1 # Decolonising knowledge practices in biosecurity:
2 # Developing a reflective toolkit for more inclusive,
3 # equitable, and respectful research

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16 Abstract

17 **1. Context:** Aotearoa New Zealand's biosecurity system, shaped by colonial and bureaucratic

18 structures, tends to prioritise competition and financial management over environmental

19 outcomes and community involvement. Successful biodiversity protection requires more

20 cooperative, inclusive practices that engage local and Indigenous communities. Despite

21   policies promoting knowledge-sharing and collaboration, practical implementation remains a

22   challenge.

23   **2. Approach:** We took an action research approach, involving iterative cycles of inquiry,

24   reflection, and refinement to explore inclusive biosecurity practices. Through interviews and co-

25   analysis sessions with biosecurity professionals, including Māori researchers, we identified

26   challenges and opportunities for integrating diverse knowledge systems. By synthesising

27   empirical insights with theoretical frameworks, we co-developed practical tools to address

28   these challenges and promote more collaborative approaches in biosecurity research, policy

29   and practice.

30   **3. Findings:** We identified six dimensions of collective praxis to support those within the

31   biosecurity system to work in a more inclusive, respectful, pluralistic, and regenerative manner.

32   **4. Synthesis and application of findings:** To help practitioners reimagine their work practices,

33   we developed a rubric with reflective prompts and gave it a more convenient and user-oriented

34   format as a set of cards. These tools were designed to spark critical thinking and facilitate

35   individual and collective self-assessment and priority setting (when used as a planning device).

36   These support devices are intended for people working at the nexus between different

37   knowledge systems. They were designed to help people with diverse cultural, disciplinary, and

38   professional backgrounds work better together and critically reflect on everyday practices that

39   marginalise, discredit, or disempower ways of knowing and doing that differ from mainstream

40   scientific biosecurity.

41   **5. Conclusion:** This action research contributes towards decolonisation of the broader

42   research culture, biosecurity system, and biodiversity protection goals. The process is also

43   valuable in adapting to changing contexts and highlights the power of reflection in reframing

44   practices across a wide range of situations, beyond biosecurity, to foster collaboration and

45   ensure more equitable decision-making.

48 **Introduction**

49 Aotearoa New Zealand (henceforth Aotearoa) is home to a unique diversity of plant and animal

50 life, crucial to the identity of the country and its people (Craig et al., 2013). Aotearoa's

51 geographical isolation has led to high levels of endemism, making many species vulnerable to

52 invasive biological threats. This vulnerability is shared by entire ecosystems and primary

53 production industries (such as mānuka honey)[1]. Protecting native species, ecosystems, and

54 plant-based industries, whilst addressing the concerns that arise from biological threats is a

55 central remit of the biosecurity system in Aotearoa which strives to keep unwanted organisms

56 out and control or eradicate any that arrive. Biosecurity efforts to exclude or eradicate pests

57 have shaped the country's surveillance of trade and tourism since the 1840s, although the term

58 was not formally introduced until the 1993 Biosecurity Act (McLean & Shoebridge, 2010). While

59 the biosecurity system in Aotearoa is often held up as an international exemplar (Boonstra,

60 2011), it needs change and improvement to address its colonial and capitalist foundations

61 (Ehler et al., 2023; Prussing & Newbury, 2016).

62 The neoliberal, capitalist underpinnings of the biosecurity system in Aotearoa are visible in its

63 competitive, siloed, and bureaucratic structures which prioritise financial management over

64 other social and ecological outcomes (Ehler et al., 2023). While the colonial origins of the

65 science system have shaped the Aotearoa biosecurity system – establishing priorities,

66 practices, and power structures which favour Western knowledge and technocentric

67 approaches – this poses challenges for integrating Māori[2] perspectives and knowledge

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[1] More broadly the term 'primary industries' includes the likes of forestry, horticulture, agriculture, and apiculture, all of which are vulnerable to biosecurity incursions.
[2] The Indigenous people of Aotearoa.

68   (Kawharu, 2000; Kuru, Marsh & Ganley, 2021). Despite the clear mandate of Te Tiriti o Waitangi[3]

69   (1840) (henceforth Te Tiriti) for all government agencies and research institutions to work in

70   partnership with Māori, Māori perspectives, expertise, and priorities remain underrepresented

71   in biosecurity policy and management (Black et al., 2019; Lambert et al., 2018). While

72   collaborative approaches are espoused, the allocation of resources and authority for aligned

73   research is often insufficient.

74   Additionally, information sharing across the wider science system and community is hindered

75   by a silo mentality and the compartmentalisation of mainstream science into separate

76   disciplines. As a result, technoscientific ideas of risk and its management dominate the

77   Aotearoa biosecurity system, and thus insights from Indigenous knowledge (Lambert et al,

78   2018; Kuru et al, 2021) and social sciences (Allen et al, 2014; Allen et al, 2018), which consider

79   the social, cultural, and relational aspects of biosecurity, are often overlooked. Recent research

80   highlights the benefits of alternative (including Indigenous) approaches to forest conservation,

81   such as better responses to biosecurity threats, climate change resilience, and biodiversity

82   protection (Lambert et al., 2018). While there is a growing interest in incorporating Traditional

83   Ecological Knowledge into environmental policies (Schlingmann et al., 2021; Gómez-Baggethun

84   et al., 2013), the selective use of Indigenous knowledges within Western institutions risks

85   perpetuating colonial practices of delegitimisation and cultural appropriation (Smith, 2021;

86   Moreton-Robinson, 2020). These systemic issues, including the prioritisation of economic

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[3] The Māori text of the Treaty of Waitangi is a founding document of Aotearoa signed by Māori rangatira/chiefs and representatives of the British Crown in 1840. Te Tiriti o Waitangi set out the terms by which the Māori chiefs envisioned a common future for Māori and British subjects on this land. Despite a recent attempt to undermine it, and in the face of historical breaches and inadequate reparations, Te Tiriti o Waitangi's current prominence within the country's legal framework and policy—including research and environmental management—stands as a testament to a prolonged struggle for justice and recognition (Mutu, 2019). Governance principles emphasising cooperation and partnership stem directly from Te Tiriti o Waitangi.

