

New Zealand's Biological Heritage National Science Challenge

Scoping Panel Report

Strategic Outcome 3:

We anticipate both emerging and latent biosecurity risks and avoid new or recurring invasions

Section 1: Creating Impact

1) Vision and link to the Challenge mission

The Issues

1. New Zealand's biological heritage is under threat from invasive organisms that are emerging in a rapidly changing environment, with huge environmental, social and economic costs.

Not only do we need to manage existing established pests but also prevent emerging and latent biosecurity risks and avoid new or recurring invasions.

Iwi/Māori are committed to preserving Papatūānuku for this generation and all that follow. The social, cultural and environmental impact of new and invasive species can be overwhelming, not only for native taonga, but for the long-term health of our ngāhere (forest) and surrounding taiao (environment). Our ability to interact with these heritage species and ecosystems will be affected, as will our ability to use plant species for the purpose of cultural activities like rāranga, tā moko, and rongoā to name a few.

2. Currently economic impacts are generally used to justify risk-management decisions, this doesn't take into account non-economic impacts and Māori values.

In part this is because economic values are easiest to quantify, and the system lacks appropriate tools to assess risk to non-economic values. As a result, potential costs to iwi/Māori, social-cultural and environmental values from pest invasions are not fully considered when assessing whether the overall costs of pest management interventions are justified in relation to the values they are protecting (classical cost: benefit analyses). This means that pests which affect indigenous taonga species, may not be prioritised in the same way as pest species which have a clear economic impact on primary production. For example, myrtle rust (affecting Myrtaceae species) initially had a different response to PSA (affecting kiwifruit).

3. Participants in the biosecurity system, and in particular Māori, are under-resourced to fully participate.

Mana whenua and other participants in the biosecurity system are under-resourced to fully contribute. This means that current risk profiles do not fully represent cultural and societal values, and the threats to these values, whether they are pathogens, insects, weeds or vertebrates.

4. Risks are dynamic, with frequent changes in the pest risk profiles.

Risk is inherently dynamic and rapidly changing as a result of both changes in human behaviour and in the risk profile of pests. Furthermore, pests can continually expand their geographic range as they invade new territories through human assisted movements (e.g. freight, plant and livestock movements and pet trade), and through more successful establishment supported by a changing climate. This is an issue for the primary production sector, as well as the wider community. For decision-makers and funders, it makes prioritisation difficult.

5. The focus is often on a single species, overlooking emergent issues.

There are often strong social and political drivers for biosecurity management to focus on pest species that are already widespread because these are the species that most people can readily identify as pests. For example, Regional Council staff are overwhelmed by all the pest species - current and potential - and are unable to do species-specific risk assessment on all of them. It can be difficult for councils to justify management of organisms that may become a risk without 'evidence' of it yet being a problem. This means that council decision-makers are constantly responding to pests that are already an issue - a much more costly proposition that tackling something at the emergent stage or immediately post arrival.

The role of the Challenge to address these issues

In summary - a world-class biosecurity system must anticipate both emerging and latent risks¹ and have the tools to fully assess and prioritise these risks. Decision-makers (including central and local government, mana whenua, and primary and tourism industries) need to be able to better prioritise these risks to make the best use of limited funds and resources. Our current assessment frameworks are ad hoc, species-specific and focus on predominantly economic values (see Figure 1).

The Challenge has the opportunity to address this critical and urgent gap by coordinating and resourcing the development of a system-wide framework that brings together a traits-based assessment tool, enables an iterative response to dynamic environmental and social changes, and responds equally to a range of values (see Figure 2). To be successful this needs to be supported with activities that increase the widespread societal awareness of emergent and latent risks, as well as actively resourcing increased participation in the biosecurity system, particularly for mana whenua.

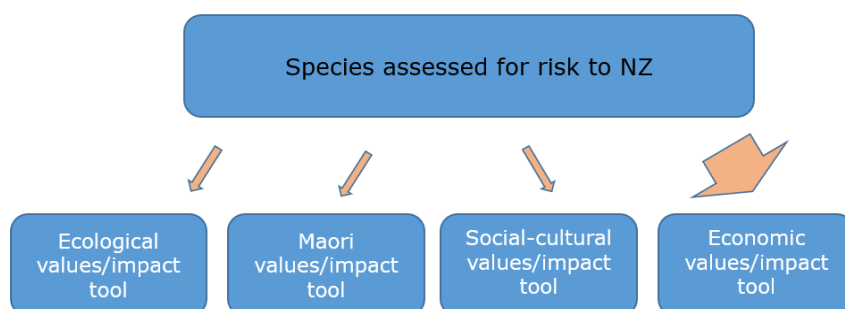
Investment by the Challenge will drive change in this part of the biosecurity system in order to achieve the following vision by 2024:

A biosecurity system that is dynamic and adaptive to biosecurity risk, where risks are prioritised across a broad range of values with input from all participants across the biosecurity system.

This links directly to Impact 2 of the Challenge: Tiaki (Protect): New Zealand's biosecurity system is world class.

Figure 1: Current Framework

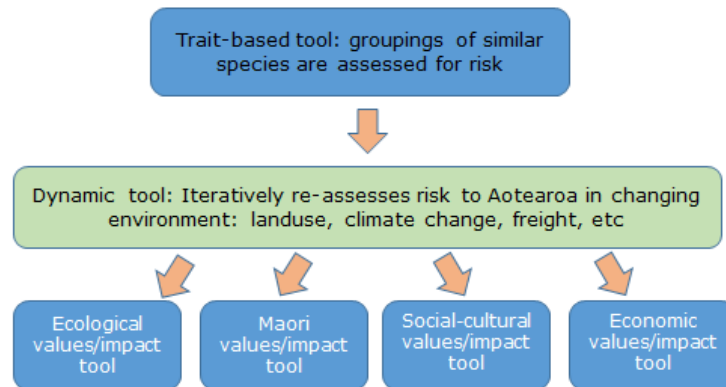
CURRENT FRAMEWORK



¹ For the purposes of the science challenge, emerging and latent risks are either pre-border species not yet known to be present in Aotearoa, or post-border species present in Aotearoa but not yet extensively naturalised or known to be causing impact either nationally or within any given area of interest, which threaten our biological heritage and values.

