

1. Title/Heading.

## • AUT Living Laboratories

2. Context and rationale.

- The New Zealand Government recognises that afforestation/reforestation is a vital component for reducing net greenhouse gas emissions in this country. It has launched the One Billion Trees Programme for the next ten years, and is developing a long-term afforestation strategy beyond this.
- However, because of the historical research focus on commercial plantation forestry, especially *Pinus radiata* monocultures under clear-felled forestry system, there are major knowledge gaps for the outcomes of establishing diverse, native forest species. This creates a path-dependency for *Pinus radiata*, because its commercial and environmental outcomes are well-known, even though *Pinus radiata* monocultures (even as carbon sinks) is suboptimal from the perspective of climate adaptation, land resilience and wider environmental benefits such as native biodiversity.
- Nature-based solutions, or “natural climate solutions”, offer an alternative approach which not only delivers a broader stack of environmental benefits, but also better aligns with indigenous values and aspirations for Maori communities. The Living Laboratories project, based at AUT University in New Zealand, will fill the knowledge gaps around native restoration, by experimenting with different site preparation and planting regimes in order to deliver optimal integrated benefits. This knowledge will help to inform other landowners, especially farmers, of the benefits, risks and revenue opportunities for ecological restoration.
- It will further advance the aims of the “reparative economy”, which focuses on repairing historical damage to local environments and human relationships through extractive industry and colonialism. In the context of Aotearoa New Zealand, ecological restoration is both an environmental remediation to historical deforestation and a form of reparations to breaches of the Treaty of Waitangi / te Tiriti o Waitangi.

3. An overview of the contribution.

- The research objective of the AUT Living Laboratories project is to fill knowledge gaps for planting the right trees on the right site for the right purpose. In particular, the Living Laboratories is focused on (a) optimal planting regimes for native restoration objectives as ‘nature-based solutions’ to climate change; and (b) effective engagement models for landowners, especially Māori landowners, who have aspirations to establish old-growth native forest. Quantitative and qualitative data will be generated through the process of establishing two demonstration sites in Auckland / Tāmaki Makaurau area.

4. How the contribution leverages living natural systems as a solution to avert climate change?

- Currently, there are major knowledge gaps relating to sequestration rates for species that are native to Aotearoa New Zealand. The Living Laboratories project

seeks to overcome these knowledge gaps, thereby helping landowners to better understand the risks and opportunities for choosing native forest over exotic. In designing the Living Laboratories, a particular focus will be using novel planting regimes to speed up the establishment of old-growth forest trees (tōtara, rimu, matai, tawa, taraire, hinau, maire, kohekohe etc.) to provide maximum value for carbon sequestration as well as other environmental values, such as biodiversity conservation and cultural value.

5. How might the contribution support both climate, mitigation and adaptation as well as other important co-benefits and social, economic and environmental outcomes in coming years. They may include:

- Negative carbon emissions through carbon capture (tonnes of CO<sub>2</sub>e per hectare)
- Increased land resilience on erosion-prone land (reduced sedimentation and improved water quality for adjacent waterways)
- Educational opportunities for AUT students for field work, and especially for knowledge exchange with landowners (especially Māori tribes or iwi/hapū)
- Social impact
  - boost kaitiakitanga for Māori, a duty of environmental care
  - expand Mātauranga Māori or indigenous knowledge, especially for rongoa (medicine)
  - create job and education opportunities through partnering with Māori iwi/hapū (tribes)
- Economic contribution (to use Living Labs as case study for reparative economy)
- Impact on realisation of the 2030 Agenda for Sustainable Development (in particular SDGs 6.6, 13, 14, 15, 17.17)
- Minimising species extinction and ecological losses and fostering an increase of biodiversity, especially by integrating eco-sourced seedling and thereby using ecological restoration sites as a storage of local genetic diversity.