87 values and the perpetuation of power imbalances, hinder effective collaboration and knowledge

88 sharing (Sarpong, 2022; Whyte, 2017).

89 Local studies acknowledge that effective biosecurity for Aotearoa is fundamentally a collective

90 endeavour which necessitates a more inclusive approach and authentic collaboration (Allen et

91 al., 2018; Greenaway et al., 2022). Such collaborative intent is required to disentangle the

92 fragmented and technocentric biosecurity system that contributes new forms of colonialism

93 (MacBride-Stewart et al., 2023). Policymakers and agencies cannot therefore tackle the

94 biosecurity challenges Aotearoa faces (namely, biodiversity loss and ecosystem degradation as

95 a result of direct threats from pests and diseases) without substantial goodwill and collective

96 action from Māori and a variety of key operational partners and associated stakeholders,

97 including local communities. Indeed, similar institutional challenges have been noted in other

98 colonised contexts (Apostolopoulou et al., 2021).

99 Decolonisation, understood here as the unmaking of colonial rule, is a far-reaching and all-

100 encompassing enterprise that must account for centuries of systematic dispossession and

101 insufficient reparations toward Indigenous populations who saw the transformation of their

102 ancestral lands into modern settler-colonial states (Moreton-Robinson, 2020). This project

103 specifically addressed how current knowledge practices, rooted in Western scientific traditions,

104 continue to marginalise and invalidate Indigenous knowledges, preventing Indigenous peoples

105 from fulfilling their spiritual and cultural obligations towards their ancestral lands. By reinforcing

106 colonial hierarchies, these practices perpetuate the harmful effects of imperialism and

107 positivist methodologies that have long silenced Indigenous voices and undermined their

108 sovereignty (Moss, 2001). By looking at how we can incorporate both Māori perspectives and

109 social science approaches meaningfully and appropriately, we therefore aim to challenge

110 existing colonial frameworks that have historically dominated biosecurity management in

111 Aotearoa. We acknowledge that decolonisation is a multifaceted and continuous process, and

112   our contributions form part of an ongoing dialogue and action towards more inclusive and

113   equitable practices.

114   This paper contributes to the ongoing efforts to decolonise biosecurity practices by exploring

115   how to integrate often marginalised knowledge systems into mainstream scientific and

116   operational discourse. Building on this context, our research developed a flexible, reflective

117   toolkit designed to promote inclusive and collaborative biosecurity practices. The guidance we

118   developed builds on: i) our empirical evidence from talking to fellow researchers and senior

119   practitioners working within or alongside the Aotearoa biosecurity system; ii) international

120   literature reflecting the experiences of growing communities of practice concerned about

121   inclusive and collaborative means for addressing global challenges; and iii) our own experience

122   as social and operational researchers (working particularly within critical social science and/or

123   participatory action research). While our toolkit was designed for those working in biosecurity

124   within an Aotearoa context, its central tenets, and the collaborative and iterative process we

125   used to develop it, are arguably adaptable to other practice areas and contexts.

126   **Research programme context and background**

127   In recent years, the emergence of plant pathogens that seriously threaten native trees and forest

128   ecosystems has become a major problem in Aotearoa. These pathogens endanger species of

129   significant cultural and ecological value, particularly to Māori, as well as to biodiversity and

130   primary industries. To address these urgent threats, the Biological Heritage National Science

131   Challenge: Ngā Koiora Tuku Iho (BioHeritage) developed a targeted 3-year programme, Ngā

132   Rākau Taketake – Saving our Iconic Trees (NRT) (BioHeritage, 2023). BioHeritage was a

133   government-funded 10-year venture that drew together researchers and research partners from

134   across the science system, primary industry, and community groups, including Māori

135   organisations. The NRT programme focused on accelerating research on pathogen-driven forest

136   decline. A key objective was to integrate Indigenous knowledge into scientific research, aligning

137 with the aspirations of Māori. Through partnerships with local tribes and by incorporating

138 collaborative and multidisciplinary research and co-design with Māori at every level, NRT aimed

139 to gain a deeper understanding of the ecological and social implications of pathogen activity

140 and to inform effective solutions.

141 As part of NRT, the Postcolonial Biosecurity Possibilities project aimed to address the colonial

142 and neoliberal legacies embedded in the biosecurity system (Harvey & McEntee, 2023). Guided

143 by the values of BioHeritage (BioHeritage, 2019) including whanaungatanga (working together),

144 kaitiakitanga (enabling environmental stewardship) and recognising mātauranga (local

145 Indigenous knowledge) and mana motuhake (self-determination), we sought to support

146 inclusion and collaboration through dialogue-based and nature-centred approaches

147 (Greenaway et al., 2023). Six of our team of eight social scientists are based in Aotearoa while

148 two are in the United Kingdom (Wales/Cymru)[4]. The research reported in this paper is based on

149 the work undertaken in Aotearoa, where, as tangata Tiriti (non-Māori New Zealanders, literally

150 'the people of the Treaty'), we come to the research with the intention of supporting our

151 Indigenous partners while appreciating the myriad of contexts in which colonial oppression

152 takes place.

