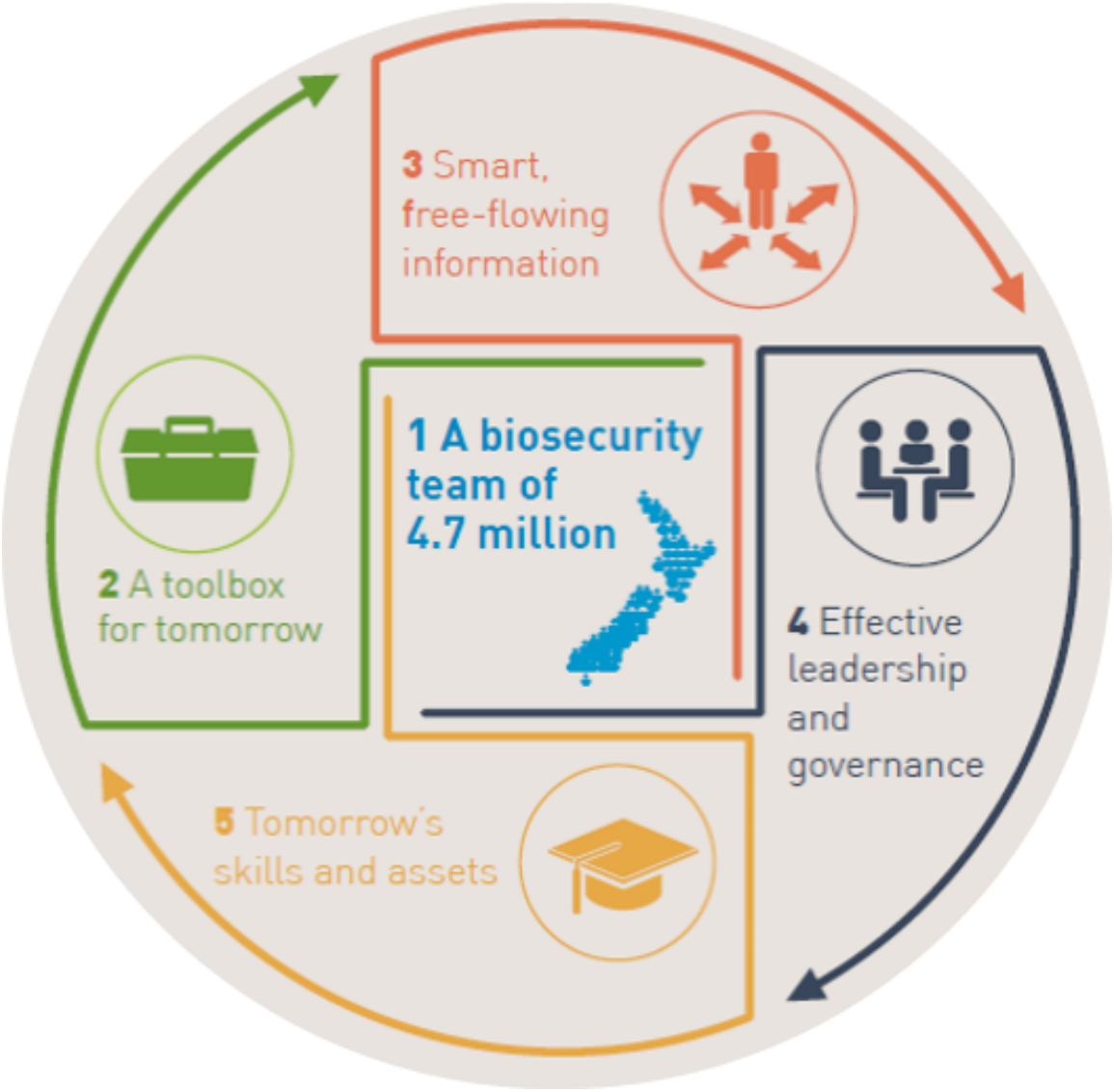
BIOSECURITY 2025



WORK PLAN

Strategic Direction 2

A toolbox for tomorrow

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1. Introduction

Biosecurity is the exclusion, eradication or management of pests and pathogens that pose a risk to the economy, environment, cultural and social values, and human health.

