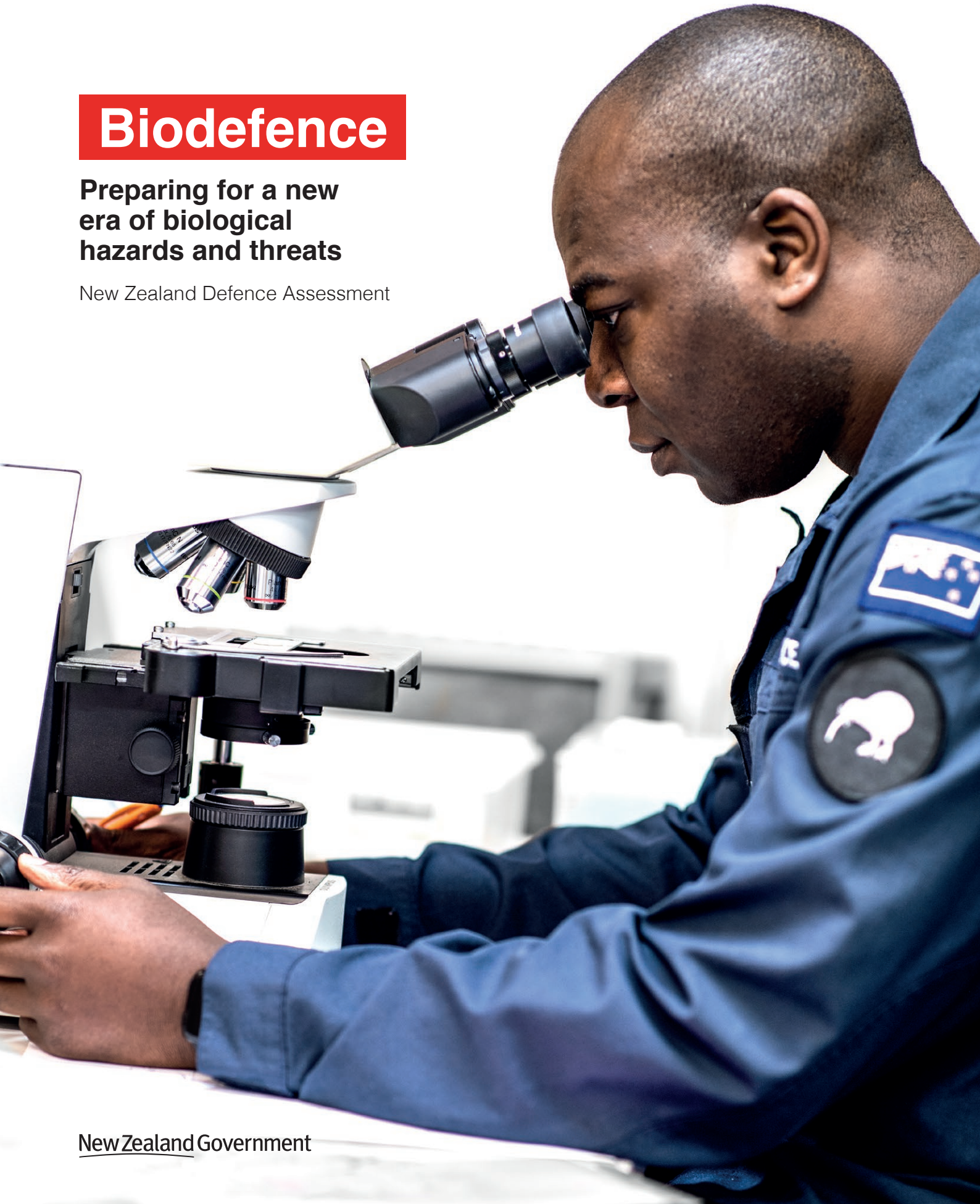
New Zealand
MINISTRY
OF DEFENCE
Manatū Kaupapa Waonga

Biodefence

Preparing for a new era of biological hazards and threats

New Zealand Defence Assessment



New Zealand Government

Exercise Border Health 2018 is a regional inter-agency exercise led by RNZAF Base Auckland and supported by the regional health sector. It is part of ongoing collaboration between border agencies to support the status of Whenuapai Airfield as a designated international point of entry.