Value of reflection and reflective aids

154 Our epistemology for this research is grounded in reflection, enabling us to identify issues with

155 current practice and opportunities to support changes in practice through the development of a

156 reflective toolkit - a set of cards, and an accompanying self-assessment board, designed to

157 facilitate playful and interactive self-evaluation and priority setting. Reflective aids, such as our

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[4] While this paper originates from within an Aotearoa context, our colleagues in the United Kingdom have based their critical and reflexive contribution from within Wales/Cymru. Both our international collaborators have direct experience with forest-based research in Aotearoa. In this project they have been adapting and utilising the rubric cards (translated into Welsh/Cymraeg) within the Welsh context which has its own colonial history. As the focus of this paper is Aotearoa, it is not reported here, but it did inform wider understandings of biosecurity science and decolonisation.

158   cards, invite individuals to engage in critical self-reflection, contemplate the potential

159   consequences of their actions, and devise strategies for behavioural modification (Mortari,

160   2015). By encouraging introspection, critical evaluation of decisions, and contemplation of

161   alternatives, they foster a more cooperative, respectful, and inclusive work environment.

162   Therefore, we propose that engaging with reflective practice questions can support members of

163   the biosecurity system in identifying areas of bias and exclusion, understanding the

164   perspectives of others, and formulating strategies for inclusivity and participation (Manton &

165   Williams, 2021). This approach is, we argue, also useful for decolonising knowledge

166   management and practice (Huria et al., 2017) as it promotes a more pluralistic environment in

167   which diverse perspectives are valued and considered.

168   In the development and application of reflective prompts, rubrics, as instructional and

169   assessment tools, can play a crucial role, facilitating substantive changes in practices and

170   enhancing existing constructive ones (Allen et al. 2018). Through a structured framework,

171   rubrics support individuals to pinpoint key focus areas, evaluate their performance, and devise

172   strategies for improvement (Allen & Tanner, 2006; Allen et al., 2018). Traditional rubrics provide

173   detailed standards for different levels of performance, such as poor, satisfactory, and excellent.

174   Whereas single-point rubrics emphasise defining what success looks like while allowing space

175   for personalised feedback on both strengths and concerns (Fluckiger, 2010). This approach

176   helps participants reflect on and improve their practice without feeling externally judged. Single

177   point rubrics can therefore encourage individuals and teams to examine their actions and

178   decisions in a broader context and identify unique strategies for improving. Thinking more

179   critically about actions and decisions in this way, fosters greater self-awareness and

180   understanding of the effect of actions on others. Thus, the value of reflective practice lies not

181   only in its ability to improve individual and collective performance but also in its power to

182   reframe how we approach biosecurity as a relational system.

Method

Scope and framing of this study

This paper presents one strand of research undertaken within the broader Postcolonial Biosecurity Possibilities project. The thematic foundations of the reflective toolkit were initially developed by the research team during the first year of the project, drawing on reflective inquiry, interdisciplinary collaboration, and critical engagement with relevant literature. This empirical foundation supported a diverse range of contributions to the wider decolonisation effort over the three-year programme. This work also informed a range of other contributions to the programme's aims, including peer-reviewed papers on fragmentation (MacBride-Stewart et al., 2023), relationality and positionality (Greenaway et al., 2023), and neoliberalism in biosecurity research (Ehler et al., 2023); a wānanga (seminar) exploring Te Tiriti-centric governance in scientific research; visual story maps (Levenson, 2023); and a Master's thesis addressing kauri dieback.

The provisional themes underpinning the reflective toolkit were then examined and refined through a series of engagements with participants. While participant contributions enriched the rubric with contextual insights and practice-based reflections, the final structure and language of the toolkit also reflect the team's synthesis of international literature and professional experience in participatory and decolonising practice. We outline these steps through a three-phase approach, noting that phases 2 and 3 overlapped in practice.

Phase 1: Developing our approach

In the first year of our project, we focused on reframing biosecurity as a system of relationships amongst humans and the rest of the living world, rather than as a detached series of practices centred on containment and isolation. This reorientation involved observing the narratives that

206   shape biosecurity and adopting a reflexive, participatory, and critical approach to facilitate

207   collective and individual practice change.

208   During this phase, our efforts highlighted the necessity of guiding research, policy, and practice

209   to identify how inherited colonial biases manifest in our knowledge practices and relationships.

210   As we engaged with these challenges, it became clear that developing a structured approach to

211   providing ethical guidance was essential. We identified several key criteria that were deemed

212   important to the successful implementation of this task, including respect, accountability,

213   inclusivity, sustainability, relationality (including non-human relations), Tiriti-led practices,

214   caring and responsibility. This foundation would later evolve into the development of a more

215   structured rubric, which would document desired practices, and allow for the self-assessment

216   and refinement of these practices.

217   **Phase 2: Local participation through interviews, thematic mapping and co-**
218   **analysis**

219   In the second phase we sought to bring participants into the process. Building on their

220   experiences, this phase aimed to explore current practices in biosecurity, and to review and

221   refine the foundational criteria established in phase one by exploring the factors that

222   encouraged or inhibited the achievement of a more inclusive and pluralistic biosecurity system.