This Action Plan is targeted on ensuring New Zealand has the science and technology it needs to protect New Zealanders, our way of life, our natural and productive resources and our biodiversity from the harmful effects of pests and pathogens.

Science provides the foundation for our evidence-based approach to risk-management. It supports wise decision-making, setting of rules and standards, development of tools to detect or eradicate pests and pathogens, and innovation to solve problems. To get the greatest value from our investment in science for biosecurity, we will ensure it is prioritised to deliver to whole-of-system needs.

A robust evidence-based approach to biosecurity issues will also ensure that we can develop trust with the public at large, individual communities, iwi and hapū, commercial sectors and the wide range of other stakeholders.

Science for biosecurity will incorporate diverse fields of research and knowledge, including social science research and Mātauranga Māori. Stronger connections within the biosecurity-science community, and with other science and technology skill sets, will facilitate greater cooperation, alignment and knowledge-sharing. Stronger links with the wider system will ensure that research outputs are relevant, practical, accessible and timely. This will enable science to have the greatest benefit for biosecurity.

Together we will accelerate innovation to drive smarter, better and more efficient ways of detecting and managing biosecurity risk throughout the system. We will proactively identify and invest in new technology, seek out and adopt innovations from other sectors, and enable the distribution of these new tools across the system.

Improving and making better use of our current tools will drive increased effectiveness. This includes augmenting existing tools with new technologies, and working to make sure the use of biosecurity tools is accepted by the New Zealand public.

Strategic Direction 2: A tool box for tomorrow focused on ensuring our biosecurity system harnesses science and technology to transform the way we do biosecurity.

Development of the workplan

This work plan has been developed by a working group made of people drawn from across the biosecurity system and beyond. The working group met six times between August and November 2017 and worked through a process to identify:

- What success looks like for each of the outcomes identified in the strategic direction statement
- Where the system is currently placed to achieve these outcomes
- What actions are necessary to take for that current state to achieve the described success

Implementation considerations

A number of the initiatives identified in the outline plan are already being undertaken, in part or in full, by participants in the biosecurity system – whether for the purposes of delivering biosecurity system outcomes or for other purposes (for example, the current review of the Biological Heritage National Sciences Challenge funding).

The implementation of this action plan provides context for, and the opportunity to leverage off, these actions, in respect of delivering the outcomes of the Skills and Assets strategic direction for Biosecurity 2025. The incorporation of these existing actions or initiatives within the action plan may also provide an opportunity to

enhance their value beyond their current purpose. Work already planned or underway should continue, and this plan shouldn't prevent anything progressing that is consistent with the vision for 2025.

Social licence underpins biosecurity science and tool development and use

Biosecurity requires the involvement and support (social licence to operate) of individuals and communities to be successful (link to SD1 4.7 million).

Social licence to operate is foremost about relationships and trust. It involves the sequential building of credibility and trust over time with affected communities of interest, and is therefore strongly dependent on the history of past relationships between organisations and communities. This means that social licence for a particular biosecurity tool, for example, is affected by, and must take into account, a much wider range of unrelated aspects. For example, previous interactions with an organisation (or even associated organisations) on different non-related topics will influence views on a particular current topic, such as new tools and their uptake. It is therefore important, when considering the social licence aspects of this document that this holistic influence on social licence is taken into account, and a long-term approach is taken to developing and maintaining the general relationships that underpin social licence to operate for a particular issue.