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The Ministry of Defence leads Defence Assessments, with support from the Defence Force and other agencies. The Defence Assessment process enables Defence to identify changes in the strategic environment and consider their possible implications for New Zealand's Defence policy and capability. In this assessment, "Defence" refers to both the New Zealand Ministry of Defence and the New Zealand Defence Force.

Biodefence: Preparing for a new era of biological hazards and threats is part of the Ministry of Defence's Defence Assessment programme, which contributes to the defence policy cycle.

Defence works to provide value to New Zealand in our Communities, for our Nation, and in the World. This topic is part of an ongoing work programme to ensure Defence is providing effective support to other Government agencies on missions critical to New Zealand's national security and wellbeing.

September 2020

PRINT: 978-1-98-851519-9
ONLINE: 978-1-98-851518-2

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Cover photo: *FLTLT Victor Ikini is an Environmental Health Officer at RNZAF Base Auckland. Victor looks at a sample under a microscope. 2019.*

Introduction

Key points

- Powerful disrupters, like climate change and advances in biotechnologies, along with the enabling nature of globalisation, are changing the risk profiles of biological hazards and threats.
- Biological hazards and threats may be transmitted environmentally, accidentally, or deliberately. They have the potential for cascading effects, which could adversely affect areas such as our biodiversity, biosecurity, human and animal health, *Te Ao Māori*, and the economy. COVID-19 is an example of the scale of the potential impact.
- The concept of biodefence covers the totality of Defence's role as part of an All-of-Government, "all hazards – all risks" approach to the spectrum of biological hazards and threats. Defence's role supporting and enabling lead agencies is diverse, and varies across the four stages of Reduction, Readiness, Response, and Recovery (4Rs).
- Defence must be flexible in maintaining capability and capacity to support other agencies. Examples of such capability include logistics support, provision of maritime domain awareness, and specialist technical capabilities. As in other areas where Defence operates, concurrent events may challenge the availability of personnel and equipment.

Scope

This Defence Assessment analyses changes in the strategic environment as they relate to biological hazards and threats to New Zealand's security and the security of the wider Pacific region.

The Assessment describes the evolving strategic environment for biological hazards and threats, and outlines potential Defence contributions as part of an All-of-Government response, using the 4Rs framework.

This Assessment does not review other agencies' activities, strategies, or response plans. Nor does it suggest changes to Defence responsibilities, or contain any recommendations for resourcing. This Assessment reinforces the importance of the NZDF's ability to provide critical support to the community and to other Government agency outcomes.

Biodefence In Action

New Zealand Defence's Biodefence Concept

TE AO MĀORI
Led by iwi/Māori

BIODIVERSITY
Led by Department of Conservation

BIOSECURITY
Led by Ministry for Primary Industries

HUMAN HEALTH
Led by Ministry of Health

BIO-CRIME & BIO-TERRORISM
Led by Police and Customs

COUNTERING BIO-AGENTS
Led by Fire and Emergency New Zealand

New Zealand Defence supporting All-of-Government outcomes

BIODEFENCE

Biodefence

1. The Strategic Defence Policy Statement 2018, The Climate Crisis: Defence Readiness and Responsibilities, Advancing Pacific Partnerships, and the Defence Capability Plan 2019 have aligned Defence's role in supporting All-of-Government responses with New Zealand's National Security System.
2. Within New Zealand's "all hazards" approach to managing national security, lead agencies with the primary mandates for managing particular risks are supported by other Government departments and agencies to deliver both business-as-usual activities and to respond to crisis events.

2.1 The Department of Conservation (DOC) leads the protection of New Zealand's biodiversity.[1]

2.2 The Ministry for Primary Industries (MPI) leads New Zealand's biosecurity system, protecting New Zealand from foreign pests and diseases, and regulates the food safety system.[2]

2.3 The Ministry of Health (MOH) leads on pandemics and other events related to human health.

2.4 New Zealand Police, New Zealand Customs, Fire and Emergency New Zealand (FENZ), and the New Zealand Defence Force work together to manage incidents involving chemical, biological, radiological, and explosive (CBRE) agents or weapons.