6. Which countries and organisations are involved in the contribution?

- Aotearoa | New Zealand
  - AUT University
  - Ngāti Whātua Ōrākei Whai Maia
  - Auckland Council
  - A formal relationship with NZ Government's One Billion Trees Programme is pending.

7. How have stakeholders (for example local communities, youth and indigenous peoples, where applicable) been consulted in developing the contribution?

- AUT Living Laboratories is currently preparing an MOU with Whai Maia, the social wing of an Auckland hapū, Ngāti Whātua Ōrākei.
- AUT is in negotiation with Auckland Council about establishing Living Labs on Council-owned farms as part of its Farms of the Future initiative.

8. Where can the contribution be put into action?

- The scientific knowledge gaps around native forest restoration are national, so the findings from the Living Laboratories experimental sites have national relevance for establishing forest, especially on post-agricultural sites.
- The framework for landowner engagement, especially with indigenous landowners, will also have national relevance, by establishing best practice for engaging with indigenous landowners to fulfil their aspirations for afforestation. By informing a wider framework of reparative economy, this will also have international relevance.

9. How the contribution will be delivered? How will different stakeholders be engaged in its implementation? What are the potential transformational impacts?

- Living Laboratories is funded by AUT University's Strategic Research Investment Fund (SRIF). With this funding, AUT has hired a project manager to oversee the planting projects, and a post-doctoral researcher to assist with research. We are currently seeking research support to expand the programme through the New Zealand Government's One Billion trees Programme.
- Ngāti Whātua Ōrākei Whai Maia is an emerging partner (MOU in process) as a potential landowner with a long-term interest in ecological restoration, in order to fulfil kaitiakitanga duties (environmental care), to exercise tino rangatiratanga (tribal sovereignty), and to enhance waiora (wellbeing).
- Auckland Council is being engaged as a potential landowner with a vested interest in the long-term success of ecological restoration sites and the knowledge that these sites will generate, especially for informing its recently launched Urban Ngahere (Forest) Strategy.

10. Is this initiative contributing to other Climate Action Summit workstreams (industry transition; energy transition; climate finance and carbon pricing; infrastructure, cities and local action; resilience and adaptation; youth and citizen mobilization; social and political drivers; mitigation strategy)?

- There are overlaps with climate finance and carbon pricing; infrastructure, cities and local action; resilience and adaptation; youth and citizen mobilization; social and political drivers; & mitigation strategy.

11. How does this contribution build upon examples of experience to date? How does the contribution link with different ongoing initiatives?

- The Living Laboratories project has been informed from its inception by the emerging research agenda around "natural climate solutions" (Griscom et al. 2017; Anderson et al. 2019).

- It is complementary to the NZ Government's One Billion Trees Programme, but also attempts to steer this afforestation strategy away from environmentally damaging clear-fell practices toward continuous indigenous forests.

12. What are the mechanisms for funding (with specific emphasis on potential for partnerships)?

- Living Laboratories is funded by AUT University's Strategic Research Investment Fund (SRIF).
- Living Laboratories is currently preparing a Stage 2 application for funding through the One Billion Trees Programme science priorities fund.
- Other relevant funding opportunities are: Foundation North's GIFT Fund for improving environmental outcomes for the Hauraki Gulf; and the Endeavour Fund through Ministry of Business, Innovation and Employment (MBIE).

13. What are the means of stewardship, metrics for monitoring?

- These are yet to be finalised, according to the specifics of the site. However, we plan to layer onto the existing project a comprehensive set of biological, environmental and cultural measurements for monitoring experimental outcomes, such as carbon sequestration, plant physiological responses to the experimental treatments (that affect carbon sequestration and water relations) and changes in soil microbial communities, which are hypothesised to be indicators of soil health.

14. What is the communication strategy?

- We will set up a Living Laboratories Twitter account, along with open-access journal articles and summaries for a general readership, to be published through key media (i.e. The Conversation, local media outlets, etc.)

15. What are the details of proponents (indicating the degree of commitment among the countries and organizations that are named).

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