223   This helped ensure that any outputs from our work were contextually relevant and practically

224   applicable within the biosecurity sector.

225   Phase two therefore involved a cumulative series of interactions with research participants

226   through which we explored their experiences of, and perspectives on, the broader biosecurity

227   system and its knowledge practices[5]. Our participants were recruited from a subset of forest

228   pathologists, ecologists, social scientists, kaupapa Māori researchers[6], policy strategists,

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[5] This research was approved through the Manaaki Whenua – Landcare Research ethics process and all participants provided informed consent (#2021/24 NK)

[6] Kaupapa Māori means a Māori approach, encompassing the incorporation of Māori knowledge, skills, values, interests, and priorities. Within scientific research, it signifies that Māori should define research

229   research managers, community advocates, and biosecurity practitioners working on tree

230   diseases within NRT. Initially, ten participants completed an online survey. The survey was

231   exploratory in nature, designed to inform the development of our interview guide, and included

232   only open-ended questions. It was distributed within a limited network during a period of high

233   sector demand, which may have contributed to the modest response rate. The results of the

234   survey nevertheless informed the guiding questions for a series of hour-long semi-structured

235   interviews with a further twelve participants[7].

236   These interviews broadly explored factors that encouraged and/or inhibited the achievement of

237   a more inclusive and pluralistic biosecurity system. Thus, we asked participants about their

238   involvement in forest protection and their experiences of working in the biosecurity system –

239   including their perspectives on who has access to infrastructure and resources, what is

240   considered valuable knowledge/data, who holds this knowledge/data, how they are used, and

241   what they/we were learning from dealing with plant pathogens. We made sure to ask

242   participants about the system's shortcomings, and about ways to improve practices and

243   navigate the system to overcome barriers.

244   The interview transcripts and open-text survey responses were manually coded and

245   thematically analysed in NVivo using a mixed inductive and deductive approach. In an iterative

246   manner, the identified themes, and their associated codes, were critically reviewed, assessed,

247   and analysed by members of the research team.

248   Participants described a range of inherited colonial biases shaping current approaches to tree

249   care and biosecurity. These included fragmented, bureaucratic approaches that overlook the

250   bigger picture, reactive decision-making, and a lack of care for the people involved. Hapū

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topics and preferred methodologies, conduct the study, and ultimately benefit from the research outcomes.

[7] Five of the survey and interview participants were Māori, while the rest were pākehā (descendants of European settlers of Aotearoa) or tauiwi (foreigners).

251   (kinship groups) were often excluded from governance but expected to handle the

252   consequences of decisions made by others, often with inadequate resourcing. There was

253   frustration over the dominance of Western science, a lack of shared priorities with hapū and iwi

254   (tribes), and power imbalances that sidelined communities. At the same time, participants also

255   shared examples of improved practices -- from connecting more directly with nature and

256   fostering non-hierarchical relationships, to building meaningful relationships with Māori. They

257   also spoke of policy shifts towards resilience, equitable resource distribution, and the value of

258   community input to support collaboration and ensure diverse perspectives are included.

259   These themes were then shared, discussed, and refined with our participants during co-

260   analysis sessions in order to bring insights from our participants and our team together.

261   **Mapping colonial legacies**

262   Discussion during these co-analysis sessions, led to the identification of a range of inherited

263   colonial biases in biosecurity practices which are illustrated graphically in Figure 1. Drawing on

264   our participants' insights, we worked through what was inhibiting and what was supporting good

265   practice, as well as who has access to resources, infrastructure, knowledge, and data. This

266   broader perspective allowed us to explore where we could leverage change.

267   Key themes that emerged from these sessions reflected a larger structural view of colonial and

268   neoliberal legacies that were affecting the biosecurity system including, competition for

269   funding, constraints to collaboration, and a lack of resources for engagement with local

270   communities. Participants also described the dominance of biophysical sciences over social

271   sciences, and Western ways of knowing over Indigenous understandings, values, and priorities.

272   There was significant concern about the limited consideration of Māori perspectives in

273   biosecurity research and management, as well as a lack of direct funding of mātauranga Māori

274   approaches and interventions. Many participants saw these factors as contributing to a

275   tendency within the biosecurity system to consider Māori as an unpaid surveillance and

276   management workforce, and as a freely accessible repository of data and samples (especially

277   related to native plants). Disciplinary silos and fragmented responsibilities were also seen as

278   hindering efforts to protect native biodiversity.

279   These themes were colour-coded according to commonalities expressed by participants that

280   described recurrent issues embedded within the biosecurity system. Six colour-coded themes

281   were provisionally assigned descriptive labels: competition, racism, reductionism, extractivism,

282   working with Māori, and internalising respectful practices. The first four relate to structural

283   issues with roots in the colonial history of Aotearoa (Hess, 2023), while the latter two reflect

284   opportunities and practices that participants saw as enabling more inclusive and relational

285   approaches. These groupings were developed to help visualise both systemic problems and

286   areas of emerging change. Their framing was subsequently discussed and refined by the

287   research team to link problematic habits and enabling practices to their associated root

288   causes.

289   A key finding of the research has been that, while all those involved identified problems within

290   the system that highlight elements of this colonial legacy, many spoke of their personal

291   intentions to "do things differently", with varying degrees of certainty around how to do so.

292   Despite these challenges, some participants shared positive experiences of nurturing

293   relationships with local Māori communities and of sharing data in meaningful ways to support

294   development of place-based knowledge and action. Many also felt that reconnecting with

295   nature and focusing their work around the needs of the natural environment helped inspire

296   positive change.

