

# Working Together to Protect Australia in the Age of Pandemics

Managing the Environmental Drivers of  
Zoonotic Disease Risks

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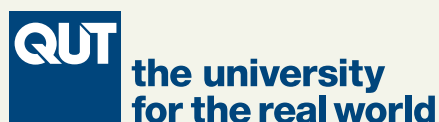
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A Policy Brief prepared for the  
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**The COVID-19 pandemic has infiltrated every level of social, cultural and political life and has demonstrated the truly devastating effects of ineffective pandemic management systems. Yet, the likelihood of another pandemic occurring in the short to medium term is greater than ever. The drivers of pandemics are not improving. Anthropogenic drivers, including agricultural intensification, land-use changes such as deforestation and urbanisation, wildlife trade, and climate change are all contributing to what has been called the ‘era of pandemics’.<sup>1</sup>**

This report contains key findings and research around pandemic prevention and zoonotic disease risk management. A **zoonotic disease** requires the transmission of a pathogen from an animal to a human host. A **pandemic** is the worldwide spread of a new disease (whether from a zoonotic source or otherwise). This is to be compared with an **epidemic**, which is the wide-ranging spread of a disease throughout an area or community where it’s not permanently prevalent. The permanent prevalence of a disease makes it **endemic**. This report is focused both on the prevention of zoonotic diseases that can cause pandemics, but also zoonotic diseases that can cause localised instances of illness, as well as regional and country-wide epidemics. The chance of a zoonotic disease causing a pandemic is much less likely than a zoonotic disease causing localised instances of illness or an epidemic. However, it is worth noting that any policy or intervention that seeks to address the drivers of zoonotic disease spillover events (when a disease pathogen passes from an animal to a human host), such policy or intervention would also be addressing, or need to consider the larger and other drivers of pandemics (such as global travel and trade, anti-microbial resistance etc), and other wider concerns such as environmental health, societal inequality and general public health. All of these things are interconnected, and so while this report is more narrowly focused on zoonotic disease prevention, it must be read and understood within this larger integrated system.

Further, while other reports take a global view of the drivers of pandemics and zoonotic disease this report is focused on the Australian context. Australia has long been a leader in biosecurity and pandemic/zoonotic disease risk management is the next frontier of focus. This report makes recommendations to ensure that Australia remains a global leader in the biosecurity space, while also demonstrating leadership in the relatively new area of ‘One Health’. One Health is a policy framework that recognises human health is inherently connected to animal and ecosystem health (including plant and marine biodiversity health), and that these three realms of health need to be given equal consideration in public health decision-making. A clearly defined and integrated One Health approach can provide the basis to effectively manage pandemic risk while increasing health and wellbeing across human communities, non-human species and broader ecosystems. The Australian federal system is well placed to adopt an overarching One Health governance system, due to the combined Department of Agriculture, Water and the Environment already making inroads in collaborative approaches with their colleagues in the Health and Foreign Affairs Departments.

## KEY FINDINGS OF THE REPORT INCLUDE:

- 1** There is a sufficient scientific basis to connect **zoonotic spillover** and pandemics to **anthropogenic environmental changes**, including land-use change, agricultural intensification, wildlife trade and climate change. As such, the precautionary principle dictates that we should be reducing pandemic risk by addressing these drivers.
- 2** There are **social, economic and environmental imperatives** to managing pandemic/zoonotic disease risk in Australia and collaborating with our regional neighbours with their own **risk management strategies**.
- 3** Australia has a large role to play in reducing the risk of future pandemics. In addition to known notifiable diseases, Australia has also been a source of emerging novel zoonoses, including Hendra virus, Menangle virus, Australian bat lyssavirus and Buruli ulcer. There are also many 'unknowns' in pandemic risk, due to a lack of research and funding in various spaces including wildlife health, pest/invasive species management, and companion animals. Additionally, Australia is in a position to collaborate with its neighbours in the **Indo-Pacific region** and more widely, where rapid land-use change and urbanisation are leading to an increased risk of disease spillover.
- 4** **One Health framework** (i.e., one that links animal, human and environmental/ecosystem health sectors, and research), partnered with **Indigenous Healthy Country principles**, is the most appropriate way for Australian governance regimes to manage pandemic risk. Australia has been a leader in biosecurity and has recognised the value of being a reputable producer of safe food, plants and livestock. A rigorous pandemic risk management regime, centred on One Health/Healthy Country, is the next step in this leadership.
- 5** Australia needs a national **One Health Governing Body**. Australia currently has a **fragmented One Health system** and is currently the only OECD country without a national multidisciplinary body focused on disease prevention, investigation and control. **Current strengths** in One Health policy and practice include national and international biosecurity and food production.
- 6** **There are three key gaps in Australia's existing One Health policies.**
  - a** The first is limited engagement with **Indigenous communities**. Indigenous people hold around 40% of Australia's landmass and are responsible for many 'on the ground' One Health related strategies. Indigenous land and sea management practices are associated with improved biosecurity, weed and non-native animal control, general conservation of threatened species, improved fire management, and lower greenhouse gas emissions. Indigenous communities are integral to an effective One Health system and need to be included in its leadership, governance, design, implementation and monitoring.
  - b** The second is limited engagement with the **environmental** sector to support ecosystem health. One Health