2. Summary of the Plan

GOAL	OUTCOME	KEY ACTIONS
SCIENCE CURRENT TOOLS NEW TOOLS	**Strategic direction** We have an integrated, forward-looking view of how we access, use and invest in science for the biosecurity system. **Science alignment** Activities and investment in science for biosecurity are prioritised to ensure they are aligned with and deliver to whole-of-system needs. **Science breadth** Science for biosecurity incorporates a breadth of disciplines and diverse fields of research, including social science research, and incorporates Mātauranga Māori. **Science uptake** Research outputs are relevant, practical and accessible; timely and effective use is made of them to benefit the biosecurity system. **Tool efficiency and effectiveness** Value is generated by making more effective use of existing tools. **Application of new technologies** New technologies enhance the effectiveness of new tools. **Social licence** There is social licence to allow the use of biosecurity tools and technologies. **Tools for the workers** Everyone working in biosecurity has smart biological and digital tools available, to maximise efficiency and effectiveness of biosecurity risk management activities. **Tools for participation** Tools are available and well-supported to enable all participants to engage with and contribute to biosecurity in ways that are easy for them. **Tools for monitoring and analysis** Wide deployment of transformational electronic monitoring technologies enables huge advances in New Zealand's capability for early detection and response to pests and diseases.	**Development of a Statement of Research Science and Technology Priorities** **Developing and communicating an integrated Biosecurity Science Plan (BSP)**. This will include: ▪ Identifying all the elements of the biosecurity system (users, beneficiaries, providers, investors, Maori, community), their science and technology needs (incl. application as tools), capabilities and capacity, and the interrelationship and dependencies between these ▪ Incorporating Kaupapa Māori and Mātauranga Māori ▪ Ensuring Maori values are explicitly provided for ▪ Setting science and technology development implementation priorities, incorporating the full breadth of science and technologies ▪ Ensuring science and technology development meets the needs of, and addresses the risks to, the New Zealand environment (terrestrial, fresh-water and marine ecosystems) and the health of our population. ▪ Encouraging public and private investment in science and innovation ▪ A clear process for oversight of the plan including communication, implementation and evaluating progress. **Strengthening science collaboration** through establishing and resourcing a mechanism to: ▪ Share best practice and identify and respond collaboratively to critical issues ▪ Recruit additional scientists and technologists (nationally and internationally) not currently involved in biosecurity science, to address critical biosecurity issues. ▪ Bring together diverse multi-disciplinary teams to tackle critical problems ▪ Facilitate prototyping of novel ideas and approaches from New Zealand start-up companies, and late-stage research from organisations around the world to provide solutions to critical biosecurity issues **Improve/promote science and tool uptake** through: ▪ Identifying and addressing barriers to uptake (including existing technology) ▪ Ensuring there is a strong value proposition for tools and they are cost-effective ▪ Facilitating dialogue on critical social-licence issues and dimensions ▪ Developing guidelines on how to ensure and sustain trust in science and tool development and use ▪ Ensuring tool development and improvement programmes have strong stakeholder engagement built in. ▪ Upgrading the Biosecurity Toolbox to provide an effective platform for sharing science outputs and information about biosecurity management tools and best practice

3. Future state – how we will know if we have made a difference

GOAL: Science

The best science underpins biosecurity through effective coordination, and processes that allow the full value of science to be realised.

OUTCOME	What success would look like
Strategic Direction We have an integrated, forward-looking view of how we access, use and invest in science for the biosecurity system. **Science alignment** Activities and investment in science for biosecurity are prioritised to ensure they are aligned with and deliver to whole-of-system needs.	➢ Science and technology that support the Biosecurity System are well understood, outcome-focused, prioritised and reviewed regularly, to reflect changes in stakeholder needs and new developments in biosecurity science. ➢ Best science capabilities in NZ and internationally are used and focussed on priorities. ➢ Biosecurity science is targeted and funded to meet system needs, and sustained with both near and long-term options. There is greater investment in biosecurity science by both government and industry. ➢ Investment funding is available to investigate, develop and bring new tools to market. ➢ Kaupapa Māori and Mātauranga Māori are integral elements of biosecurity science. ➢ Manawhenua is recognised and provided for [in the context of the Treaty of Waitangi]
Science breadth Science for biosecurity incorporates a breadth of disciplines and diverse fields of research, including social science research, and incorporates Mātauranga Māori.	➢ Capabilities and disciplines are matched to the science needs, ensuring: ▪ Existing disciplines and skills are retained to meet needs and are fit for purpose ▪ New disciplines and skills are being regularly applied in biosecurity science. ➢ Adaptation and re-purposing of science and technology not currently applied to biosecurity problems are conventional approaches to biosecurity issues. ➢ Social licence for undertaking research and application of results is considered from the outset. ➢ Co-innovation is a core means of delivering science and technological solutions for biosecurity problems or issues. ➢ Māori scientists specialise in biosecurity and contribute to the biosecurity system. ➢ Collaborative relationships, both international and national, across institutions and organisations, deliver inter- and trans-disciplinary approaches to problem solving and research.