Think of Māori as individuals to work with

Invest in cultural capability

Make room for mātauranga Māori and Māori scholarship

Learn about the history of the land and the people you are working with

Become familiar with Māori words and concepts frequently used in biosecurity

Work to create impact

Keep in mind the ultimate goal of forest protection

Tell helpful stories

Keep yourself and others safe

Consider a multiplicity of management options

Reframe the way you talk about biosecurity

What encourages suitable practices?

Who has access to information and resources?

Who has access to knowledge and data?

Competition for funding

Reluctance to share information or data

Property and intellectual rights

Institutional rivalry

Inability to collaborate

Supremacy of Western knowledge

Focus on private rights at the expense of collective good

Underfunding mātauranga Māori-based approaches and interventions

Considering Māori as free repositories of data, botanical samples, or work force

Diminishing mātauranga Māori in research and management

Capitalism and extractive economy

Excluding Māori from decision-making

Failing to find a correlation between work practices and forest protection

What hinders suitable practices?

Organising biosecurity based on the human/nature divide

Fragmentation of processes and responsibilities

COLOUR CODE

Colonial legacies as systemic issues in biosecurity

Opportunities for decolonising biodiversity protection

RACISM
REDUCTIONISM
EXTRACTIVISM
COMPETITION

WORKING
WITH MĀORI
INTERNALISING
RESPECTFUL
PRACTICES

Figure 1: A mapping of inherited colonial biases and potential opportunities for decolonising biosecurity practices. This colour-coded diagram draws on participant insights and literature synthesis to show how access to knowledge, data, and infrastructure shapes suitable practice.

302

303 Drawing on the insights of participants, the team identified two categories of good working

304 practices related to Māori engagement which are illustrated in Figure 1. The first, "working with

305 Māori", includes practices such as investing in cultural capacity; exploring the stories of the

306 land, people, and species involved; and valuing Māori contributions to knowledge, which have

307 often been ignored or underestimated.

308 The second, "internalising respectful practices", recognises that biosecurity practitioners and

309 researchers – including non-Māori teams – can adopt more respectful (read inclusive and

310 relational) ways of working, even when not directly partnered with Māori. These practices are

311 not in themselves decolonising, but can meaningfully support efforts to address structural

312 inequities and reflect Te Tiriti obligations when used as part of a wider commitment to change.

313 These practices aim to foster systemic change, not as a performative response to external

314 scrutiny, but out of recognition of the structural issues that are hindering the effective protection

315 of native species and ecosystems. Suggested practices within this category include keeping in

316 mind the ultimate goal of forest protection, ensuring the well-being of oneself and others, and

317 valuing community input throughout biosecurity efforts.

318 By the end of this phase of research, we had gained a deeper understanding of the biodiversity

319 context and the challenges and opportunities facing decolonisation within the Aotearoa

320 biosecurity system.

321 Phase 3: Developing a rubric

322 While Phase 2 centred on gathering insights from participants across different roles in the

323 biosecurity system, our third phase focused on developing a rubric to support practices which

324 address the inherited colonial biases identified in phase 2. To ensure our work was robust and

325 grounded in both local and broader perspectives, we drew on (empirical and theoretical)

326   insights provided by our participants and by global communities of practice in various sectors

327   addressing similar relational challenges. These contributions supported our decision to use a

328   single-point rubric, promoting self-assessment and continuous learning. They also helped the

329   research team refine, merge, and rename the criteria identified in phase 1. In addition, these

330   global practice guides helped identify indicative examples of good practice, not only to measure

331   performance against each criterion but also to encourage teams to reflect on what good

332   practice might look like in their specific contexts. Finally, the literature reinforced the

333   importance of shared direction and reflective practices, highlighting the need to first recognise

334   and align team values and actions, ensuring members work towards common goals while

335   continuously adapting and learning.

336   Figure 2 represents a non-linear progression from entrenched colonial legacies toward more

337   inclusive and collaborative workplace practices. The staggered layout and curved pathway

338   reflect the idea that these shifts are aspirational and require active, ongoing work rather than

339   simple substitution.

340

Colonial legacies as systemic issues in biosecurity

RACISM
REDUCTIONISM
EXTRACTIVISM
COMPETITION

Opportunities for decolonising biodiversity protection

WORKING WITH MĀORI
INTERNALISING RESPECTFUL PRACTICES

Towards better workplace practices

CARE
Te Manaakitanga
REFLECTION AND REFLEXIVITY
The Huritao Whaiaro
RELATIONALITY AND REGENERATION
Te Hononga me te Whakahaumanu
ACCOUNTABILITY AND TRUST
Te Papanga me te Whakapono
INCLUSION
Te Whakawhāitianga
SHARED DIRECTION
Te Ahunga Ngātahi

341

342　**Figure 2:** Moving from challenges and opportunities to decolonise biodiversity protection (on

343　the left), toward better workplace practices in biosecurity (on the right). The six key dimensions

344　of practice are not directly aligned but instead mapped as aspirational shifts along a reflective

345　journey.

346　　　　**Key dimensions of practice**

347　The six key dimensions — shared direction, inclusion, accountability and trust, relationality and

348　regeneration, care, and reflection and reflexivity — highlight areas where significant progress

349　can be made to foster better practices within teams and by individuals working in the

350　biosecurity system. We include a brief literature review to offer a shared reference point for

351　understanding each dimension and to support the development of best practice examples.