2.5 The NZDF is responsible for mitigating and managing biological hazards and threats on the Defence estate and during its domestic and international movements, and supporting All-of-Government responses.

[1] The New Zealand Biodiversity Strategy 2000 – 2020 (Department of Conservation).

[2] Biosecurity 2025 Direction Statement 2016 (Ministry for Primary Industries).

The Changing Strategic Environment

Department of Conservation staff and their dogs carry out an inspection of HMNZS Wellington before her departure to Raoul Island. 2019.

3. New Zealand's wellbeing, economy, way of life and biodiversity are all subject to biological hazards and threats that can cause both immediate harm and wide-ranging consequences.

4. Biological hazards and threats may also have a broad range of impacts on *Te Ao Māori*. *Te Ao Māori* is unique to Māoridom and is protected under the Treaty of Waitangi. Treaty partners, which includes Defence, must act in goodwill when assisting with biological incidents that impact *Te Ao Māori*.

5. Disrupters such as climate change and rapid advances in biotechnology are changing how biological hazards and threats may manifest through the natural environment, accidents, and deliberate acts. As a result, the NZDF may be called upon more frequently to assist with a broader range of biological incidents both domestically and regionally.

Environmental vectors

6. Climate change will have increasingly complex environmental, whole-of-society, and strategic implications. Direct impacts include rising global temperatures, changing weather patterns, and increasing frequency of severe weather events. Although these impacts will vary regionally, the consequences are global.

7. For New Zealand and the Pacific, the impact of climate change on the environment will be particularly important. Many indigenous communities and nations across the region rely on the ocean to provide food and economic wellbeing. Warmer oceans due to climate change will be more vulnerable to invasive species, and fish stocks will migrate into new areas, including previously isolated regions such as Antarctica and the Southern Ocean. This will affect biodiversity and present new risks to security. New invasive species on land could disrupt a range of ecosystems, and could be particularly dramatic where monocultures are present, such as New Zealand's reliance on ryegrass for animal feed or *Pinus radiata* for commercial forestry plantations.

8. Climate change will also expand the geographic reach of disease vectors such as disease-carrying mosquitoes. These changes may have implications for broader populations as well as NZDF personnel, whose operational effectiveness may be impacted by heightened risk of disease, including during offshore deployments. Plants and animals will also be exposed to intensified risk of disease due to expanded disease vectors.

Accidental vectors

9. Globalisation has enabled greater connections both regionally and globally, bringing both positive and negative implications.

10. Increasing international connectivity – within the Pacific region in particular – and increased trade volumes and tourism can contribute to the proliferation of pests, diseases such as measles and COVID-19, and instances of bio-contamination such as bio-fouling. These risks are compounded by resource competition, inadequate infrastructure (such as ports that are not equipped for increased volumes), evolving security challenges, or weak public health systems.