Figure 2: Proposed Framework

PROPOSED FRAMEWORK

**2) 2024 Goals**

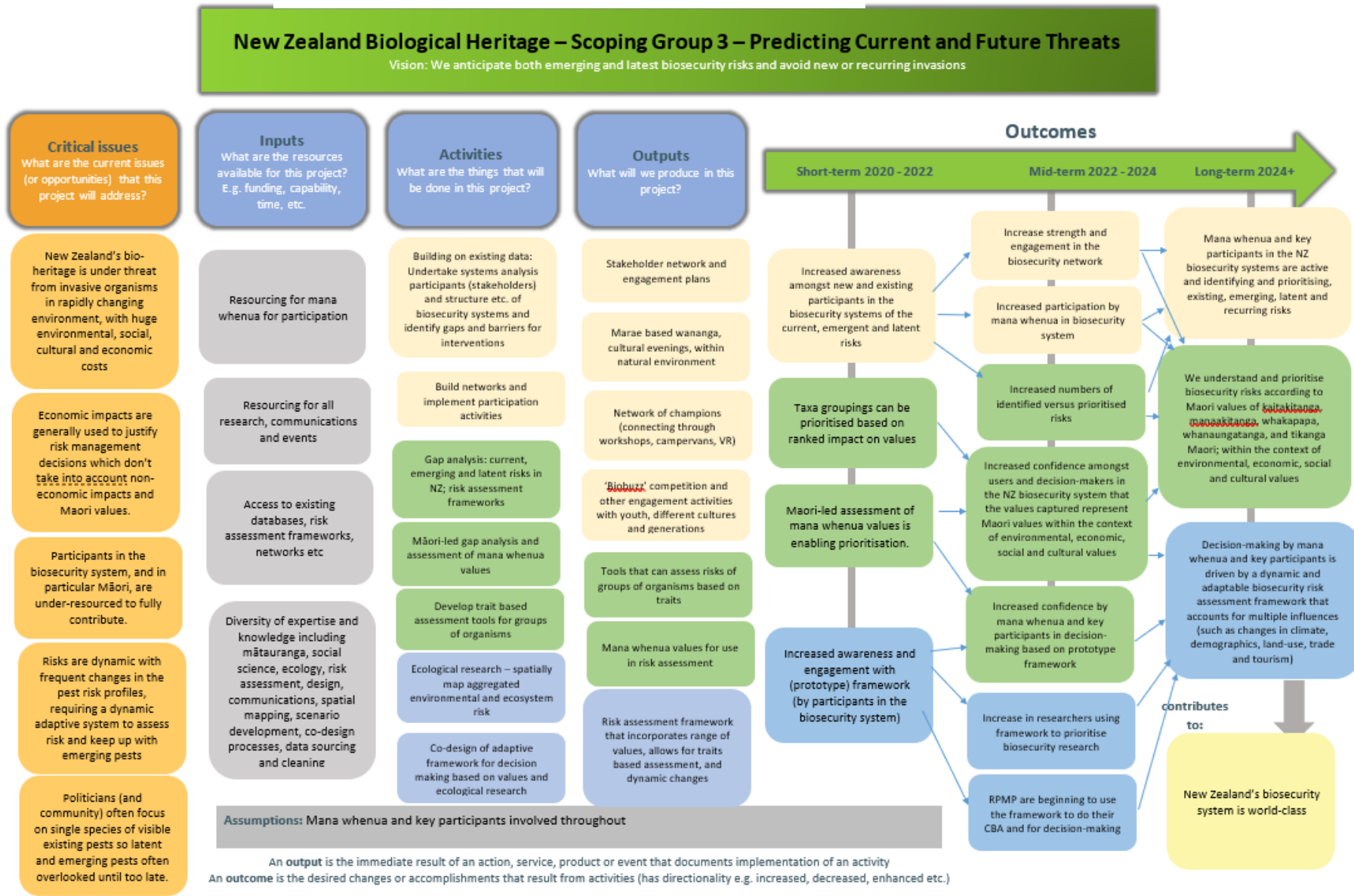
This Scoping Panel Report outlines the rationale for investment in activities to address the issues outlined in Section 1 and to achieve the **following 2024 Goals**.

1. **Participation:** Mana whenua and key participants in the New Zealand biosecurity system are active in identifying and prioritising existing, emerging, latent and recurring risks.
2. **Values:** We understand and prioritise biosecurity risks according to Māori values of kaitiakitanga, manaakitanga, whakapapa, whanaungatanga, and tikanga Māori; within the context of environmental, economic, social and cultural values.
3. **Impact:** Decision making by mana whenua and key participants is driven by a dynamic and adaptable biosecurity risk assessment framework that accounts for multiple influences (such as changes in climate, demographics, land use, trade and tourism).

The 'full picture' is shown in the Theory of Change (programme logic), Figure 3. The rest of the scoping panel report will outline in more detail how the three goals of participation, values and impact can be achieved through strategic Challenge investment.

Figure 3: Theory of Change/ programme logic for SO3

Updated: November 2019



3) Beneficiaries

Meeting the goals of this strategic outcome will benefit **all** New Zealanders, by creating an enhanced biosecurity system that reverses the decline in our biological heritage and avoids new or recurring invasions. Thus, the ultimate beneficiary is the mosaic of unique biological systems of Aotearoa, through reduced pest pressure.

We have identified the following groups as directly benefiting from this work. As there was substantial cross-over amongst the beneficiaries for each of the goals, we have combined them here with an indication of how they would benefit. It is difficult to prioritise who benefits most; all are important for different reasons.

This list was constructed through a process of brainstorming and empathy mapping, followed with sense checking with representatives of Te Tira Whakamātaki (Māori Biosecurity Network); Primary Sector Organisations (Horticulture NZ, Winegrowers NZ, Kiwifruit Vine Health, Dairy NZ); Central government (DOC, MPI), regional councils (Auckland Council, and Biosecurity Managers Group); researchers, including emerging researchers, representing Better Border Biosecurity, AgResearch, Plant and Food, NIWA, Manaaki Whenua, University of Auckland, Lincoln University and independents; conversation groups and individuals involved in biosecurity (including Forest and Bird NZ). The SO3 team collectively had direct representation with many of the groups/organisations listed above, or contacts within them.

Iwi/Māori will benefit from active participation at all levels of the biosecurity system so that their values and world views are paramount when planning and prioritising responses to invasive biosecurity risks.

Primary industry sector organisations and participants (horticulture, agriculture and forestry) will benefit from a system in which a collective framework and dynamic approach to prioritising risk will assist decision making around investment, effort and early responses, leading to improved economic and environmental outcomes for the sector. This flows on to protecting and enhancing these sectors' contribution to New Zealand's GDP, and hence overall prosperity.

The tourism industry will benefit by being able to proactively address the threats to NZ's biological heritage from the behaviour and activities of overseas visitors, thereby securing the ongoing health and aesthetic attractiveness of NZ's biological systems.