352　Creating a shared direction is crucial for collaborative endeavours, amplifying success,

353　increasing participation, and bridging the divide between project leaders and teams.

354　Practitioner-driven change models often include developing a vision and desired outcomes

355　(Doten-Snitker et al., 2021). Recognising partners' goals and values, especially in biosecurity, is

356　crucial. Shared values foster common ground, while diverse perspectives enrich the process.

357　Facilitated processes address this plurality (Apgar, Ataria & Allen, 2011), enhancing

358　engagement, commitment, and helping tailor communication initiatives. A collective way

359　forward helps stakeholders collaborate, envision holistic changes, and understand their

360　contributions to common goals.

361　Diversity and inclusion are important because they can help promote innovation, creativity, and

362　problem-solving (Allen et al. 2018). Teams with diverse backgrounds, experiences, and

363　perspectives are better equipped to tackle complex problems and develop novel solutions. By

364　combining individual perspectives, resources, and skills, the group creates something new and

365　valuable together— often producing an outcome that is greater than the sum of individual parts

366　(Lasker, Weiss & Miller, 2001), benefiting biodiversity protection (Kuru, Marsh, & Ganley, 2021).

In interdisciplinary or trans-disciplinary research teams, accountability and trust are paramount (Palmer 2023). Trust, which evolves over time, is essential for balancing power and voice within teams. It often begins with scepticism, transitioning to functional or critical reflective trust as different perspectives are better understood. This trust development is key to partnership, equity, and shared power (Horton, Prain & Thiele, 2009; Dare, Schirmer & Vanclay, 2014). Accountability is closely tied to governance in research projects, involving practices such as research ethics oversight, partnerships regulation, data management and dissemination (Mulumba et al., 2021). Governance structures can aid decolonisation by returning some control of research to the community, allowing greater deliberation over research problems and methods.

Relationality and regeneration are also important concepts in decolonisation, linked to the Indigenous notion of the interconnectedness of all beings and things (Gram-Hanssen, Schafenacker & Bentz, 2021). The separation and domination of nature by humans is a colonial legacy, counteracting relational approaches. Exploring decolonisation and relationality can underpin transformations as research engages with the notion of 'right relations', interpreted as fulfilling responsibilities in any relationship, whether it involves other humans, other species, the land, or the climate (Gram-Hanssen Schafenacker & Bentz, 2021). Regenerative sustainability builds on similar concepts, integrating recent understandings from science, Indigenous knowledges and practices, different ways of knowing, and inner and outer dimensions of sustainability necessary for systemic transformation (Gibbons, 2020).

Promoting care and hospitality in inter- and trans-disciplinary collaborations is essential for building trust and critical emancipatory knowledge (Staffa, Riechers & Martin-Lopez, 2022). Leaving these collaborations to chance or individual choice is inadequate. McKercher (2021) emphasises the need to establish and uphold safety, especially with groups that have experienced trauma or historical neglect. Without safety, participation, inclusion, and creative

392   expression become challenging, if not unattainable. Success in collaborations is more likely

393   when trust-building activities, such as nurturing cross-sectoral and cross-cultural

394   understanding, are committed to within ongoing relationships (Bryson, Crosby & Stone, 2006).

395   The likelihood of a collaboration staying together hinges on its demonstrated success (McLean

396   & Behringer, 2008). Recognising and adjusting a group's efforts is fundamental to iterative

397   participatory process design (Bryson et al., 2015). Continuous reflection and reflexivity ensure

398   that collaboration remains adaptive and responsive to changing circumstances. Reflection

399   identifies problems and solutions, while reflexivity reveals underlying assumptions that may

400   need to be challenged (Bolton, 2010). Evaluative tools, such as rubrics, can help assess and

401   enhance collaboration dynamics (Allen et al., 2014), enabling continuous improvement and

402   adaptation for individuals and teams.

403   Drawing on both this literature and the local knowledge of participants, the team then

404   developed indicative examples of good practice for each dimension of practice, providing clear

405   and practical guidance on what success looks like. These indicative examples of good practice

406   were then discussed and refined with groups of our participants during two reflection sessions

407   resulting in the practices included in Table 2.

408   **Table 2:** Indicative examples of good practice associated with the six key dimensions of practice

Key Dimensions of Practice	Indicative Examples of Good Practice
Shared Direction	Team members are actively involved in developing a common vision and a plan for reaching it.
	Group discussions highlight (shared and individual) values and aims.
	People are empowered to have a voice.
	Team members recognise how their different skills, backgrounds, perspectives, and contributions add to the project.
	There is strong leadership that helps the team to collectively set and reach their aims.
Inclusion	Team members use language in a mindful and inclusive way.
	Team members actively seek a range of perspectives by bringing together people with different backgrounds and abilities.