involves a triad of health concerns, but largely, only animal and human health are considered in existing One Health policies. Collaborative and intersectoral management of pandemic risk that considers all three pillars of One Health equally is essential to ensure not only national responsiveness to emerging zoonotic diseases but global leadership in this area.

- c** The third is a lack of engagement with the **social sciences**. A One Health system needs to ensure **multispecies wellbeing** and **justice** across groups, communities and species, and these criteria go beyond the hard sciences. Social science research and engagement are required to determine the most effective methods for collaboration, systems thinking, behaviour change, communication, education, and bipartisan political support.

- 7** To meet these and other gaps, Australian decision-makers should take steps to implement a **One Health/Healthy Country pandemic risk management strategy** that is based on **strong local values and science**, including Indigenous ‘Caring for Country’ values, systems and long-term thinking, collaboration, honesty and transparency, justice, and multispecies wellbeing. Such a ‘framework’ approach enables localised responses to global issues that require multifaceted policies and coordination of a variety of specialised, technical and controversial areas.

- 8** Implementing such a framework into **laws and policies** will require both top-down and bottom-up policies, from the international to the local scale. Examples of relevant laws and policies include Local Decision-Making for Indigenous communities, incorporating pandemic risk into land-use and development planning documents via Environmental and Health Impact Assessments, and redirection of economic incentives towards incentivising positive action for biodiversity management, such as species or ecosystem restoration.

- 9** Any pandemic risk management strategy must be supported by **strong, interdisciplinary research**. A One Health research program should be established (or extended from within the Department of Agriculture, Water and the Environment (DAWE)’s existing foresighting groups) to fill existing gaps in zoonotic risks identification in Australian wildlife, livestock and companion animals, as well as invasive species. Further research is also required on the environmental drivers of disease spillover such as climate change and deforestation. From a social science perspective, research is required on consumer behaviour, communication methods and benefits of existing and proposed One Health policies, to name just a few. Such a research program should be focused on outcomes, not outputs, and be well-funded through a new scheme that crosses the medical, veterinary and ecosystem health disciplines.

# 1 Introduction and scope of this report

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**The world is still amid a pandemic that has had the most destructive economic and social effects in recent history. SARS-CoV-2 (the virus that causes the disease COVID-19) has been described as ‘the 21st century’s Chernobyl moment’.<sup>2</sup> While the medical, social and economic responses to this pandemic continue to be of the utmost importance, this report suggests that Australian law and policymakers should also be prioritising pandemic/zoonotic disease risk management to reduce the risks of a crisis of this magnitude in the future.**

In recent years, pandemic risk management has primarily been concerned with animal health and epidemiology. Most pandemics of the last century have arisen from potentially pathogenic microbes that have crossed from animals to people (zoonoses). Alarming, the rates of potential pathogens and zoonotic transmission (known as spillover) are increasing. The frequency of infectious diseases with epidemic potential has increased four-fold in the past six decades, while the number of detected zoonotic disease outbreaks has more than tripled in the last decade.<sup>3</sup> Critically, if action is not taken to prevent spillover events, there remains vast potential for future zoonotic disease spillover. Indeed, there are an estimated 1.7 million currently undiscovered viruses existing within mammalian and avian hosts globally, up to 850,000 of which are estimated to have the capacity to infect humans and cause local disease outbreaks, an epidemic or even another pandemic.<sup>4</sup> Scientists have been warning for decades of an ‘era of pandemics’, and COVID-19 is unlikely to be the only pandemic in our lifetime unless action is taken to reduce their drivers.<sup>5</sup>