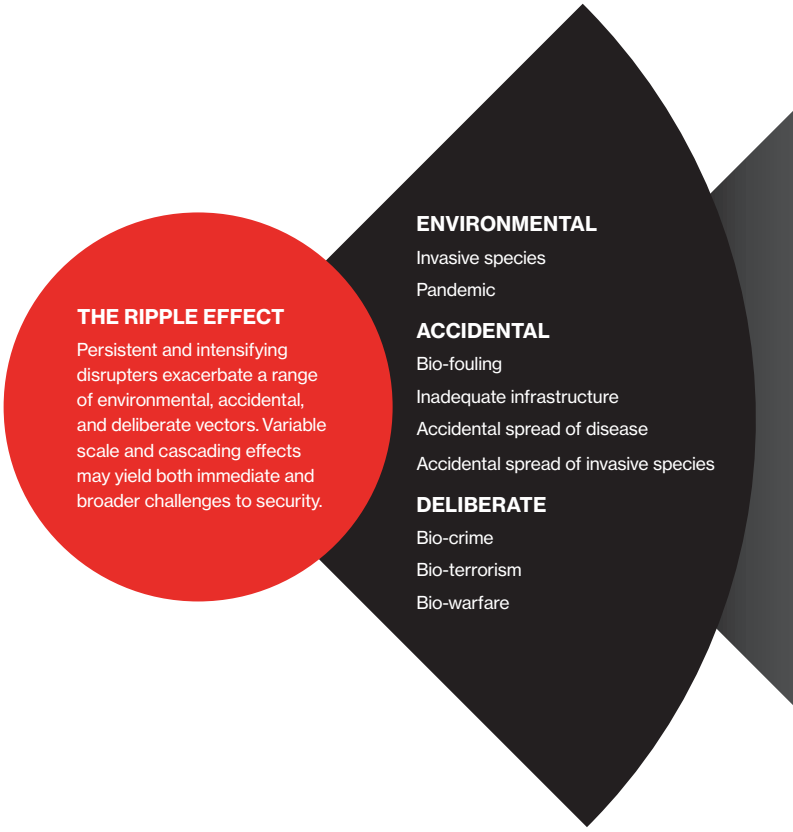
In 2017, an external actor illegally brought a banned shipment of gravel into Vanuatu, which raised concerns about foot and mouth disease contamination. Although this incident did not result in the disease being introduced to Vanuatu, it highlights the potential risks to regional economies from accidental vectors for biological hazards.

11. Further unintended consequences may arise from a range of biological activities regardless of intent. These activities could include pest control, sub-standard animal and plant handling, gene editing (such as genetically modifying organisms and biological engineering), and poor laboratory containment practices.

Ballast water is carried by ships to assist with stability and manoeuvrability. In January 1991, 10,000 people died in Peru as a result of a deadly cholera epidemic due to the dumping of ballast water carrying a new strain of the disease. Globalisation, and more specifically, the increase in global trade and expansion of ports of origin, have increased the risk of a similar event occurring elsewhere.

In 2000, *Gymnodinium catenatum*, a microalgae of uncertain origin, bloomed in Manukau Harbour causing the largest toxic algal bloom seen in New Zealand. This bloom resulted in the closure of shellfish and mussel farming along 1500 km of coastline for nine months.

The Ripple Effect: Cascading implications of causal vectors



Deliberate vectors

12. The security and wellbeing of New Zealand or other states can be seriously compromised by deliberate acts. These include the release of an invasive species into crops or other ecosystems; engineering a disease to infect a population; using a biological agent to compromise water security; or contamination of food supply chains. The capabilities to undertake these types of acts are increasingly available to both state and non-state actors.
13. The barriers to employing emerging bio-relevant technologies such as synthetic biology, gene editing, and artificial intelligence are becoming lower which, among other effects, has resulted in the rise of grassroots "biohackers". This increases the potential for biological threats to emerge from hostile actors, such as violent extremist groups.
14. There is a risk of individuals or groups using biological agents for extremist purposes. The United States Centres for Disease Control and Prevention notes the ease with which *Bacillus anthracis* (anthrax) can be used as a biological weapon. In 2001, five people died in the US after letters containing anthrax were sent through the US postal service. German authorities have disrupted more recent attempts to create biological weapons. In 2018 police arrested two suspected extremist-inspired individuals who were preparing ricin for a biological bomb attack. Authorities were alerted when the couple purchased 3,300 castor beans online from which to distil the biotoxin.

15. Other trends, such as increasing antibiotic and pesticide resistance, as well as the use of misinformation by a range of actors, will continue to challenge New Zealand's biosecurity and health systems.
16. The ripple diagram above illustrates that disrupters do not work independently. Rather, the impacts of these disrupters are most pronounced where they are exacerbated by others. For example, climate change will accelerate the geographic reach of disease-carrying vectors, such as mosquitoes, while globalisation will exacerbate their spread between populations. Furthermore, urbanisation is likely to expose greater numbers of people in already densely populated areas to risk, which may further challenge health systems.

In 1997 a Czech strain of Rabbit Haemorrhagic Disease Virus (RHDV1) was illegally spread in parts of New Zealand's South Island to control wild rabbit populations. The virus initially caused a fast and large drop in rabbit numbers. Due to ineffective use of the disease, rabbits have now become increasingly immune to the virus. In 2017, Canadian university researchers resurrected Horsepox, a disease that had been absent in nature for decades, and published their methodology for doing so.