GOAL: Science

The best science underpins biosecurity through effective coordination, and processes that allow the full value of science to be realised.

OUTCOME	What success would look like
Science uptake Research outputs are relevant, practical and accessible; timely and effective use is made of them to benefit the biosecurity system.	➢ Biosecurity science outputs are widely accessible (available and understandable) to and used by those who need them, e.g. researchers, tool developers, practitioners, managers and decision-makers, industry, communities, iwi and hapū. ➢ Barriers and impediments, including to the uptake and implementation of tools, are routinely overcome through co-innovation, early engagement with Maori, and involvement of all stakeholders. ➢ Research and tool development are outcome-focused, cross and trans-disciplinary, agile, cost-effective, supported by the regulatory environment, and focused on strategic priorities. ➢ Science, technology and Mātauranga Maori contribute to effective biosecurity operations and better and faster decision-making, and support effective monitoring and reporting on outcomes. ➢ Science informs understanding of risk, and risk communication, across the biosecurity system. ➢ Impacts on and benefits to human health are considerations in biosecurity science outputs . ➢ Social science and engagement, including understanding of public perceptions, decisions and choices, ensures successful uptake and implementation of tools. ➢ The skills are available to maximise technological opportunities, and keep improving NZ biosecurity systems. ➢ Clear pathways exist for commercialisation and implementation of science and technology.

GOAL – Current tools

Continuous improvement ensures we get the very best value from biosecurity tools and technologies.

OUTCOME

Tool efficiency and effectiveness

Value is generated by making more effective use of existing tools. This includes:

- Applying new technologies to enhance effectiveness of current tools
- Maintenance of social licence for use of the tools

Application of new technologies

New technologies enhance the effectiveness of new tools.

What success would look like

- Biosecurity tools are more effective and cost effective for end-users across all domains.
- New technologies are applied to minimise negative non-target effects of existing tools, e.g. lures.
- International advances in tool development are imported and adapted to NZ uses.
- Adaptation and re-purposing of science and technology not currently applied to biosecurity problems are conventional approaches to biosecurity issues – engineering, computing, social science, biotechnology, artificial intelligence, complex networks, etc.
- Kaupapa Māori and Mātauranga Māori are core [parts of co-innovation processes] in development of biosecurity tools [as appropriate]
- Integrated application of multiple tools achieves greater effectiveness in management of biosecurity risk.

Social licence

There is social licence to allow the use of biosecurity tools and technologies.

- Social licence for existing and new tools and technology is developed and maintained.
- Early focus on successful adoption of tools through:
  - Recognising and providing for manawhenua
  - Being outcome rather than output-focused
  - Involving the public and specific communities early in decision-making in development, and use, of new technology
  - Having an open, evidence and values-based dialogue on acceptability of tools with those potentially affected, with strong leadership on this
  - Ensuring human health is considered and addressed in risk assessment and communication around the use of new tools and technologies
- Co-innovation is a core means of delivering science and technological solutions for biosecurity problems or issues
- Biosecurity tools can be used with relatively limited opposition across a wide variety of conditions, areas, or incursions

GOAL – New tools

Capitalising on innovation and technology, by proactively seeking out and adopting new tools, transforms the way we do things.

