different organisations (including central government) could easily access and use the images. The central data repository should also be a community platform to enable shared tools and experiences of using this type of data.

We support investment in the interoperability of technologies. As outlined in the Briefing, this will ensure that data generated by – or held in – different formats can be used together.

16. The interoperability of technologies will enable greater collaboration across different organisations, agencies and businesses. It will also create economies of scale by preventing the duplication of work and will address resourcing constraints.

We recommend that investment is focused on technologies that can be used for multiple project initiatives by Regional Councils.

17. Regional councils are undertaking several major project initiatives in response to national directions, and these all require satellite imagery and remote sensing technologies. For example:

    - Extensive mapping will be undertaken by regional councils to identify highly productive land as required by the National Policy Statement for Highly Productive Land.
    - Under the essential freshwater framework, regional councils will be identifying, mapping and monitoring natural inland wetlands that are larger than 500 square metres or that contain threatened species.
    - Regional councils are also undertaking modelling for climate mitigation and adaptation purposes, such as the modelling of coastal inundation, and flooding.

18. We recognise that not all these initiatives relate solely to biodiversity. However, we consider there is an opportunity to either leverage off the technologies already being used at district and regional levels or develop them further to specifically address biodiversity challenges.

We consider that there will need to be clear regulation for the collection, use and analysis of biodiversity data.

19. As technologies improve, more data could be extracted from an image and regulations will need to keep pace to address any potential privacy impacts resulting from these improvements. For example, district and regional councils could start to hold detailed data about private properties because of the satellite technologies used to survey the land. This information could become subject to an Official Information Request. Clear regulations will therefore be needed to govern the use of these technologies.

We recommend several corrections to the oblique imagery example provided on page 13 of the Briefing, outlined in paragraph 20 below.

20. Dr Paul Dutton requests that the following corrections are made to his quotes:

    - "if you're lucky, you could visit one site per day. But with oblique imagery, one person can review the pictures and classify ~~hundreds~~ dozens of forest types and locations in a day. It's very efficient."
    - The work was committed by Toitū Te Whenua, with ~~400,000~~ 30,000 photos taken from an aeroplane along the length of the river.
    - Caption: Because the oblique imagery is captured at an angle, it provides more detail than a standard orthorectified aerial photograph.

    This data also provides a historical reference which can be continually compared over time to observe change.

Artificial intelligence and data-driven technologies

We recommend that the Briefing includes upskilling and training as a key consideration for biodiversity technologies. The successful application of technologies will require an aptly trained workforce.

21. We consider AI has huge potential to reduce resourcing constraints and will enable access to relevant and timely data for making decisions about protecting and restoring biodiversity. However, we highlight that for AI to provide effective outcomes, there must be investment in upskilling the workforce. Staff will need to be trained at an organisational level within New Zealand.

We recommend DOC and Toitū Te Whenua contact the Artificial Intelligence Institute of the University of Waikato to further understand existing AI projects and their potential application to biodiversity.

22. AI technology requires significant computer power, so the deployment needs to be done on substantial computer infrastructure. We consider AI tools could be used to develop a web application that can run models in the background. For example, Dr Phil Mourot, in collaboration with the TAIAO[1] project is developing a tool to predict flood impact in the Waikato Region using machine learning. The AI prediction model runs on the University of Waikato supercomputer, and the outputs of the processing is accessible via an online interface where users (the flood response team) can use this information for decision making.

We recommend the Briefing highlights the importance of partnering with iwi to assess technologies that have been created abroad to ensure they are relevant to the local context and incorporate mātauranga Māori.

23. We commend DOC and Toitū Te Whenua in highlighting Māori data sovereignty. We agree that Māori will have systems and protections around the sharing of existing knowledge and may wish to adapt this tikanga to digitised data.

24. We consider the Briefing should address the aspects of bias (including cultural bias) in AI and data programming. Clear lines will need to be drawn between data interpretation and decision making. The decision-making step will be required to address any data bias. This will be important in the context of mātauranga Māori and te ao Māori.

[1] TAIAO

Genetic technologies

We consider that genetic technologies could address biodiversity challenges, however social license will be key to their successful implementation. We consider social license and public education should occur alongside the development of technologies.

25. We consider there is scope for genetic technologies to be used as a tool for protecting the resilience of Aotearoa's indigenous biodiversity. We acknowledge that genetic technologies could play an integral role in protecting native species from extinction, in particular from the pressures of climate change and emerging diseases. For example, genetic technologies could be used to develop disease resistance in native species from myrtle rust or kauri dieback disease. Similarly, as the climate warms, more native species risk extinction and genetic technology is one tool that could be used to address these challenges. For example, temperature determines the gender in a developing embryo within a tuatara's egg, with less than a degree Celsius separating gender determination. With warmer climates males are likely to start outnumbering females, posing a threat to their species.