Central Government (including agencies such as Department of Conservation, Ministry for Primary Industries, Ministry of Health, Ministry for Environment, Environmental Protection Agency, Te Puni Kōkiri, Ministry for Business Innovation and Employment and Ministry for Foreign Affairs and Trade) will benefit from having an adaptable risk assessment framework to enable better policy, investment and decision-making, that will deliver environmental, social (including health and wellness), and economic impacts and outcomes.

Regional Government (particularly regional councils and their biosecurity teams) will benefit from a framework that is not only based on economic values but also better reflects Māori and ecological values in decision making. Councils will benefit from increased public appetite for best-practice, preventative management of latent and emerging pest species, relative to the current focus on species that are already widely established and therefore recognised as pests. Together these elements will improve policy and decision-making, particularly Regional Pest Management Plans, increase buy-in from public through wide scale consultation, and support a shift to more precautionary management of emerging and latent pests.

The general public (including younger and older generations and ethnic groups beyond Māori and Pākehā, and recreational users) – all benefit through the opportunity to be involved with and understand the pressures (current and future) on NZ's environment, leading to action.

Funders and investors (e.g. Government, industry sector and community organisations) will be able to better target where they invest resource for emerging, latent and recurring pest risks.

Researchers (including CRIs and universities) will benefit from being part of an 'innovation systems' approach in which there is a higher likelihood of research uptake and impact due to participation of other partners in the research process.

Environmental groups and NGOs will benefit through having wider participation of others in the biosecurity system, and an adaptive framework that focuses on a range of values. This sector will also be able to increase the impact of their work through an increased understanding of latent and emerging pests.

Education providers and students, from pre-school to universities and community education, will benefit through having real-world teaching material and connections to the biosecurity system.

Section 4 (delivery pathways) and Section 8 (essential partnerships and relationships) provide more detail around the involvement of those who benefit. The underlying principle is that of co-design and co-development - involving partners and beneficiaries from the beginning and throughout the process to achieve all three goals.

In particular, we have identified that the following partnerships will be essential in order to achieve impact.

Goal 1 (Participation): will require partnership between mana whenua, central and regional government, researchers (including social scientists), international biosecurity connections and networks (especially in the Pacific), primary industry sector representatives, tourism representatives, the environmental sector (including NGOs) and the general public.

Goal 2 (Values): The essential partnership required to deliver impact has initially been identified as mana whenua, central and regional government, researchers (a transdisciplinary team) and primary industry representatives.

Goal 3 (Impact): Partners are the same as for goal 2, with the addition of designers, computer and data management specialists, and Statistics NZ.

4) Delivery pathways

Delivering impact across the three goals in this strategic outcome (SO) requires decision-making, in the context of emerging risks, to be based on a broad range of values including environmental, economic, social and cultural values that are incorporated within an overall framework that includes trait based assessment and dynamic risk assessment (Figure 2).

We recognise that on its own a 'framework' is not sufficient to bring about the step change required. Firstly, it needs to be underpinned by increased participation in the risk assessment process, and by a wider range of participants. Secondly there needs to be an overall increase in awareness about emerging and latent pest species. Thirdly the development and deployment of the framework itself needs to be done with and by the people who are going to be ultimately using it for decision making. The rest of this section outlines how this can be achieved.

A critical step in this process is increased engagement by mana whenua and other key participants in the biosecurity system in identifying and prioritising biosecurity risk. Delivery pathways to achieve this engagement will build on the existing Biosecurity 2025 Ko Tātou initiative, which is about getting all New Zealanders engaged in biosecurity and building a team of 4.7 million people actively asking for early detection and intervention, not just management of existing pests.

As well as creating engagement, and raising awareness of latent and emerging risks, this SO will be facilitating the exchange of ideas and input into risk assessment frameworks. A different set of delivery pathways will be required to ensure that the requirements of beneficiaries (Section 3) are captured in a framework and ultimately used to drive decision-making.

Interpersonal influence through social networks is central to most of these pathways as a means of diffusing information. Most of these pathways do not require the discovery of new knowledge, but rather resourcing and innovative approaches to achieving stakeholder engagement. Such approaches may already be employed in other fields, but may be innovative for science, and especially for input into biosecurity risk assessment.

Some of the principles that will be followed with implementing all pathways to impact are as follows:

- We will start with an (overall) systems analysis that involves improved understanding of all the participants in the biosecurity system and identifying their current points of connection, information needs and information sources. This will build on existing knowledge, and link to other SOs as appropriate. Part of this analysis is gaining an understanding of barriers and enablers in the biosecurity system, for example policy and institutional structures. This will enable a more holistic approach to implementation rather than something that will fill a few holes but will not strengthen the 'weave'.
- We will build in monitoring and evaluation from the beginning so that we can monitor the extent to which each approach has delivered the desired outcomes. A flexible and adaptive monitoring system will enable us to re-assess and alter actions based on whether we achieve our desired outcomes. This also implies starting small in some cases, piloting ideas and then rolling out more widely based on feedback. An overall evaluation plan will be developed to demonstrate progress towards impact.
- We will use co-design approaches with the partners mentioned in Section 3 so that any initiatives are designed with (and for) representatives of the people we aim to engage with.
- We recognise that there will be no one pathway to achieving impact and no one size fits all. Therefore, we outline suggested approaches below.
- We anticipate that there will be the opportunity to integrate approaches with other SOs so that we can get the best 'bang for buck' with the engagement and integration in order to deliver overall impact.

Specific examples of delivery pathways are as follows:

A. A Network of Biosecurity Champions

Creating a network of biosecurity champions is a cost-effective delivery pathway to start conversations, raise awareness and build public support for biosecurity initiatives on the ground - especially for the less visible latent and emerging risks, as well as new or recurring incursions. These networks will build on those created within the Ko Tātou initiative but broaden where necessary to ensure representation within the social networks of key target groups, especially mana whenua. Strong networks of biosecurity champions will ensure early recognition of emerging issues and that appropriate responses can be implemented expeditiously. This network should contain sufficient diversity that all New Zealanders can relate to at least one of these champions and reflect their key values, yet at the same time, having credible champions for specific sectors (e.g. tourism, agriculture etc). In the modern world of social media, many potential champions will have an existing base of followers and need to be recruited to the vision. Others may already be champions of the vision but need assistance in expanding their reach, which may include social media but also more traditional forms of communication.

The purpose is to lift New Zealanders' understanding of the importance of biosecurity, and then get them participating in other initiatives. To achieve that aim, we will rely on a core group of champions representing diverse values who can be supported by translator/storytelling/communication skills and design or graphics to relay key messages to a broad audience.