Biodefence: Defence Contributions

Exercise Border Health 2018 is a regional inter-agency exercise led by RNZAF Base Auckland and supported by the regional health sector. It is part of the ongoing collaboration between border agencies to support the status of Whenuapai Airfield as a designated international point of entry.

17. In this complex and interdependent context, Defence plays an important role supporting and enabling agencies to reduce, be ready for, respond to, and recover from biological hazards and threats. This includes the provision of personnel, transport, assistance with planning, and other logistics.

Reduction

18. The NZDF seeks to be a responsible actor both at home and abroad, operating in ways that seek to mitigate risks from biological hazards and threats. The NZDF adheres to strict biosecurity practices such as reporting biofouling and removing bio-contaminants from equipment, vehicles, and other kit when travelling around New Zealand and between international destinations.

19. Defence bases at Devonport, Whenuapai, and Ōhakea must maintain both biosecurity and border health surveillance under the International Health Regulations (2005) set by the World Health Organisation to help mitigate and control public health crises.

20. The Royal New Zealand Navy has upgraded its underwater antifoul coating systems to mitigate biofouling. Dry-dock facilities allow for hulls of ships to be progressively cleaned, while wash downs and insect traps assist with managing the potential incursion of foreign insects.

21. Defence supports the Ministry for Primary Industries and Customs by providing naval and air capabilities to assist with patrolling for potential biosecurity incursions offshore.

22. Defence engages with New Zealand's Pacific partners to contribute to robust security architectures. This could extend to advice on best biosecurity practices that enhance resilience to biological hazards and threats across the region.

23. Defence also assesses the health threats in regions where NZDF personnel will be deployed. This ensures that the appropriate education and vaccinations can be provided, but also supports broader understanding of emerging hazards.

Readiness

24. The NZDF has the unique capacity to provide operational and logistical support to a range of Government operational plans, including MPI's *Foot and Mouth Disease Response and Recovery Plan*[3], and the Ministry of Health's *New Zealand Influenza Pandemic plan: A Framework for Action*[4].

25. Alongside planning, Defence participates in regular national exercises to practice responses to a range of events. This includes foot and mouth disease, pandemics, and bio-terrorism.

26. The NZDF assists New Zealand's biodiversity and biosecurity efforts on Raoul Island in the Kermadec Islands, and in Antarctica. The transport of Government staff, scientists, equipment, and other supplies has advanced the work of the Department of Conservation (DOC), as well as agencies such as GNS Science, MetService, and the Sir Peter Blake Trust. The support provided by the NZDF has enabled these agencies to study and protect local environments.

27. The NZDF's Explosive Ordnance Disposal (EOD) capability is critical to dealing with CBRE threats, including those involving the use of biological materials. Defence capabilities can identify and render safe such materials, and provide force protection to the wider response force in the event of biological warfare.

28. Internationally, the NZDF's ability to identify and address CBRE threats is particularly important for Defence personnel deployed in environments where there is a risk of CBRE agents being used. This capability also provides scope for potentially significant niche contributions to coalition operations.

29. NZDF operations also play an important role in assisting New Zealand's Pacific partners to identify and deal with potential biological hazards and threats. For example, in 2015 Operation Catalina saw a NZDF P-3K2 Orion assist Fiji with maritime surveillance, which included looking for potential biosecurity concerns.

[3] Foot and Mouth Disease Response and Recovery Plan (Biosecurity New Zealand).

[4] New Zealand Influenza Pandemic Plan: A Framework for Action (Ministry of Health).

30. Planned investments in capabilities, including new aircraft and an enhanced maritime awareness capability, will improve the assistance Defence can provide to Government agencies in achieving their strategic goals.
31. The planned investment in a Southern Ocean Patrol Vessel (SOPV) would better support the sustainability of marine resources in the Southern Ocean and New Zealand's Exclusive Economic Zone.
32. The planned increase in Army personnel will allow Defence to better respond to a greater range of events, including concurrent events and those involving biological hazards and threats. The NZDF can support government agencies while maintaining its ability to be combat-capable, flexible, and ready.