26. However, we do recognise a balanced approach must be taken and acknowledge the risks of genetic 'pollution'.

27. We consider early and meaningful engagement with the public is important. Education around genetic technologies will be essential to any future ability to implement these technologies. Social license should be built alongside a technology's development, as opposed to after its creation. This means that once the technology is ready for use it can be implemented immediately. It will also ensure that investment only occurs in technologies for which there is public support or where this support can be developed over time.

28. We also consider that if genetic technologies are to be used for pest control and eradication, the country of pest origin should be consulted and collaborated with.

We highlight the need for clear direction and consistent leadership from central government on the management of genetic technologies.

29. For example, the government will need to clearly outline whether regional councils could manage the use of these technologies through their pest management plans/resource management plans or whether this function will remain with government agencies.

We consider that the Briefing should acknowledge the wider functions of eDNA and its use by local and regional organisations. We also recognise there are limitations associated with eDNA and consider further investment would be required to enhance its effectiveness as a biodiversity tool.

30. We consider eDNA has potential benefits as an environmental monitoring tool. An advantage of eDNA is that it can detect the existence of species that were not previously identified, and it can be used to support iwi and community groups make sense of data from samples. We consider there is an opportunity to interrelate eDNA with other technologies so that it can used as a part of a larger framework for environmental management. However, we recognise that there are limitations to its use and that it is subject to numerous variables. For example, upstream fishing and DNA 'pollution' in domestic cat and dog faeces. We recommend investment is made into reducing these limitations and supporting the wider community to understand how to better interpret the results.

31. We recognise that DOC and Toitū Te Whenua are considering eDNA from a biodiversity and biosecurity perspective. We do however consider that the Briefing should acknowledge the wider functions of eDNA and its use by district and regional organisations. For example, regional councils

have wide mandates and although the primary purpose of eDNA is for research it could also be used for monitoring and enforcement. For example, to identify pollutants and provide evidence for prosecutions. Therefore, central government will need to provide clear direction/regulation on how eDNA is collected and used.

Table A: Questionnaire answers: Long-term Insights Briefing

	Question	WRC staff feedback
1	What other technologies could be game changing for biodiversity?	We consider the following technologies could be game changers for biodiversity: • Thermal signatures and AI have the potential to be gamechangers for pest control. We refer to the work of Lincoln Agritech Ltd and their PAWS™: Pest identification sensor pad.[2] The trackpad system registers animal interactions when they step onto the sensor pad. This could play an even greater role in pest control if it were developed further to release appropriate toxins as the pest exits the sensor. • Remotely monitored traps have the potential to make a big impact in the biodiversity space. Wireless technologies would enable remote data to inform communities and groups about the capture of a pest in real time, reducing the labour component of this trapping methodology substantially. The viability of this technology will increase with the roll out of 5G wireless technology. • WRC staff provided input into research undertaken by Jia *et al* (2021), that used deep learning and AI to identify Kahikatea from aerial oblique imagery. This provides an example of how multiple technologies can be used together to effectively contribute to biodiversity data and projects. WRC staff would be happy to share any key learnings from this work with DOC and Toitū Te Whenua. • Change detection using Sentinel II data could be a game changer for identifying vegetation loss. Our staff worked with an external provider to use Sentinel data and baselines to compare pixels. This enabled them to identify changes in colour and identify where vegetation had been cleared. WRC staff would be happy to share any key learnings from this work with DOC and Toitū Te Whenua. • We note the Briefing does not refer to soundscapes and the use of acoustic recorders and cameras. We consider this technology could be very useful in identifying the different bird calls within a forest and to enable comparisons over time. • Drones, as highlighted in the Briefing, will be a game changer for biodiversity. The benefit of drone use is that they can visually tell a story about our biodiversity. For example, they can be used to provide a fly-through showcase of wetland restoration or riparian planting projects in a way that cannot be demonstrated using other technologies. • Using (Internet of Things) IoT systems can provide another source of data collection. Sensors are becoming cheaper and their deployment on the ground could enhance the accuracy of analysis. Sometimes, the resolution of satellite imagery is not