OUTCOME	What success would look like
Tools for the workers Everyone working in biosecurity has smart biological and digital tools available, to maximise efficiency and effectiveness of biosecurity risk management activities.	➢ New cost-effective biosecurity tools are developed that make use of developing and new technologies, such as molecular genetics and bio-engineering. ➢ Rapid identification methods are available to identify high-risk organisms. ➢ A research development pipeline is visible and active, and enables field experience (e.g. border evidence and information) to inform tool development.
Tools for participation Tools are available and well-supported to enable all participants to engage with and contribute to biosecurity in ways that are easy for them.	➢ The New Zealand public feels empowered by being able to use and develop: ▪ Tools available to everyone ▪ Community participation in biosecurity risk management, including initiation and development of tools ➢ Government, industry and research providers value and embrace iwi and hapū engagement, and public participation in biosecurity surveillance, and have systems in place to manage great public input. ➢ Implementation of new tools take into account the impact on Maori values.
Tools for monitoring and analysis Wide deployment of transformational electronic monitoring technologies enables huge advances in New Zealand's capability for early detection and response to pests and diseases.	➢ Real-time and rapid identification methods and tools are readily available and used. ➢ Predictive modelling is used to scan and assess future risks. ➢ There are advanced data analytics, drawing on multiple data sources, to solve complex problems (e.g. pattern recognition, big data analytics). ➢ Tools are available to detect pests, pathogens and asymptomatic hosts. ➢ Investment in development of new tools includes investment in post-deployment efficacy monitoring, acceptance and adoption. ➢ Research and development programmes are in place addressing over-the-horizon pest and pathogen threats (i.e. not yet in NZ). ➢ Greater use is made of tools for managing risks offshore.

4. How we are going to get there

Biosecurity Science Plan

1. **Development of a Statement of Research Science and Technology Priorities** to ensure biosecurity research, science and technology priorities inform wider critical priority setting activities, and decisions being made for science and science investment in 2018 (National Science Challenges midterm reviews, 2019/20 budget, review of various MBIE science investment, e.g. collections)
2. **Development and communication of an integrated Biosecurity Science Plan (BSP)** to identify and deliver against system-wide priorities for science and technology, to strengthen the biosecurity system. This will include:
    - Identifying all the elements of the biosecurity system (users, beneficiaries, providers, investors, Maori, community), their science and technology needs (incl. application as tools), capabilities and capacity, and the interrelationship and dependencies between these
    - Incorporating Kaupapa Māori and Mātauranga Māori
    - Ensuring Maori values are explicitly provided for
    - Acknowledging the needs across all parts of the biosecurity system – pre-border, border and post border
    - Setting science and technology development and implementation priorities incorporating the full breadth of science (e.g. social, biological and technological sciences, etc.)
    - Ensuring science and technology development meets the needs of, and addresses the risks to, the New Zealand environment (terrestrial, fresh-water and marine ecosystems) and the health of our population
    - Influencing public and private investment in research and innovation
    - Clear process for oversight of the plan including communication, implementation and evaluating progress

    The key development steps for the BSP will involve stakeholders working together to:

2.1. Identify the **high level goals and objectives** for science and technology to meet recognised biosecurity system outcomes

2.2. Undertake a **science and technology needs assessment** across the biosecurity system, ensuring coverage of all sectors (government, industry, community, iwi and hapū) and domains (terrestrial, fresh water, marine, human health). This should build on the Biosecurity Science Strategy (2007) and draw on the National Science Challenges, relevant science roadmaps, science provider strategies, the Better Border Biosecurity Strategy and relevant industry and sector strategies and plans

2.3. Identify **critical participants** to deliver science and technology to the biosecurity system including relevant **roles, responsibilities and accountabilities**

2.4. Support **more effective use of the full breadth of existing science and technology**, and future tools. This will require

- Stock-take of critical tools, their function, barriers (including early engagement with Maori social licence), risks to their use, and opportunities to improve or adapt them
- Identifying existing science and technology that is not being used, and determine the barriers to uptake and implementation and ways of overcoming these

2.5. Include **Mātauranga Māori and Kaupapa Māori in the BSP** which will require identification of what is needed to support and/or resource Mātauranga Māori, Kaupapa Māori responsiveness, and Māori values and priorities across the whole of system.