Key attributes:

- Build on, not duplicate effort of, Ko Tātou networks and champions
- Likely utilize a single network across all SOs to build engagement, not specific to these goals only
- Can be a virtual (broad) network, as well as a core network of champions
- Use monitoring and evaluation to assess the effectiveness of the network
- Can de-risk this by piloting and building up over time

Barriers:

- A focus purely on social media “influencers” will exclude portions of society, particularly older participants. Champions should be diverse and include individuals that have a social media presence, and an ability to engage at a more personal level with key groups. As above, social media will not be the only way of connecting this network.
- Information overload. Today it seems that everyone is an influencer, which dilutes their effectiveness and makes it harder for the message to stand out from the noise.
- Ethnicity and culture-specific barriers, behaviours and traditions. Careful consideration is required to ensure non-Pākehā communities can be meaningfully accessed in relation to emerging and latent pests of relevance to their communities.
- Pre-conceived pest priorities, especially in relation to the relative importance of managing established pests compared with future pests.
- Competing value positions: many potentially damaging species also have existing value as a resource (e.g. pets, retail, hunting, fishing etc).
- Differing rural and urban viewpoints: many of the direct impacts of biosecurity incursions are seen and felt in the rural areas (e.g. cattle culling as a result of *M. bovis* incursion), however, the urban community need to also be on board.

Building scale/ future vision:

This approach can start from a core and build in size and scale over time. The vision is a national network that encompasses all parts of society actively communicating through social networks and other media.

SO3 Goals this relates to:

Goal 1

Alignment to other SO goals:

SO4 Goal 1 & SO5 Goal 1: Equitable consideration & implementation of Te Ao Māori understanding, values, approaches & opportunities.

B. Using different media/fora to engage

A range of different mediums and forums will be used to connect with different parts of society. For mana whenua these may include wānanga at a marae or within the natural environment, or incorporation into existing events (e.g. sporting, cultural, social). It will incorporate te Reo Māori and include other elements of culturally specific communication.

For younger audiences we will seek to make biosecurity exciting through the use of digital media such as virtual reality games. Using the Find-a-Pest app that was developed in Tranche 1 of the Challenge, BioBlitz competitions will be held in local communities with participation of schools and local community groups.

Key attributes:

- These approaches consider the context and setting of the different groups, as well as preferences for information exchange and learning.
- We acknowledge that there is not a 'one-size-fits-all' approach, and that innovative methods are needed to encourage participation in some cases.

Barriers:

There will be a limit to how many individual events can be conducted and there is a need to ensure efforts are not spread too thinly. To mitigate this, we will need to monitor and evaluate how effective different approaches are and adjust the delivery pathway based on what is working (or not). With respect to young people, this could be mitigated by partnering with existing environmental education entities, such as Enviroschools, who can assist in amplifying reach.

Building scale/ future vision:

Monitoring and evaluation will help us learn from what works and in which context. The approaches can then be adapted to better fit the needs of participants to engage and exchange information.

SO3 Goals this relates to:

Goal 1

Alignment to other SO goals:

SO4 Goal 1 & SO5 Goal 1: Equitable consideration & implementation of Te Ao Māori understanding, values, approaches & opportunities.

C. Focus groups/workshops/hui/interviews

Building participation is the first step in creating a step-change in our approach to anticipating biosecurity risks, but we must go further to understand the values of mana whenua and key participants to effectively prioritise biosecurity risk for all New Zealanders. Participatory methods such as focus groups, workshops, hui and interviews will be used to gather this information.

Key attributes:

- Participatory methods that enable individuals to engage and exchange information
- Engages different participants from the beginning and throughout the process to ensure all values are identified
- Diversity in the audience will be key – will require a range of representatives to reach all sectors of the community
- Allows different voices to be heard and contribute
- Enables collection of data in a robust manner (which will guide research and practice decisions)
- Activities to be based on case studies relevant to participant values

Barriers:

- Depending on the methods used, participation can be resource intensive and lead to engagement fatigue
- There needs to be motivation for the participants to take part (and they must see the benefit of their contribution)

Building scale/future vision:

- A full engagement plan will be developed to show how initial data collection will occur and guide decisions in this programme of work
- Use existing and new networks to scale out

SO3 Goals this relates to:
Goals 1 & 2

Alignment to other SO goals:

- SO4 Goal 1 & SO5 Goal 1: Equitable consideration & implementation of Te Ao Māori understanding, values, approaches & opportunities.
- SO6 Goal 2: More meaningful ways to evaluate the non-market values of the environment to people.
- SO7 Goal 1: Mana whenua are enabled and resourced to participate as a partner.

D. Capability courses

Short courses on biosecurity will upskill mana whenua and participants to reduce capability as a barrier to active engagement in risk prioritisation. Before implementing, a needs analysis/scoping study would be required to ensure this doesn't duplicate what is already in place (e.g. through Primary ITOs, universities). It would also build on the needs identified through #3 above.

Key attributes:

- For mana whenua this may be through marae and wānanga
- Short courses will embed into the education system
- Links with education providers and schools
- Connections to community and religious groups

Barriers:

- Resourcing (mana whenua are lacking capacity to participate) and extent of existing capability
- Lack of culturally tailored content – cannot just be based on standard Western science resources
- Lack of understanding and perceived value (some believe biosecurity has no impact on them)

Building scale/ future vision:

Pilot courses used initially before being scaled out nationwide.

SO3 Goals this relates to:
Goals 1 & 2

Alignment to other SO goals:

- SO2 Goal 2: Establish a clear, coherent & collective understanding of the preferred state for NZ biological heritage based on a national conversation.
- SO4 Goal 1 & SO5 Goal 1: Equitable consideration & implementation of Te Ao Māori understanding, values, approaches & opportunities.
- SO7 Goal 1: Mana whenua are enabled and resourced to participate as a partner.

E. Develop and embed framework within existing processes

The framework for assessing and prioritising emerging and latent risks based upon a broad range of values, (including kaitakitanga, manaakitanga, whakapapa, whanaungatanga, and tikanga Māori; within the context of environmental, economic, social and cultural values) and delivers dynamic and trait based assessment tools, will be used to drive decision making by mana whenua and key participants in the biosecurity system. This requires a delivery pathway to embed the framework into existing processes.

Key Attributes:

- Involvement of mana whenua and decision-makers (identified through systems analysis and existing networks) who will use the framework in a co-design/co-development process that creates ownership from the beginning
- Workshops using invasion scenarios throughout the development process
- Align with existing guidelines and regulatory regimes through co-design process

Barriers

- Some participants in the biosecurity system may have their own risk assessment processes in place (note the proposed gap analysis is the first step to identifying what currently exists to ensure alignment)

SO3 Goals this relates to:

Goal 3

Alignment to other SO goals:

SO7 Goal 2: Design a new governance architecture for biological heritage resilience.