[2] PAWS® pest identification sensor pad » Lincoln Agritech

		suitable for the purpose of biodiversity monitoring, and often ground data is needed to correlate the information. IoT technology is now efficient (low power), and data can be transmitted in real-time to allow continuous monitoring. • We highlight the TAIAO programme.[3] TAIAO is a data science programme of $13 million over seven years, funded by the Ministry of Business, Innovation, and Employment (MBIE). TAIAO will develop new machine learning methods for time series and data streams that are able to deal with large quantities of big data in real-time, which are tailored to deal with data collected on the New Zealand environment. This programme is a new collaboration between the Universities of Waikato, Auckland and Canterbury, Beca and MetService and includes world-leading data scientists, data engineers, and environmental scientists.
2	Are there ways you could use these tools at an iwi or community level?	We consider AI tools could be used at iwi and community levels. For example, the Artificial Intelligence Institute of the University of Waikato has developed a mobile species classifier.[4] This allows you to take a picture of any animal in New Zealand and the species classifier app will tell you what it is. There is also a new mobile application that has recently been developed based on the same model to identify vegetation in New Zealand.[5] There are a lot of potential applications for biodiversity that can be developed based on existing products. We recommend DOC and Toitū Te Whenua contact the Artificial Intelligence Institute of the University of Waikato to further understand these products and their potential application to biodiversity. We also suggest using the TAIAO community platform to collaborate with other scientists or users.
3	How should we build stronger international relationships?	We consider the following actions could help build stronger international relationships: • Instead of creating our own framework, there is an opportunity to pilot existing data models used overseas and to collaborate on these at an international level. For example, the Global Biodiversity Information Facility (GBIF) is an international network and data infrastructure funded by the world's governments to provide open access to data.[6] • Collaboration with pest origin nations will go a long way to addressing biodiversity challenges. • We note tertiary institutes have strong international relationships, however there is less opportunity for local and regional councils to develop similar relationships. Focus on international recruitment at a council level could assist with building these stronger relationships to develop global insights.

[3] TAIAO
[4] Species Classifier (waikato.ac.nz)
[5] TAIAO
[6] GBIF

		To develop effective and emerging technologies in biodiversity we consider PhD students need to be funded within New Zealand. Investing in students at a national level will be important because these students often collaborate with international counterparts through research and development.
4	What areas of biodiversity could Aotearoa New Zealand provide global leadership in?	We consider New Zealand is a world leader in island pest eradication. The expertise of New Zealanders is contracted overseas due to the successes in pest mammal eradication on islands. New Zealand could also lead the way in showcasing how indigenous knowledge can be used to inform new biodiversity technologies. There is an opportunity to encourage scientists to engage with communities, co-develop research and work with Māori on long-term collaborations. We consider the BioHeritage Science Challenge[7] is a project that is leading the way on this. The project looks at building resilience in threatened taonga species by analysing their DNA and genetic diversity to determine how they can adapt to climate change - including partnering with iwi to build mahinga kai values into the project.
5	If we decide to use emerging technologies, how can we build social licence, cultural licence and trust to support their safe and effective use?	Early and meaningful engagement will be key to developing social and cultural licence. Continuity of projects will also be essential. For example, instead of having layers of different pest control projects, the continuance of projects and shared knowledge will provide more effective results. We highlight the importance of investing in technologies that are best suited to the New Zealand context and that will target specific problems. Priority should be given to technologies that will have the best outcomes with the most acceptable risks and that will benefit a wide range of users – e.g., government agencies, local and regional councils, Crown Research Institutes, private businesses, etc. eDNA is an example of technology that reflects these characteristics.
6	How much of a role should the government have in biodiversity protection?	National standards will drive biodiversity outcomes, but localisation will be the key to achieving those standards. We highlight the importance of early and meaningful engagement with community groups.
7	What could the guiding principles for decision-making about information and biotechnology look like, and who should be involved in developing these?	We refer to the section titled *Elevate mātauranga Māori and the role of mana whenua.* We agree with these guiding principles and consider decision-making should be responsive to community needs and it must incorporate mātauranga Māori.

[7] Mātauranga-a-Iwi vital in the restoration of biodiversity - Biological Heritage - National Science Challenge (bioheritage.nz)

8	What areas should we put funding or resourcing into, and why?	We reiterate our response to question 4. Investment should occur in technologies that that are best suited to the New Zealand context and that will target specific problems. Priority should be given to technologies that will have the best outcomes with the most acceptable risks and that will benefit a wide range of users. We highlight the urgency to create a sustainable data ecosystem, that has a long-term maintenance plan to ensure datasets are available for future generations. Whilst we may not currently have the tools or solutions to process and understand all available data, we consider these will be become available as computer technology rapidly evolves. To prepare for the future, investment should be focused on developing a sustainable data ecosystem.