2.6. Foster and draw on international collaborations and working groups, to leverage wider resources and capability for the purposes of improved resilience and sustainability in the provision of science and technology that meets New Zealand biosecurity system needs

3. **Identify and influence available and potential investment in biosecurity science**
    - Undertake a stock-take of available and potential funding and investment avenues for biosecurity science
    - Establish funding or partnership mechanism to support commercialisation of tools at prices that support uptake
    - Communicate science and technology needs and opportunities to science and technology investors and practitioners

4. Establish a group or mechanism to **own and drive** investment and research, science and technology priorities, and implementation of programmes associated with the wider Strategic Direction 2 Workplan

    4.1. Monitor and review the implementation of the Statement of Research Science and Technology Priorities

    4.2. Initiate and oversee the development of the BSP

    4.3. **Regularly review and update the BSP** and its implementation, which will require:
        - Clear roles and responsibilities for the review
        - Tracking progress against agreed actions
        - Understanding existing needs and monitoring changing needs (including emerging and competing risks)
        - Regular environmental scanning of all existing and emerging science capabilities and technologies that could be used in biosecurity
        - Monitoring and evaluating the impact on Maori values
        - Monitoring and evaluating uptake, cost effectiveness and social acceptability of biosecurity tools and knowledge
        - Assessing whether science funding and capability is fit for purpose

    4.4. **Leverage existing collaborative networks** to bring new players into the biosecurity system

Driving innovation through collaboration

5. **Strengthen science collaboration** through establishing and resourcing a mechanism to:
    - Share best practice, and identify and respond collaboratively to critical issues
    - Recruit others with unique expertise (nationally and internationally) not currently involved in biosecurity science, to address critical biosecurity issues
    - Better leverage NZ departmental, iwi and hapū, and science system international relationships, e.g. Centre for Excellence in Biosecurity Risk Analysis (CEBRA)
    - Bring together diverse multi-disciplinary groups (Science + Technologists + Business + Social + Māori + Communities + field workers) to tackle critical problems
    - Facilitate prototyping of novel ideas and approaches from New Zealand start-up companies, and late stage research from organisations around the world, to provide solutions to critical biosecurity issues
    - Proactively embrace new technologies to create automation and increased collaboration, while mitigating biosecurity risk (e.g. detection technologies, AI, blockchain, etc.)

- To work collaboratively with international partners, to understand and develop science and tools to better manage risk offshore

6. Engage with the Royal Society of New Zealand to review and prepare a report on building and sustaining trust in science, technology and tool development, and their use for biosecurity purposes. The review should include but not be limited to:
    - Taking into account lessons learnt from past and current experiences
    - Considering how biosecurity science and technology development ensures that social and cultural values of manawhenua are addressed
    - Assessing the role, importance and nature of engagement and use of participatory process
    - Providing advice on the importance of uptaking and using tools of robust and well-communicated science, defendable evidence and clear value propositions

Science and tool uptake

7. Identify **critical social licence issues and dimensions,** and facilitate an open dialogue or engagement on these (different mechanisms for different issues).
8. Ensure the right skills are available to maximise science and technological opportunities.
9. Develop tools to support effective and faster decision-making.
10. Ensuring tool development and improvement programmes have **strong stakeholder engagement** built in. This could involve:
    - Using a co-innovation framework, e.g. MPI extension framework
    - Building and strengthening partnerships
    - Providing support for grass roots or citizen-led initiatives as appropriate
    - Adopting and implementing **guidelines on how to ensure and sustain trust** in science and tool development and use
11. **Establish Bionet** as an effective platform for sharing research outputs and information about biosecurity management tools and best practice, and to support participation by Māori, agencies, industries and community groups.
    - Develop guidance on the use of current tools for existing and new purposes, including a mechanism to ensure quality assurance of material placed on the platform.
    - Develop mechanisms to reduce barriers and impediments to uptake and implementation of research outputs.
    - Tailor MPI's extension framework as a process to ensure efficient uptake of research outputs.
    - Implement a communications programme that generates 'plain-English' translations of science results.
    - Support the uptake of myrtle rust mobile app.
    - Enable an integrated and coordinated approach to science and investment nationally, that supports prioritisation and uptake of results.