In October 2020, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) released a Workshop Report on Biodiversity and Pandemics that found:

**Without preventative strategies, pandemics will emerge more often, spread more rapidly, kill more people, and affect the global economy with more devastating impact than ever before.**

Although pandemic management and recovery are critical to responding to the immediate pandemic, there is also an urgent and largely overlooked need to start working now to integrate science into policy and practice, to help understand and address the drivers of disease emergence and pandemic potential, and to inform prevention policies. Pandemic prevention via zoonotic disease risk management is an under-discussed area and therefore, it is the focus of this report. It is under-discussed because the types of preventative strategies required are not simple. They require transformation of pandemic policies from response to prevention, via enabling policies that focus on the interrelated health of humans, animals and the environment. These types of ‘One Health’ policies have the potential to reduce the economic activities and types of consumption and trade that require agricultural expansion and environmental destruction, that in turn drives disease emergence and spread. Australia has the opportunity to further develop its role as a global leader in pandemic prevention policy and has the knowledge and resources to do so. In this report, we show where Australian One Health and pandemic risk management policy is now, where we want it to be, and how to get it there.



## 1.1 The background to this report

This report is the result of wide collaboration between the authors, government, NGOs and inter-disciplinary experts who participated in a series of workshops in June/July 2021, facilitated by Queensland University of Technology and Craig Salt from Sustainable Consulting (all participants are listed in Appendix A). During those workshops, the participants designed a 'blueprint' for pandemic risk management in Australia and beyond (Appendix B). This report explains that blueprint.

In preparing this report, we note that other organisations and researchers are concentrating on pandemics through a public health lens, such as the proposed Victorian-based Australian Institute for Infectious Disease, but in this report we focus on pandemic prevention and risk management, and the steps required to bring Australia to the forefront of One Health law and policy. We make key recommendations concerning the creation of a Federal One Health System that sits across all government departments and portfolios and is partnered with state governments, industry and communities.

## 1.2 International responses to COVID-19

Various organisations at the international level have made recommendations for transformative change concerning pandemic risk prevention, preparation and response. These calls have been prevalent long before the threat of COVID-19 became apparent. Since the 2009 H1N1 influenza pandemic, at least 11 high-level panels and commissions have made specific recommendations in 16 reports to improve global pandemic preparedness.<sup>6</sup> Although most recommendations contained in these reports have never been implemented, the number of pandemic-related 'expert panels'

has increased since the onset of the COVID-19 pandemic and recommendations continue. These include the One Health High-Level Expert Panel,<sup>7</sup> the Independent Panel for Pandemic Preparedness and Response<sup>8</sup>, the Preventing Zoonotic Disease Emergence Initiative (PREZODE),<sup>9</sup> and the Harvard International Scientific Task Force to Prevent Pandemics at the Source.<sup>10</sup> There are also ongoing discussions surrounding a Pandemic Treaty, and countless reports from international organisations such as the World Health Organisation (WHO),<sup>11</sup> the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES),<sup>12</sup> and the World Organisation for Animal Health (OIE).<sup>13</sup>

## 1.3 One Health

One common policy recommendation to emerge from those numerous reports and panels is the integration of a 'One Health' framework in domestic systems. The One Health framework typically asks policymakers and practitioners to consider human, animal and environmental/ecosystem health as interconnected when making decisions regarding public health. The framework has been particularly useful for policy regarding monitoring and detection of potential zoonoses, and for directing actions once an emergent pathogen that has zoonotic potential is discovered or has infected people.

Although the definition of the One Health approach differs between institutions and users, the One Health High-Level Expert Panel has recently defined it as:

**One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.<sup>14</sup>**

In this report we suggest ways that the One Health framework can be utilised to

greater effect, to set policy for pandemic risk management in the Australian domestic system and support our global neighbours. We recommend that One Health be viewed as a problem-solving framework and value proposition, under which more specific policies are defined and implemented.

## 1.4 Pandemic risk prevention policy in Australia: the need for a comprehensive review

Australia has a large role to play in reducing the risk of future pandemics, notwithstanding the spillover events of recent pandemics originating elsewhere. Australia has an extensive list of notifiable animal diseases,<sup>15</sup> there are many 'unknowns' due to a lack of research and funding in various spaces including wildlife health, pest/invasive species management, and companion animals. Additionally, Australia is in a position to collaborate with its neighbours in the Indo-Pacific region and more widely, where rapid land-use change and urbanisation are leading to an increased risk of disease spillover.