Response and recovery

33. The NZDF's capabilities have provided a critical logistical role during the measles epidemic in Samoa. As part of an All-of-Government response, a Royal New Zealand Air Force Hercules delivered critical supplies, including 50,000 measles and rubella vaccines from Fiji to Samoa, as well as 2.7 tonnes of medical stores.
34. Defence has assisted MPI with the response to Kauri dieback disease, and provided space for portable labs at the Devonport Naval Base during the 2019 fruit fly response.
35. The NZDF provided a range of personnel at all levels to support different elements of the COVID-19 response, while making contingency preparations in case the situation deteriorated significantly. The NZDF's role during New Zealand's initial COVID-19 response is outlined in the case study on page 10.
36. The NZDF has the ability to support lead agencies in responding to biological dispersal devices, explosive CBRE ordnance, and biological warfare as part of an All-of-Government response.
37. Domestically, Police would lead in the event of a bio-terror incident, and FENZ would lead in an event concerning hazardous materials. The NZDF's capabilities could provide niche services, such as rendering safe dispersal devices, decontamination for personnel and equipment during and after a CBRE event.

Alongside the acquisition of the P-8A aircraft, which will enable New Zealand to continue to carry out a wide range of surveillance operations independently, any further air surveillance capabilities will enhance All-of-Government maritime domain awareness in New Zealand and the Southern Ocean supporting agencies such as DOC and MPI, among others.

CASE STUDY

New Zealand and the initial response to the COVID-19 pandemic

The COVID-19 pandemic is a powerful example of a biological hazard that has had profound impacts globally on our strategic environment and on New Zealand itself. This case study looks at COVID-19 within the Biodefence "ripple effect diagram" (see page 6) as an environmental vector exacerbated by globalisation. The case study also outlines the support provided by Defence during initial stages of the COVID-19 crisis.

It is assessed that COVID-19 naturally originated from an animal and was then transmitted to humans, as an environmental vector. The characteristics of the virus (its incubation period, potential to be asymptomatic, and rate of infection) made internationally mobile humans a highly effective catalyst for the accidental spread of COVID-19. Its rapid spread highlighted inadequacies within state health infrastructures as health systems globally have been challenged by unprecedented demands at unprecedented speed. This confluence of environmental and accidental vectors has resulted in the global spread of COVID-19, which has then produced cascading health, social, economic and political impacts.

In keeping with its national security policies, the New Zealand Government has taken an "all-hazards, all-risks" approach to fighting COVID-19 and its complex implications. This includes restricting movement in and out of New Zealand, physical distancing measures, and the temporary closure of non-essential businesses. This has required an All-of-Government response, with the NZDF playing a critical supporting role to other agencies as part of this response.

In the first instance, at least 718 NZDF personnel assisted Government agencies with strategic planning, intelligence, logistics, and operational coordination in the first few months of the pandemic. Domestically, the NZDF:

- provided support to isolation and quarantine facilities in Auckland, Wellington and Christchurch;
- provided the defence estate in Whangaparaoa as a quarantine site;
- supported port operations;
- provided advice and assistance with personal protective equipment (PPE) supply chain planning and management;
- embedded eighty personnel in All-of-Government response centres, while others packed and distributed care packages in Manawatu;
- conducted an aerial surveillance flight of recreational craft in Auckland for NZ Police with a P-3K2 Orion aircraft;
- provided logistic support for acquiring domestic PPE;
- retrieved DOC staff from Raoul Island in the Kermadec Islands with HMNZS Canterbury;
- provided Defence Technology Agency scientists to sit on working groups with our security partners that focussed on COVID-19, staying apprised of and sharing scientific developments; and
- maintained additional personnel at a heightened state of readiness.

Defence concurrently assisted Pacific Island countries in response to Tropical Cyclone Harold, through delivery of essential equipment and supplies. These deliveries required additional safety measures (such as the use of PPE, disinfecting cargo, and having personnel self-isolate) to mitigate the risk of COVID-19 entering the Pacific. RNZAF aircraft were used to repatriate New Zealand citizens from the Pacific and to assist Pacific nationals to return home, as a result of the combined impact of COVID-19 and Tropical Cyclone Harold, which also required additional safety measures with health officials in New Zealand.