	Team leaders include and resource different people and approaches meaningfully and equitably.
	Project coordinators promote diversity in leadership.
	Research activities are designed and conducted in a manner that is respectful of the land, species, and local communities with whom we work or who are affected by our work.
Relationality and Regeneration	The relationships between individuals, communities, and the living world are acknowledged and valued.
	The team recognises relationships of mutual care and interdependence between humans and nature.
	The team acknowledges the importance of such connections to individual and collective well-being, sense of belonging and identity.
	The team strives to create resilient ecosystems and communities.
	The projects and interventions designed provide opportunities for people to reconnect with the land they inhabit.
Accountability and Trust	Relevant project information is available in a timely manner and is shared in an accessible language and format with team members and research partners.
	The decisions and actions taken around specific projects are consensual and fair.
	The project aims, processes, and decision-making practices are transparent, and take into consideration socio-cultural values.
	Trust and reliability between team members and research partners are actively earned and not taken for granted.
Reflection and Reflexivity	The team critically reflects on how their preferences, assumptions, and partialities shape their work and strives to counteract their influence.
	Team members recognise where the power and privilege lie within their project and implement corrective measures.
	Team members regularly check with each other about how they are going collectively and individually.
	Lessons learnt through self-critique and reflection are readily applied, and planning and milestones are adjusted accordingly.
Care	Caring about each other while co-designing research is common practice.
	Hospitality is never left to chance or individual discretion.
	The team works hard to create and maintain a safe space for all project members and partners, particularly those who have historically been excluded.
	Care is all-encompassing and demonstrated through the ways we work with local communities, species, biological samples, data, systems, etc.

409

410 Having collaboratively identified the six key dimensions of practice, and associated indicative

411 examples of good practice, for our single point rubric, the final step in the development of our

412 reflective toolkit was to establish a self-assessment scale to allow users to reflect on their

413 progress and plan next steps. For our scale we settled on a continuum from aspiration - 'we are

414 thinking about this' - to mastery - 'we are becoming good at this', with 'we are trying to do this' as

415 a mid-point.

Phase 4: Finalising the toolkit

417 During the process of iterative collaboration that led to the creation of our toolkit, we found that

418 a set of cards, each representing a key dimension of practice linked to indicative examples of

419 best practice, provided a helpful and user-friendly way of presenting the rubric. The cards

420 included prompts that could be read, reflected on, and adapted by individuals or teams,

421 supporting them in assessing what they were doing well and identifying areas for improvement.

422 We present here the resultant set of cards, each named in both English and Te Reo Māori, the

423 official spoken languages of Aotearoa (Figure 3). The back of each card lists the indicative good

424 practices related to the corresponding dimension, designed to prompt deeper reflection and

425 discussion (Figure 4). To further explore the toolkit's adaptability and relevance across different

426 contexts, we also translated the set of cards into Welsh/Cymraeg for use by our UK research

427 colleagues (operating in a Welsh context), allowing them to engage with the dimensions of

428 practice in the local linguistic framework.

429

Figure 3: The front side of the cards showing the six identified dimensions of practice.

431

Figure 4: The reverse side of the cards displaying indicative examples of good practice.

433   **Using the reflective toolkit**

434   By highlighting the rubric's key criteria as dimensions of practice on a set of cards (small,

435   mobile, and tactile devices) we allow for flexibility in how and where individuals and teams can

436   interact with them. These cards can be used individually, or as a set, and revisited multiple

437   times for either self-reflection or group discussions. This engagement can be casual, or part of a

438   structured self or group assessment or priority-setting process guided by the accompanying

439   rubric self-assessment board (Figure 5).

440

441   **Figure 5:** Self-assessment board.

442   To support their use we provided a guide, and a QR code link to further information about the

443   tool (as well as a digital version of the tool), inside the box containing the cards (Figure 6). This

444   guide encouraged participating individuals or teams to determine how they wished to use the

445   cards, reflect on and assess their performance, and connect with the authors.

446

Figure 6. Decolonising Knowledge Practices toolkit.

448 Some of the groups we have tested the cards with chose to assess themselves using the self-

449 assessment board, while others relied solely on individual reflection and/or group discussion as

450 they engaged with the cards. Some used the cards to reflect and gain greater clarity on what

451 they did well and what needed improvement, while others used them to prompt reflexivity on

452 why their behaviour around particular practices differed significantly across various projects

453 and organisational contexts. In this way individuals learnt about themselves, and teams learnt

454 from and about each other.

455 In all the cases described, we noted that identifying effective work practices is a reflective

456 process that can be initiated individually or collectively. When using this toolkit in a group, the

457 priorities to be addressed, the adequacy of current biosecurity practices, strategies to improve

458 them, deadlines for reassessment, and other relevant criteria should, ideally, be discussed

459 collectively and decided by consensus. Thus, we contend that the tool's flexibility is one of its

460 greatest strengths.

Discussion

462 The reflective toolkit is more than an isolated intervention; it is part of broader decolonising

463 initiatives aimed at systemic change. By fostering critical self-reflection and inclusive practices,

464 the toolkit contributes to the systemic shifts needed to decolonise the biosecurity system,

465 aligning with efforts to integrate Māori leadership and perspectives, and promoting equitable

466 and sustainable biodiversity protection.

467 After a three-year joint investigation, we do not claim to have uncovered universally relevant

468 criteria that solve the myriad of obstacles and difficulties confronting those wishing to

469 decolonise knowledge practices within the Aotearoa, or any other, biosecurity, or biodiversity

470 protecting, system. Such criteria must be customised to the specific contexts and individuals

471 involved. Our main contribution has been to enhance understanding of the challenges

472 associated with collaboration across knowledge systems – especially under colonial structures

473 that prioritise certain perspectives while silencing others – and to draw participants into

474 reflective practice. By identifying key areas of practice and prompting reflection and discussion,

475 our toolkit encourages more inclusive and collaborative work practices.