Australia has been a leader in recent decades<sup>16</sup> and has recognised the value of being a reputable and reliable producer of safe food, plants and livestock. A rigorous pandemic risk management regime, centred on One Health, is the next step in this leadership.

We have already seen a move towards a One Health framework in certain areas across Australian jurisdictions. Australia's obligations under international law are also pushing this move. There is an increasing social, economic and environmental imperative to move towards a holistic One Health framework that considers pandemic risk prevention as a primary concern.

### 1.4.1 The social imperative

Pandemics are threat multipliers, amplifying existing vulnerabilities and resulting in unequal impacts for different nations and communities. For example, the elderly experience different physiological vulnerabilities to the COVID-19 pandemic, while the economic impacts were experienced most severely by those from low socioeconomic backgrounds, women and Indigenous Peoples.<sup>17</sup> In Australia, the pandemic has exacerbated trends that were emerging before COVID-19, including higher levels of unemployment, poverty and psychological distress for the disadvantaged.<sup>18</sup>

Australia's Indigenous people are particularly susceptible to the virus and the social inequities it is exacerbating. Aboriginal People in central Australia, for example, experienced COVID-19 rates five times higher than the non-Indigenous population early in the pandemic.<sup>19</sup> Additionally, Indigenous communities experience other challenges compared with non-Indigenous communities, such as vaccine and medical accessibility.<sup>20</sup>

Finally, other pre-pandemic social trends (such as reducing trust in government and science, large corporate influence over values and attitudes, vaccine hesitancy etc.) influence pandemic preparedness and response.<sup>21</sup> Overall, COVID-19 has highlighted the fact that pandemics are not only public health emergencies, but also food, economic, social, political and environmental crises.

### 1.4.2 The economic imperative

Pandemics and other emerging infectious diseases are estimated to cause one trillion dollars in economic damages annually.<sup>22</sup> By September 2020, COVID-19 had cost the global economy an estimated US\$8-16 trillion.<sup>23</sup> The IMF had increased that to US\$28 trillion by the

end of 2020 and that figure is still growing.<sup>24</sup> The many hidden costs of COVID-19 make the true sum incalculable.<sup>25</sup> Within Australia, the direct costs included two Federal economic stimulus packages, at a total of \$291 billion as of May 2021,<sup>26</sup> and \$20 billion for health support.<sup>27</sup> This does not include indirect losses from things like reduced economic activity and tax revenue (measured by a reduced Gross Domestic Product) and direct and indirect public financial support by the states and territories. Nor does it cover the direct economic losses of individuals and all businesses along the supply chain.

In contrast, strategies directed towards preventing pandemics in the first instance through reducing wildlife trade and land-use change, and increasing One Health surveillance are estimated to cost between US\$22 and 31.2 billion globally per year.<sup>28</sup> A large portion of these costs (US\$17.7-26.9 billion) will be lowered if we account for the offsetting benefits of deforestation and carbon sequestration.<sup>29</sup> Yet, only \$4 billion is spent each year worldwide on prevention activities.<sup>30</sup>

### 1.4.3 The environmental imperative

Changes to Australia's ecosystems through land clearing, management of waterways, bushfires and biodiversity decline<sup>31</sup> increases contact between humans and animals harbouring pathogens, which may increase rates of microbial spillover, disease emergence and spread.<sup>32</sup> Studies show that microbial transmission risk, demonstrated by zoonotic disease risk, is elevated in forested tropical regions experiencing land-use changes, and in environments with high rates of wildlife biodiversity.<sup>33</sup> For example, New South Wales experienced high levels of rainfall following the Australian bushfires, dramatically increasing mosquito abundance and, in turn, increasing rates of Ross River Virus (RRV) infections.<sup>34</sup> Queensland also has been shown to have a high



Land-use changes elevate the risk of zoonotic spillover

incidence of vector-borne diseases, including Ross River Fever and Barmah Forest disease, as well as faecal-oral parasitic diseases.<sup>35</sup>

Conserving the natural ecosystem in these hotspot areas goes beyond the economic and social benefits of pandemic risk prevention. Human disruption of disease processes in natural ecosystems can accelerate species extinction rates.<sup>36</sup> Pandemic risk management, via ecosystem conservation, can contribute to species conservation, carbon capture, the improvement of waterways and ecosystem services, reduced risks to livestock, reductions in bushfire risks, as well as reducing the risk of potential pathogen spillover and pandemics in Australia.