5) Risks

- Lack of uptake of the framework by decision-makers.*** Regional councils, for instance, have recent experience of attempts to align Regional Pest Management Plan cost-benefit analyses (pest risk assessments), which have fallen short of aspirational alignment due to diverse and competing regional political, economic, social and ecological drivers. The risk of a similar lack of uptake can be mitigated by early and on-going engagement with end users, and by ensuring that the framework is scalable and adaptable for diverse needs.
- Safe management of mātauranga Māori.*** Taking into account impacts on taonga requires knowledge of those taonga, but Māori may hold very reasonable concerns around the implications of disclosing such information to wider audiences. This is a risk that likely applies across other strategic outcomes and requires consideration in partnership with Māori to ensure appropriate mitigations are in place.
- Attempting to do too much and thereby failing to achieve the most important elements.*** This can be mitigated through careful prioritisation, and the initial scoping stages (systems analysis and gaps analysis).
- Existing data sets across government and industry are of differing formats, scope and quality.*** Some organisations may be unwilling to share existing risk assessment data sets, in which they have already invested. This will be mitigated through the initial gaps analysis stage and building a better understanding of what is available, what is missing and what are the barriers to use.
- Co-design/co-development and other participatory processes often rely on the same group of participants who are spread thinly amongst other activities.*** This can particularly be the case for mana whenua. To overcome this barrier, we are proposing to provide resourcing for increased participation of mana whenua in the biosecurity system (potentially shared with other SOs).

- F. **Changes to the political, funding or threat landscapes** that force a re-prioritisation of key biosecurity 'values' or a return to the traditional metric of biosecurity risks being evaluated primarily based on economics.

6) Communications and relationship management

Communications are central to achieving the goals of this SO. This is reflected in the delivery pathways (Section 4) which are communication-based and illustrate the modes of communication that will be used to reach mana whenua and key participants of the biosecurity system.

Certain relationships will be key to the success of this SO. The following relationship managers can act as conduits between the Challenge and their respective sectors, with the key communication channels described below. Representatives on the SO3 scoping group either have direct links into the networks described below or could facilitate the relationship building. So far, communication has been limited to awareness raising of this SO and its goals amongst individuals representing the key relationships below (with the exception of DOC Biosecurity Managers and targeted community partnerships). The next step would be to develop and implement a relationship and engagement plan. Communication has been costed as a line item in the project budget so that this activity receives dedicated focus.

Relationship	Key relationship manager	Communications channels
Mana whenua	Te Tira Whakamātaki	Hui, face to face meetings, electronic.
Regional government	Regional government bio-managers & biosecurity working group	This working group meets on a regular basis to discuss issues and can serve as a communication channel to the wider council and members.
MPI	GIA team, Risk Assessment team	GIA represents a partnership in biosecurity between industry and government who are represented by MPI. Therefore, GIA forums also present an excellent communications channel for MPI and industry concurrently. The Risk Assessment team are likely to be key to the development and adoption of this framework given their role in the biosecurity system. It will be important to maintain a key contact with a member of this team, have regular face-to-face meetings and ensure a strong level of engagement.
Primary industry (GIA)	Industry Biosecurity Managers (where present, or CE)	About 85% of primary industries are now signatories to GIA. The Livestock Council and Plant Council and biosecurity managers group are all forums for communication through face-to-face meetings or email distribution groups. Biosecurity managers would have well-established communication channels to their respective sectors.

DOC	DOC Biosecurity Team	
Community partnerships	Landscape-scale ecological networks	There are many existing community networks with visions for protecting and enhancing biodiversity (e.g. NorthWest Wildlink, Eastern Songbird, Cape to City, Taranaki Mounga Project, iwi, hapū and Community Nursery Network (Auckland)). These are community-driven, with support from NGOs and agency support. These have well established communication networks and would be a pilot before engaging non-environmental community groups.
Researchers	NSC BH & Better Border Biosecurity (B3)	Utilising the existing channels of these entities is the most effective way to reach out to the research community. These channels include newsletters, face-to-face meetings and symposia in existing conferences.

Section 2: Incentivising Investment

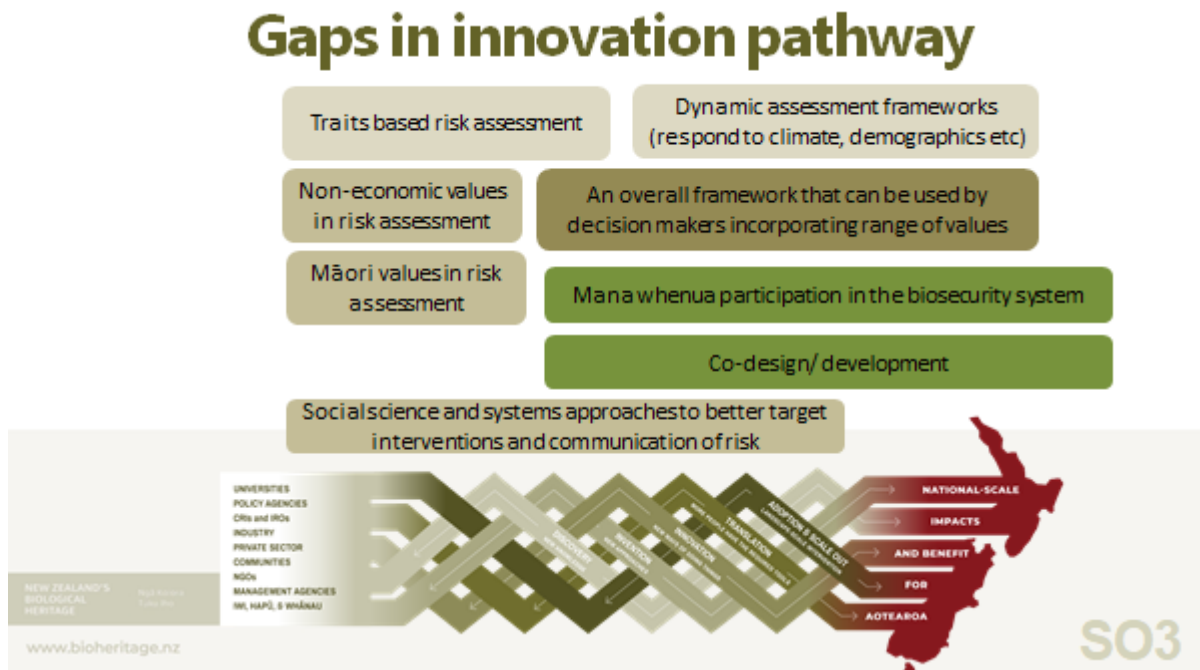
7) Essential activities

In order to achieve the goals, we are suggesting a mix of discovery, connection, invention, innovation, translation and adoption/scale out activities. Our approach to developing these was based on the following:

- Building on existing information knowledge systems, frameworks, networks and research (we are not reinventing the wheel)
- Research activities aligned to gap analysis
- Māori led values and approaches are front and centre
- Collaborate and integrate approaches with other SOs
- Innovation includes the *approaches* used to convey and exchange information
- Activities in the innovation/translation space can be piloted and then scaled or not (fast-fail, agile)
- Frequent reassessment of biosecurity priorities based on knowledge of global threats, emerging national issues and changes in values or environmental conditions
- Embed monitoring and evaluation throughout all activities, that is used for reflection and learning (i.e. not just accountability)

Critical gaps that the Challenge can resource along the innovation pathway

As part of the design process we spoke to the representatives of the key partner networks (see Section 6) and identified that while there are activities underway, there are gaps in the innovation pathway that are preventing progress in the biosecurity system (see Figure 4). In the section below we outline the specific activities proposed to achieve the Goals (section 2) along the different strands of the pathway.

Figure 4: Identified gaps in the innovation pathway relating to SO3

Discovery

Goal 1 Participation

- Whole of system analysis of the biosecurity continuum (including people plus structures/functions and points of connection) – social science

Goal 2 Values

- Gap analysis for pathway risk and ability to manage risk
- Māori-led gap analysis & assessment of mana whenua values
- Gap analysis to review availability of existing environment values and risks (e.g. ecosystem rankings)
- Ecological research to spatially map environmental/ecosystem risks
- Social science to increase understanding of values held by different groups in society
- Gap analysis for trait/higher than species-level prediction of taxa risk
- New trait/high level biological research to fill identified gaps

The key gaps this addresses: There are major gaps in current risk assessment models – in particular, Māori values of kaitiakitanga, manaakitanga, whakapapa, whanaungatanga, and tikanga Māori have not been included. Most biosecurity responses are reactive to individual species deemed high risk, and by default risk assessment focuses on assessing the risk of single species to New Zealand, often those that are well-known pests internationally (e.g. brown marmorated stink bug). However, there is a large pool of exotic species, both those transported to our borders and those latent within New Zealand as part of our invasion debt (e.g. 20 plant species naturalise each year). It is not possible to undertake a full risk assessment for the many thousands of pre-border and latent species, and thus species that have not been fully assessed for risk emerge as pests (e.g. hadda beetles, Chinese fan palm).

Continuing to conduct risk assessments for each taxa will enable species to slip through due to the overwhelming number not fully assessed. To achieve a step-change, approaches from other industries must be employed: for example, the insurance industry approach is to assess risk based on different classes (e.g. under 25-year-old drivers are a high-risk class). Likewise, we must assess risk for 'classes' or groups of organisms, based on traits or relatedness rather than for each individual species (e.g. subtropical palms are a risk class for Northland/Auckland, particularly under a changing climate). Gap analysis must identify new ways of predicting risk for larger groups of organisms (e.g. trait-based) so that prediction is broad, accurate and limits surprise incursion from lesser-known taxa. There is limited information about social values in a form that can be used in a risk assessment model, requiring discovery social science research. In addition, a full systems analysis, which considers structures and functions of the system, as well as the participants, is a missing precursor to understanding where participation and other interventions may best be targeted.

Invention/ Innovation

Goal 1 Participation

- List/database of current, emerging and latent biosecurity risks in NZ (building off existing data)
- Database of key stakeholders and their interests to help ensure no double-ups or major gaps in work underway
- Innovative approaches to engagement (see also translation), which will be monitored and evaluated for success
- Establish mana whenua placed based learning (e.g. nature walks, pest identification etc)

Goal 2 Values

- Incorporation of non-economic values including Māori values, into risk assessment models
- Values (e.g. ecological) are spatially explicit, with regional rankings
- Risk analysis methods are developed that assess risk for groups of organisms (e.g. snakes, subtropical palms), both pre- and post-border

Goal 3 Impact

- Gap analysis of existing frameworks to build on what has been done before, including other sectors
- Co-design and co-development of a framework based on values and incorporating risk analysis methods developed in Goal 2
- Design dynamic influence models (e.g. incorporating climate change) as part of the framework

The key gaps this addresses: Current risk assessment frameworks do not include social and cultural considerations and are not necessarily dynamic, nor adaptive for changes in things such as climate, demographics, land-use, trade, geopolitical developments and tourism.

Engagement and knowledge-exchange around emergent and latent biosecurity risks is not always targeted, and new innovative and co-ordinated approaches are needed to better connect to other participants in the system (including but not limited to mana whenua, youth, tourists, different generations, immigrant cultures, importers/exporters etc). Here the Challenge could take on a co-ordination role, as well as piloting and assessing new approaches on a fast-fail basis.

Translation, adoption and scale out

Goal 1 Participation

- Set up active stakeholder networks and methods of engagement, based on knowledge of participants, stakeholders and systems
- Resource mana whenua to actively participate in biosecurity and risk assessment
- Through marae, run wānanga, cultural evenings and events within the natural environment
- Establish relationships that will continue into co-design of framework
- Establish/confirm international collaborations and relationships, especially within the Pacific, and with regards to invasive species (knowledge and practice)
- Trial innovative approaches to increase engagement of youth, tourists, older generation, different cultures, including VR simulation, BioBlitz approaches, music and/or art festivals
- Develop capacity through short courses on biosecurity, pathogens, influences etc. (may require a needs analysis to determine what is offered already)

Goal 2 Values

- Present invasion scenarios to New Zealanders using innovative approaches (e.g. via walks, virtual reality) and gather values
- Monitoring & review programme - refresh 'values' programme every 5 – 10 years

Goal 3 Impact

- Involvement of partners and beneficiaries in co-design from the beginning
- Design and development of framework via series of targeted workshops (building on work in Goals 1 & 2)
- Establish overall champion agency & governance structure within and beyond the life of the Challenge

The key gaps this addresses: The gaps in this part of the innovation pathway 'weave' reflect that those who are affected by the impacts of emerging and latent biosecurity risks are often not involved or actively able to participate in the biosecurity system, this is particularly true of mana whenua. In general, engagement can be ad hoc or focussed on one species or issue. The Challenge can address this gap by resourcing participants, especially Māori, to actively participate in identifying and prioritising existing, emerging latent and recurring risks. This will involve co-design processes to determine values that form part of the risk assessment framework, as well as using innovative approaches to reach different groups within the community.