5. Sequencing of key actions

= Activity initiated

= Baselined activity

= Contributing activity under way by third parties

Toolbox for tomorrow	Short term 2018-2019	Med term 2020-2022	Long term 2023-2025
Biosecurity Science Plan			
1. Development of a Statement of Research Science and Technology Priorities	●		
2. Developing and communicating an integrated Biosecurity Science Plan (BSP)		●	
3. Identify available and potential funding	●	●	●
4. Establish a group or mechanism to **own drive and review** investment and research, science and technology priorities	●	●	●
Driving innovation through collaboration			
5. Strengthen science collaboration	●	●	●
6. Engage with the Royal Society of New Zealand to review and prepare a report on building and sustaining trust in science, technology and tool development	●		
Science and tool uptake			
7. Critical social licence issues and dimensions	●		
8. Strong stakeholder engagement	●	●	●
9. Guidelines on how to ensure and sustain trust	●	●	●
10. Sharing research outputs	●	●	●
11. Upgrade the Biosecurity Toolbox	●	●	●

7 Sequencing of key actions

Tomorrow's skills and assets	Near term 2018-2019	Med term 2020-2022	Long term 2023-2025
Implementing the Skills and Assets Action Plan			
1. Establish a group or mechanism to oversee the implementation, regularly review and update the Skills and Assets Action Plan			
Stocktake and Gap analysis			
2. Stock-take and gap analysis of NZ biosecurity infrastructure and systems, biological collections and data bases, and networks			
3. Stock-take and gap analysis of NZ biosecurity capability needs, including assessment of why people are leaving biosecurity			
Capability development plan			
4. Biosecurity-related careers			
a. Establish programme to make accurate and up-to-date information on biosecurity careers available through national and international career information platforms			
5. Biosecurity in education			
5.1 Develop and implement a programme to support biosecurity awareness in early learning, primary and secondary school education, and professional development			
5.2 Improve alignment of tertiary education provision with system needs			
5.3 Develop vocational training and educational pathways to support alternative or non-traditional means of entry into working in the biosecurity system			
6. Training and building capability			
6.1 Establish specific professional recognition processes and certificates			
6.2 Build corporate governance and strategic leadership capability in biosecurity			
6.3 Build biosecurity capability internationally			
6.4 Establish programme to broaden reach of biosecurity training			

Tomorrow's skills and assets	Near term 2018-2019	Med term 2020-2022	Long term 2023-2025
6.5 Establish a business certification system for those businesses operating in biosecurity system (e.g. transporters, diggers, construction, irrigators)			
7 Retaining capability			
7.1 Establish programme to support employers to retain capability and ensure succession			

Capacity development plan

8 Implement programme to improve/enhance use and functionality of existing infrastructure and systems

8.1 Ensure NZ's physical infrastructure and systems are fit for purpose

8.1.1	Update the New Zealand Organism Register and ensure it is resourced and maintained			
8.1.2	Enhance and develop existing biological collections to support biosecurity needs			

6. Targets

- At least $80 million of public and private investment in science for biosecurity, with at least 50% of investment focused on identified critical biosecurity areas.
- Halve the cost of managing a significant established pest. This will be achieved through innovative science, and new tools and approaches to pest management. (Bio 2025 target)
- >80% of NZ biosecurity science publications are translated to understandable format and made available to end-users.
- >90% of end-users surveyed feel they are able to effectively access NZ biosecurity science results and use new knowledge in biosecurity operations.
- End-user surveys indicate >80% are satisfied with progress in biosecurity tool development.