Despite the social, economic and environmental imperatives to implement pandemic risk management strategies, the pandemic threat has never been promoted to the same level of concern as those regarding potential war, terrorism, economic instability and other major global concerns. COVID-19 has made it clear that this is a major gap in Australian domestic and foreign relations policies and this report is a step towards filling that gap.

## 2 Drivers of pandemics in Australia and beyond

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**Pandemics are increasing in frequency, with five new diseases emerging in humans annually.<sup>37</sup> Up to 70% of emerging diseases and pandemics are of animal origin.<sup>38</sup> In addition to known zoonotic diseases, potentially an estimated 631,000–827,000 undiscovered microbes with zoonotic potential exist in mammal and avian species.<sup>39</sup> This suggests that less than 0.1% of potential zoonotic disease risk has been discovered.<sup>40</sup>**

The frequency at which these emerging diseases are turning into global pandemics is increasing.<sup>41</sup> The reason for this is clear; anthropogenic environmental changes and human behaviour are behind the increase in pathogen spillover,<sup>42</sup> and the increasing mobility of people facilitates rapid transmission within and across continents. The link between the environment and pandemics is vital to understand and address, to prevent potential pathogen spillover and reduce pandemic risk, both in Australia and on a global scale.

While the overwhelming evidence points to an animal origin for COVID-19, the exact pathway of spillover of SARS-CoV-2 to humans remains unknown. It will be some years before there is scientific consensus on the origin of the virus and its likely environmental drivers/influences. In the meantime, we must take a precautionary approach and follow the known science.<sup>43</sup> Critically, the drivers of potential pathogen spillover and disease emergence from other species to humans are linked to human activities such as the wildlife trade, land-use changes, intensive agriculture and climate change.<sup>44</sup> For example, there are large-scale studies that show disease risk is highest in areas of human-altered landscapes because it causes closer contact between people, livestock, wildlife and other species.<sup>45</sup> Hendra virus spillover has been linked to land-use change via degradation of habitat because of deforestation, and land-use change via curated pastures and paddocks for horses and other livestock.<sup>46</sup> Influenza and Nipah virus

have been passed indirectly from wild animals, via livestock, to people, with links to intensive production methods.<sup>47</sup> Increases in some tick-borne viruses have been associated with the effects of climate change.<sup>48</sup>

The wildlife trade is a particularly important risk factor for disease emergence because it provides a contact point between wildlife, farm animals and humans. An increased volume of trade (driven by consumption patterns and consumer preferences, including in high-income countries)<sup>49</sup> and the efficiency of long-distance transport along the wildlife trade supply chain, drive the movement of pathogens across large distances to contact populations that may not have had prior contact with them.<sup>50</sup> Many diseases have been linked back to the wildlife trade, including Ebola, SARS and MERS.<sup>51</sup>

The complicated nature of the systems involved is demonstrated in Figure 1 (next page), which details just some of connections between the human-animal-ecosystem interfaces that drive these changes.

In this section, we identify the risks and drivers and pathways of potential pathogen spillover directly relevant to Australian domestic and foreign policy. Further, we note that the threats identified below come with a variable level of certainty. Some risks have known probabilities and outcomes, but many identified risks are unknown to various extents. We identify both known and unknown risks below.