Essential Activities by Year

Goal	2020	2021	2022	2023	2024
1: Participation	<p>Begin conversations and build relationships.</p> <p>Social science system analysis (includes actors, policies, institutions etc).</p> <p>Resource stakeholder network.</p> <p>Identify key international and pacific networks to connect to and leverage off.</p>	<p>List/database of current versus emerging risk (baseline). Establish network of champions and international connections.</p> <p>Wānanga and marae-based approaches.</p> <p>Connect to the establishing international indigenous biosecurity network.</p>	<p>Events and activities to maintain momentum (e.g. arts and music).</p> <p>Capacity-building activities, including education, short courses, emerging research.</p>	<p>Participation activities (e.g. BioBlitz competition or similar, to increase youth participation).</p>	<p>Review and evaluate success. List of priorities.</p>
2: Values	<p>Gap analysis: pathways, species traits, ecosystems values, mana whenua values, social values.</p>	<p>Maori-led assessment of mana whenua values. Ecological research (spatially explicit risks to environmental/ ecosystem).</p> <p>New tool for assessing risks of groups of organisms (traits/relatedness).</p> <p>Tools for 4.7 million NZers based on values – VR invasion scenarios, workshops, campervans spreading collection of data.</p>		<p>Values obtained and tested. Spatial mapping of values begins.</p>	<p>Review programme, refresh values (every 5 – 10 years).</p>
3: Impact	<p>Review what has been done already (gap analysis of frameworks).</p>	<p>Co-design and co-develop framework based on tools and values. Begin piloting prototypes.</p>		<p>Socialise framework and build capability to use.</p>	<p>Framework adoption and scale-out. Monitor decisions guided by framework.</p>
On-going	<p>Monitoring and evaluation of success; communication; engagement with other SOs, encourage adoption as government policy (align with wellbeing budget).</p>				

8) Essential partnerships and relationships

Key partnerships

As outlined in previous sections, only initial engagement has occurred at this stage. However, as mentioned many of the SO3 group have direct links and relationships with these potential partners. An initial step is to look across the whole system (systems and stakeholder analysis) rather than rely on the 'usual suspects.'

Maori

For Māori, there is nowhere else to call home. This is it! Māori are committed to preserving Papatūānuku for this generation and all that follow. There are no second chances, there is no going back. We have to get it right first time, we have to get it right now.

There are many emerging iwi/Māori organisations with a vested interest in the preservation and conservation of the taiao and the potential damage being done to it by new and invasive incursions. Many have experienced the devastation both myrtle rust and kauri dieback have had on taonga, however a lack of resources has limited their participation thus far. Participation at all levels of the biosecurity continuum will ensure resources are adequately shared among all stakeholders in the chain. Te Tira Whakamātaki, the Māori Biosecurity Network, will be an essential partner in establishing strong links with iwi and mana whenua.

Researchers

[B3 \(Better Border Biosecurity\)](#) undertakes research on Risk Assessment (Theme B) and Pathway Risk Assessment (Theme C) for cross sectoral pests, pathogens and weeds in natural and productive (i.e. pastoral, forestry, horticulture, cropping) plant systems. Its CRI partners undertake similar research on sector specific invasive organisms and pest management of established invasive organisms. B3 and its partners (incl. MPI, DOC) brings aligned investment, capacity, capability and expertise to BHNSC. As part of the design phase we have engaged with the B3 researchers; the B3 director has been on the SO3 scoping group.

[The EpiCentre](#), based at Massey University, provides world-class research, service and teaching in epidemiology, biosecurity and public health

[The Bio-Protection Research Centre](#) is finding innovative, natural and sustainable solutions to protect New Zealand's plant-based, productive ecosystems from pests, diseases and weeds.

Universities

[Centre for Biodiversity and Biosecurity](#) - joint centre between University of Auckland and Manaaki Whenua – Landcare Research

Crown Research Institutes - All land focused CRI's (PFR, AGR, Scion, Manaaki Whenua) have significant BHNSC aligned investment in managing risks from invasive pests, diseases and weeds. Representatives of AgResearch, Plant and Food Research, and Manaaki Whenua have participated in the scoping group and provide excellent links to these organisations. Freshwater invasive species have not been included at this stage, but if they are will require discussions with NIWA and Cawthorn.

Primary sector organisations

Primary sector organisations are a likely end user for the emerging risk framework. Many sectors already prioritise threats to their industry with frameworks based on likelihood and consequence, where consequence is primarily measured as economic impact. However recent responses such as the Psa incursion in kiwifruit and *Mycoplasma bovis* in the animal sector, have highlighted that these responses can have significant impacts to non-economic values to primary sectors also. These incursions both had significant social impacts to individuals, families and communities which were likely underestimated,

and difficult to quantify at the outset. A framework that gives greater consideration to non-economic values will assist with better priority setting for primary sector organisations.

The intent is to align with work that has been done by these organisations to date. For example, DairyNZ has been investing in an independent analysis of biosecurity risks to the dairy sector for a number of years. Initial discussions suggest the goals of this SO align to their biosecurity objectives at the high level.

Central Government

MPI are likely to be a key partner and beneficiary. The risk assessment framework would need to build on/align with what is currently being done in MPI.

DOC are also a key beneficiary, as achieving the goals of this SO lead to enhanced protection of New Zealand's conservation estate.

Regional councils

A key avenue for potential impact for this Strategic Outcome is through implementation in Regional Pest Management Plans (RPMP). Development of RPMPs must meet criteria prescribed in the Biosecurity Act 2012 and National Policy Direction for Pest Management 2015. Furthermore, the content of RPMPs is heavily influenced by public views on pests, notably including competing value positions, and a tendency to focus on pest species that are already widespread. Councils also face a challenge in assessing the enormous burden of potential pests within the country (e.g. 25,000 species of non-native plants). Regional councils therefore have an interest in supporting research and translation work that can assist them to develop technically effective and publicly supported RPMPs addressing latent and emerging pests. Regional councils are aware of the Challenge and have acknowledged the potential value in this work. There is opportunity to seek further alignment and on-going engagement with regional councils primarily through the Biomanagers Special Interest Group, and the bio-science sub-group.