476 Developing a reflective toolkit to help shift the performance of the Aotearoa biosecurity system

477 towards more inclusive and diverse knowledge making practices is not a one-off process. We

478 have documented how a toolkit can be developed and used for different individual or team

479 initiatives, and this is now being taken up in different settings within Wales. Our process

480 emphasises an iterative approach that can be engaged with at different points in time and

481 adapted to suit the needs of the group or individual. In doing so, we have developed and shared

482 the toolkit in different contexts, involving different organisational cultures, and interdisciplinary

483 mixes.

484   Our discussions and reflections support calls for normalising a more pluralistic approach to

485   working within the Aotearoa biosecurity system, one that includes a range of values,

486   knowledges, and activities highlighting relationships and the effects of knowing the world

487   relationally (Watene, 2016; West et al., 2020). Avoiding the privileging of one perspective over

488   another aligns Indigenous worldviews and approaches to the increasing inclusion of multiple

489   cultural and ecological values (Cooper et al., 2016; Kawharu, 2000). These approaches are also

490   evident in contemporary sustainable and stewardship-oriented approaches (Hill et al., 2021;

491   Tadaki et al., 2022).

492   A key contribution our toolkit provides in the context of biosecurity is its encouragement of

493   reflection on the processes of biosecurity research, practice, and engagement, and their

494   impacts on the people involved. As noted in other literature on biosecurity, there are often few

495   opportunities for people to reflect on what they are doing, to consider the implications of their

496   actions, and to understand how their activities are perceived by onlookers (Porth, Dandy &

497   Marzano, 2015; Marzano et al., 2020).

498   Reflecting on our own team involvement in forest protection and our evidence gathering with

499   researchers, policymakers, and practitioners, we note that our toolkit is for people who already

500   feel the need to work in a different manner that acknowledges our Te Tiriti obligations. Without

501   the desire to change, there is little that a set of cards can do to support transformation. Through

502   our work, we found that many participants were indeed open to exploring different ways of

503   working and were eager to consider approaches that align with these obligations. It is therefore

504   notable that people who are more open to what they can do as individuals or in smaller work

505   teams, are more likely to use these reflective prompts (Kaine & Wright, 2022) than those who

506   feel the responsibility, and ability, to change lies solely at a higher level of governance.

507   However, reflective prompts are not a panacea even for those seeking change, and their

508   effectiveness depends on several factors. The timing and presentation of these prompts, for

509   instance, can impact their efficacy (Super et al., 2021). If perceived as adversarial or

510   judgmental, they may be met with resistance. Moreover, individuals may lack the necessary

511   skills for effective self-reflection (Super et al., 2021). As Sitzmann & Ely (2010) note, it is

512   beneficial to provide reflective prompts regularly when seeking to change practices. However,

513   we would discourage using this toolkit during a personal grievance process, when major

514   organisational change is happening, or when Māori or other Indigenous leadership already have

515   a process in place that this might detract from.

516   Engaging with this reflective toolkit may prove challenging for some, as it requires individuals

517   and teams to commit to self-reflection, therefore creating a supportive and nurturing team

518   environment is crucial (Huria et al., 2017; Manton & Williams, 2021). In contexts of change,

519   caring for one another plays a pivotal role in facilitating this process of growth and

520   transformation (McKercher, 2021). The reflective tools we have developed are intended for

521   those who are willing to engage in this journey and to empower participants to drive change

522   within their spheres of influence.

523   **Concluding thoughts**

524   In this research we have formulated ideas for addressing colonial biases and worked with

525   participants to develop critical self-reflection. Thinking critically about what we do and how we

526   do it can help biosecurity researchers and practitioners (among others) to assess whether their

527   work is inclusive, representative, and just. Adopting self-reflective practices can identify areas

528   where colonial biases and imbalances persist and make necessary changes. Guided reflection,

529   based on rubrics, can be used to support discussions around practical performance between

530   colleagues, promoting critical thinking and collaboration. As part of these approaches, it is

531   important, as researchers and practitioners, to embrace diversity of perspectives and values,

532   work with communities, consider ethical implications, and use methods critically and

533   reflexively to address colonial biases. The reflective toolkit presented here, along with the

collaborative approach used to develop it, was created to contribute to enabling this shift in biosecurity and, if adjusted for differing national, environmental, and cultural contexts, it may also prove helpful in other settings and fields seeking to decolonise knowledge practices. However, it is crucial that the reflective practices promoted by such tools and processes are complemented with additional decolonising initiatives, including, in an Aotearoa context, investment in Māori leadership and Te Ao Māori initiatives, training opportunities, and appropriate policy development to ensure a comprehensive approach to decolonising knowledge practices. Overcoming challenges, such as those faced within the Aotearoa biosecurity system, will ultimately require collaborative efforts, mutual support, and a commitment to growth and collective learning, in order to ultimately embed a pluralistic and inclusive cultural foundation within this system for the benefit of future generations.

Author Contributions

All authors are members of the Postcolonial Biosecurity Possibilities project. S.F-S.*, M.B.A.* and W.A.* developed the reflective toolkit, and planned and drafted the paper with help from An.G. All authors contributed to the wider project design, gathering and analysis of the data from participants in the biosecurity community, and provided critical input and feedback on the tools developed. All authors discussed the results and commented on the manuscript. (*equal lead authors)

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Conflict of Interest Statement

The authors declare no conflict of interest.

559 **Data Availability Statement**

560 Due to the sensitivity of the research topic and the type of data collected, it is not possible to

561 make the audio recordings or transcripts of the workshops and interviews publicly available. We

562 guaranteed anonymity and confidentiality to our participants in compliance with the ethics

563 approval granted by Manaaki Whenua – Landcare Research (#2021/24 NK).

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