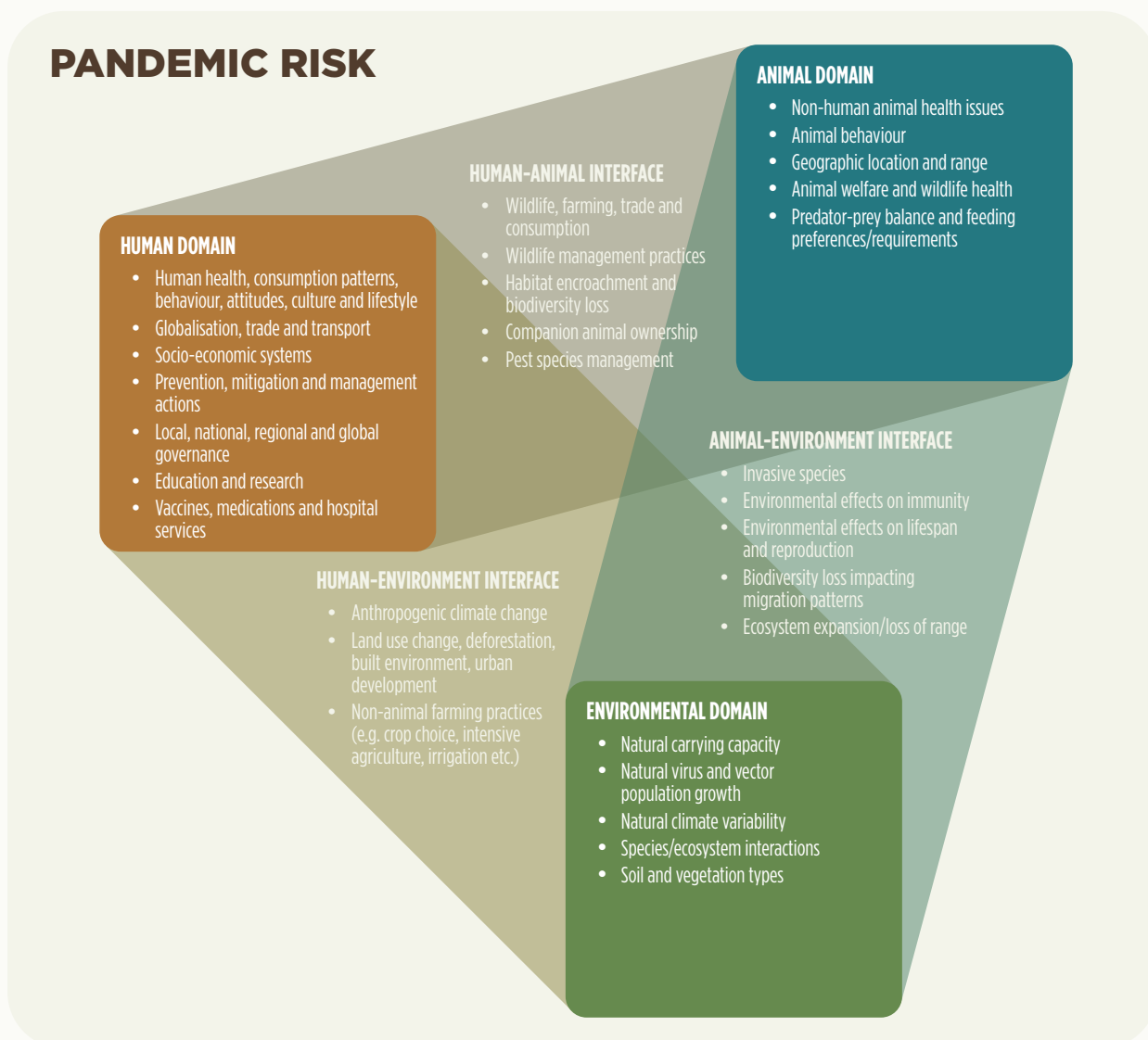


Figure 1 Drivers of Pandemic Risk

## 2.1 Australian risks: our species

According to the Australian Department of Health, there are ten zoonotic diseases in Australia categorised as national notifiable zoonotic diseases.<sup>52</sup>

- Anthrax
- Australian bat lyssavirus infection
- Avian influenza in humans
- Brucellosis
- Leptospirosis
- Lyssavirus infection (NEC)
- Ornithosis (otherwise known as Psittacosis)
- Q fever
- Rabies
- Tularaemia

Of these, five national notifiable diseases are hosted by animals that are native to Australia. All Australian bats are presumed carriers of the Australian bat lyssavirus.<sup>53</sup> Leptospirosis has been found in native rodents, bandicoots, and common brush-tailed possums.<sup>54</sup> All bird species



All Australian bats are presumed carriers of lyssavirus

are susceptible to Ornithosis (Psittacosis), including native bird species.<sup>55</sup> Q fever is hosted by macropods and potentially bandicoots, possums, koalas, fruit bats, dingoes and rodents as well as companion animal and livestock species.<sup>56</sup> Tularaemia has been found in the Eastern ring-tailed possum.<sup>57</sup>

The Federal Department of Health also maintains a separate list for national notifiable vector-borne diseases. This list contains:

- Barmah Forest virus infection
- Chikungunya virus infection
- Dengue virus infection
- Flavivirus infection (unspecified)
- Japanese encephalitis virus infection
- Kunjin virus infection
- Malaria
- Murray Valley encephalitis virus infection
- Ross River virus infection

However, just as not all of these diseases have pandemic potential, disease risks from diverse species in Australia are not limited to these lists. Each state and territory government drafts its

own notifiable disease lists, which must include the national notifiable diseases but may also include diseases specific to the jurisdiction.<sup>58</sup> Further, there are zoonotic diseases that are not considered a 'notifiable disease' on a national or sub-national scale but may nonetheless have significant impacts on human, animal, and environmental health in Australia.<sup>59</sup>

While known zoonoses like avian influenza and bat lyssaviruses are relatively well monitored in Australia through state and federal surveillance programs and the work of organisations like Wildlife Health Australia, there are many other wild species of animals that are not monitored regularly, or at all. This presents a significant gap in our understanding of risks from wildlife and other native biodiversity.<sup>60</sup>

Domestic pets also pose risks, both known and unknown. Two-thirds of Australian households own at least one pet, with 29 million pets in total around the country.<sup>61</sup> Many pets are considered members of our families and share the house, food and even beds with their humans. This close contact creates opportunities for disease spillover. For example, *E. canis* has been detected in dogs in remote communities.<sup>62</sup> Sporadic Q fever cases have been linked to pets in Australia, although it remains unclear if pets were the host or shared a contaminated environment with human cases.<sup>63</sup> Free-roaming companion animals can be exposed to viruses from wildlife sources and potentially transmit viruses to their human carers. Exotic pets also pose risks, particularly when imported near other species. For example, in 2003, people in the US became infected with monkeypox via prairie dogs that had come into contact with imported Gambian giant rats in a pet distribution centre.<sup>64</sup>

## Case study: Hendra virus (HeV) infection

Hendra virus (HeV) infection is endemic in Australian *Pteropodid* fruit bat (flying fox) populations.<sup>65</sup> HeV was first isolated in 1994 in a thoroughbred horse stable in Brisbane, Queensland<sup>66</sup> after the virus was transmitted from flying foxes to horses, and then to humans.<sup>67</sup> In 2013, a second variant of Hendra virus (HeV-g2) was detected in grey-headed flying foxes (*Pteropus poliocephalus*) in Adelaide, South Australia.<sup>68</sup> Recently, this novel variant was detected in a horse in Newcastle, New South Wales<sup>69</sup> and in urine from both black flying foxes (*P. alecto*) and grey-headed flying foxes.<sup>70</sup> As of October 2021, 63 HeV spillover events have been recorded in Australia.<sup>71</sup> Increased frequency of HeV spillovers have, at least in part, been linked to several socio-ecological drivers, including land-use change, biodiversity and climatic changes.<sup>72</sup>

Loss of habitat and depletion of native food sources, such as the nectar of flowering eucalyptus trees, contributes to flying foxes moving into urban and peri-urban areas, in search of alternative food sources.<sup>73</sup> This, in turn, increases the risk of HeV spillovers

into horse and human populations.<sup>74</sup> The connection between land clearing and zoonotic transmission is particularly problematic in Australia,<sup>75</sup> where nearly half of the original forested area across Eastern Australia has been lost.<sup>76</sup> Most of this land clearing consists of eucalypt-dominated forests<sup>77</sup> where flying foxes reside and forage.

Climatic variability also impacts the spatial and temporal distribution of flying foxes' preferred food sources.<sup>78</sup> As the intensity and frequency of climate variabilities increase, due to anthropogenic climate change,<sup>79</sup> flying foxes could be further forced into areas populated by humans and intermediate hosts, such as horses.<sup>80</sup> Such an increase in interactions at the human-animal-environment interface would increase the frequency and geographic range of HeV risk.<sup>81</sup>

The following figure, compiled by Kirsten Martinus and others, shows the complexity of the anthropogenic drivers of HeV.