9) Essential resources

The following have been identified as the key resources required to deliver impact:

Goal 1:

- Resourcing of mana whenua participation **(all goals)**
- Project Manager **(all goals)**
- Monitoring and evaluation **(all goals)**
- Communications specialist and cost of events and communications
- National campaign to encourage awareness and involvement
- MPI and others - risk-analysis and off-shore screening
- Funding for social science systems analysis
- Funding to co-ordinate co-design/development processes

Goal 2:

- Existing biosecurity information (biosecurity functions) on state, trends and values – data required for example from MfE, DOC and councils
- Existing ecological/environmental information (geolocated and including ecosystem rankings)
- Links with SO6 regarding methodology for impact assessment of non-economic values
- Network of biosecurity champions (from Goal 1)
- Researchers to develop risk assessment tool (dynamic and for groups of organisms)

Goal 3:

- Funding to support delivery pathways
- Data inputs (e.g. climate, demographic, trade patterns, etc), from Stats New Zealand and others
- Funding people:
 - TTW
 - Design specialists
 - Co-designers
 - Relationship managers
 - Trans-disciplinary research team
- Access to existing tools and frameworks

Section 3: Quantifying Cost Elements

10) Budget details and cost narrative

The following major cost elements have been identified:

Goal 1

- Resourcing for mana whenua (& other participants?) – across all goals
- Project Manager
- Designer to develop and pilot engagement activities
- Communications specialist and events organisation
- Social science for systems analysis
- International collaboration / relationships development
- Funding to run and facilitate co-design/ development processes
- Funding for developing and running network of champions

Goal 2

- Funding for mana whenua values assessment
- Social science assessment tools/workshops
- Spatial mapping of values
- Invasion scenario development (e.g. VR)
- Ecological research → risk assessment tool (is dynamic and for groups of organisms)

Goal 3

- Review of existing frameworks and gaps analysis
- Design of framework & tools (e.g. values)
- Data sourcing, cleaning & synthesis, etc.
- Funding to run and facilitate co-design processes
- Delivery costs (to build and deliver framework)

An indicative budget has been developed based on these cost elements (see Figure 5).

Figure 5: Estimated Annual SO3 Budget

Annual Budget SO3								
Description	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Total	PA	full FTE
<i>All Goals</i>								
Support for mana whenua						1,500,000	300,000	
Science leader	0.25	0.25	0.25	0.25	0.25	500,000	108,000	400k
Project Manager	0.25	0.25	0.25	0.25	0.25	375,000	75,000	300k
Monitoring and evaluation	0.1	0.1	0.1	0.1	0.1	175,000	35,000	350k
Communications	0.1	0.1	0.1	0.1	0.1	150,000	30,000	300k
Administration	0.1	0.1	0.1	0.1	0.1	100,000	20,000	200k
Operating						100,000	20,000	
<i>Goal 1. Participation</i>								
Risk analysis and off-shore screening						in-kind		TBD
Biosecurity system analysis / social scientist	0.4	0.4	0.2	0.2	0.2	490,000		350K
Workshop facilitation to implement co-design	0.4	0.4	0.1	0.1	0.1	385,000		350K
Operating						80,000		
<i>Goal 2. Values / data sequestration</i>								
Gap analysis, tool development and spatial mapping for biosecurity and environment information	0.5	0.5	0.5	0.5	0.5	875,000		350k
Assessment of societal values (non-Māori)	0.2	0.2	0.2	0.2	0.2	350,000		350k
Maori-led assessment of mana whenua values	0.2	0.2	0.2	0.2	0.2	350,000		350k
Operating						100,000		
<i>Goal 3. Impact</i>								
Decision tool development / design	0.1	0.1	0.2	0.2	0.2	280,000		350k
Data analysis	0.1	0.1	0.2	0.3	0.3	350,000		350k
Framework design				0.2	0.2	140,000		350k
Workshop facilitation to implement co-design			0.2	0.2	0.2	210,000		350k
Development of trait based tool			0.4	0.4	0.4	420,000		350k
Access to existing tools and frameworks						500,000	100,000	
Totals	2.7	2.7	3	3.3	3.3	7430000	1486000	

Section 4: Evaluating Success

11) 2024 Goal Metrics

The theory of change/programme logic (section 2) outlines the short-term and intermediate steps/measures of success needed to achieve the 2024 goals. These success measures, and how they could be used to measure progress towards impact, are outlined below under each of the goals.

We suggest that Monitoring and Evaluation is formalised within a programme structure and embedded as part of the project team. Building on the work done to date by the design team (outlined below), an evaluation plan will confirm the measures and methods to monitor progress towards outcomes and impact. The monitoring will be budgeted as an activity within this investment area, with the intent that as much as possible is done within the project to build capacity within the team, and to encourage learning and reflection.

Goal 1 – Participation

By 2024 there is increased strength and engagement in the biosecurity network

This will be measured by increased engagement across the network against the start-of-project baseline. Methods of tracking change could include social network analysis (in 2020, and again in 2024); numbers of interactions, and survey/feedback which can be incorporated as part of the engagement plan.

By 2024 there is increased participation by mana whenua in the biosecurity system

This will be measured against a start-of-project baseline. Methods of tracking change include social network analysis (done at the start in 2020 and again in 2024), records of attendance at events and may include collection of qualitative data (e.g. through interviews or other appropriate methods) with Māori involved in the biosecurity system. Associated with this will be increased numbers of mana whenua representation and participation across all sectors of the biosecurity continuum.

A short-term outcome/critical step to achieving successful participation is:

Increased awareness amongst new and existing participants in the biosecurity system of the current, emergent and latent risks (based on the assumption that awareness is often a precursor to involvement and participation).

Goal 2 - Values

By 2024 emerging and latent risks are able to be prioritised

This is be measured against and baseline list of current risks to show the changes over time. Actions taken will also be recorded.

By 2023 decision-makers in the NZ biosecurity system can assess risks based on environmental, social, cultural and economic values.

This can be measured through an interview (or other method e.g. survey) with decision-makers in the NZ biosecurity system. Interviews will ensure that individual mātauranga is protected.

Critical steps to achieving this are:

- Values of threatened species and ecosystems (terrestrial and aquatic) have been captured and ranked at a regional scale

- Taxa 'groupings' can be prioritised based on ranked impact on values of mana whenua and key participants, and the environment
- Framework created that incorporates social and cultural considerations as well as dynamic processes (e.g. climate change, trade) into assessment of risk to Aotearoa's values

Goal 3: Impact

By 2024 regional and central government, and other decision-makers, are using the risk assessment framework to enable better decision making.

This will be measured by evidence of the use of the framework, particularly in policy. A key metric will be the use amongst MPI, regional councils and other decision makers, and how investment is aligned to prioritisation.

Evidence may be through phone interviews (or similar) with selected policy agencies around the use of the framework.

By 2024 there will be an increase in researchers (25% more against 2020 baseline) who will be using framework to prioritise biosecurity research.

This can be measured through direct contact and/or short survey with existing research networks.

By 2022 there is an increased awareness and engagement with framework amongst those who will benefit from the use of the framework (see beneficiaries section).

This will be measured through recording workshop attendance, active participation in co-design, diversity of participants, and through the use of feedback at all events to capture understanding and knowledge. It can also be tracked through web-based usage patterns of prototypes (e.g. on a dummy website).

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