These examples were just some of the support that took place in the context of a coherent, All-of-Government response to the pandemic. Where security, wellbeing or logistics stresses to the response change, the NZDF maintains the capability to provide appropriate support, such as trained personnel and specialist equipment, at a speed and scale which is not available to the rest of Government.

Ngā kaitiaki: Māori me Te Ope Kātua o Aotearoa
The Guardians: Māori and Defence

Vice Chief of Defence Force Air Vice-Marshal Tony Davies names and releases Kiwis with Department of Conservation and Ngāi Tai representatives on Motutapu Island. 2018.

38. Māori are partners with the Crown in addressing biological hazards and threats, and hold important local and indigenous knowledge that can assist in detecting and responding to biological incidents.

39. Within *Te Ao Māori*, biological incidents could severely harm *taonga* (anything treasured whether cultural, social, or physical including the Māori economy), *whenua* (land), *moana* (marine and fresh water resources), and traditional practices that are integral to Māori culture. Māori are *kaitiaki* (guardians) of the environment, as well as the elements above.

40. As part of response and recovery to a crisis, Māori have opened *marae* (grounds) to shelter and feed those in need, and to provide space for first responders and other Government agencies, such as the NZDF, to operate.

41. Māori wardens have acted to maintain order, provide security and act as facilitators between Māori and non-Māori.

42. Defence will continue to build relationships and engage with Māori communities, and to include Māori when responding to biological incidents. This could include through communication, planning, and joint decision making, particularly if the incident concerns Māori land and people, and areas of biodiversity and our biosecurity system.

Implications for Defence

Medics undergo Chemical/Biological/Radiological (CBR) Casualty Rescue training at Linton Military Camp. 2018.

43. New Zealand Government agencies will continue to call upon Defence as an important contributor to the All-of-Government response to biological hazards and threats.

44. Defence cooperation with domestic agencies and international partners will be critical when supporting biodefence activities.

45. Defence engagement and collaboration with Pacific partners on biodefence-related issues would be a valuable contribution to New Zealand's Pacific responsibilities. Engaging with partners in the wider Pacific enables Defence to enhance its contribution to the security of New Zealand's neighbourhood, in line with New Zealand's Pacific, Antarctic, and Southern Ocean responsibilities.

46. For the protection of Defence personnel deployed overseas, Defence will need to remain up to date on existing and emerging environmental health threats.

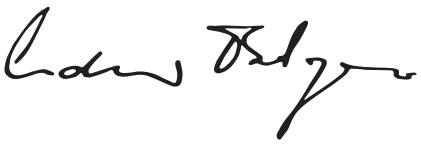
47. NZDF personnel are likely to be deployed in areas around the world where there is an increased likelihood of CBRE agent use. Defence, and particularly EOD personnel, must continue to maintain an appropriate level of capability to operate effectively in environments where there is a risk of CBRE agents used by state and/or non-state actors. Defence will need to continue to ensure that force protection measures, training, and equipment remain appropriate to counter current and potential CBRE threats. As biodefence threats evolve Defence capabilities that can contribute to domestic All-of-Government biodefence related challenges will also advance.

Conclusion

48. This Assessment will contribute to All-of-Government understanding of the full range of biological hazards and threats and their transmission, as well as their potential impacts on the security of New Zealand and our region.

49. NZDF makes two unique contributions to national emergency response in a crisis. The first is the specialist capabilities NZDF maintains such as the Explosive Ordnance Disposal capability. The second is the maintenance of contingent deployable capabilities that can provide valuable assistance to other Government agencies when called upon.

50. In a changing strategic environment, Defence must maintain its preparedness to support other Government agencies in reducing, readying for, responding to, and recovering from biological hazards and threats.



ANDREW BRIDGMAN
Secretary of Defence

Defence supports a range of existing strategies and response plans led by other agencies that aim to protect New Zealand from biological hazards and threats. Recently announced procurements and capability investments will further improve the support that the Defence Force can provide.

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AND AIR FORCE