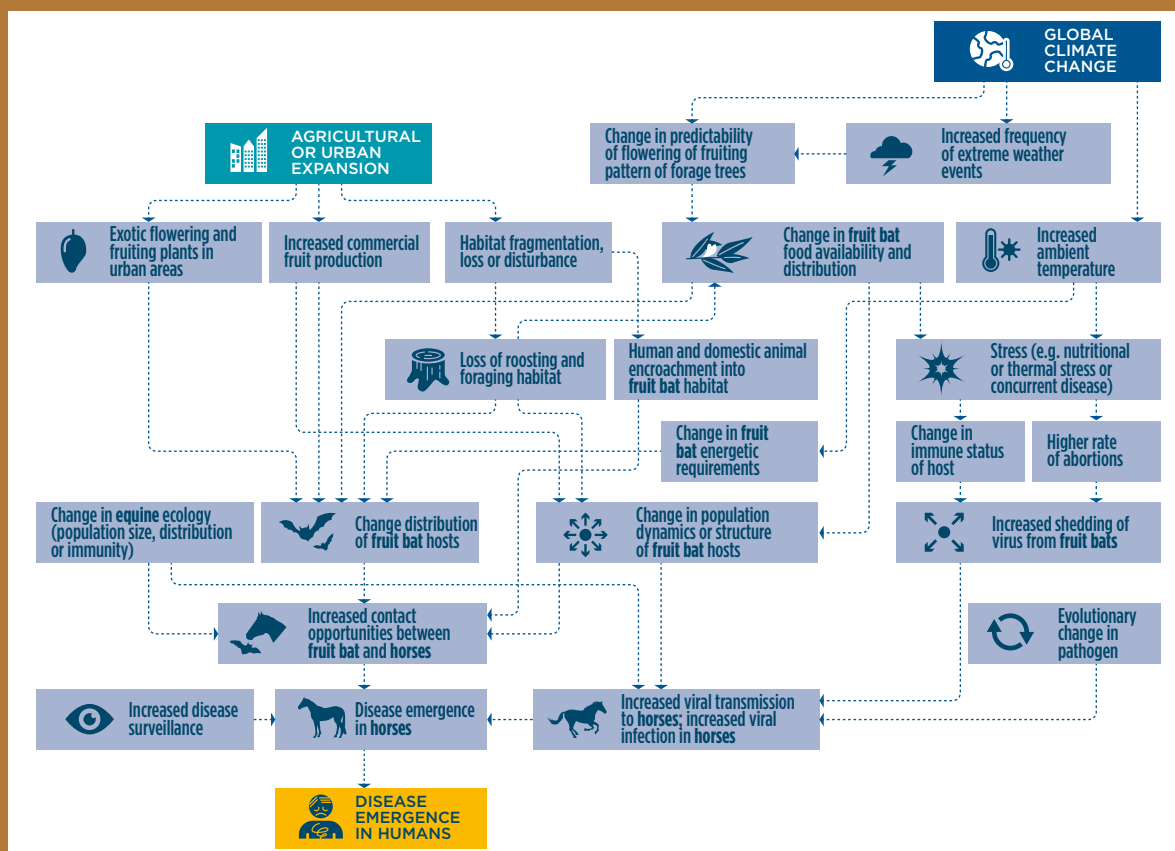


Figure 2 Hypothesised factors leading to Hendra virus spillover events. Source: Kirsten Martinus *et al.*, 2020<sup>82</sup>

## 2.2 Australian risks: biosecurity and domestic and international trade

In the context of emerging infectious diseases, definitions of biosecurity can be narrowed to focus on 'the protection of people, animals, ecological systems and the economy from the emergence, entry, establishment and spread of harmful infectious agents and diseases'.<sup>83</sup> Biosecurity risks can arise both from within and outside of Australia. Many significant emerging infectious diseases in Australia have arisen from within the country<sup>84</sup> and the majority of these are transmitted from wildlife.<sup>85</sup> However, introduced species also pose risks. For example, feral goats are associated with Q Fever,<sup>86</sup>

and introduced deer are associated with five notifiable diseases.<sup>87</sup>

Some livestock practices are also part of on-farm and supply chain biosecurity measures. Increased levels of agricultural production and intensification, required to feed an increasing global population, are already creating spillover events worldwide.<sup>88</sup> For example, the first outbreak of Q-fever in Australia was detected in abattoir workers in Brisbane, Queensland,<sup>89</sup> with sheep, goats, cattle and other farm animals implicated as hosts.<sup>90</sup> Spillover events from other zoonotic viruses, such as highly pathogenic avian influenza and Newcastle disease have also been linked to livestock exposure to diseased wildlife in Australia.<sup>91</sup>



The commercial wildlife trade has been linked to a variety of diseases



The commercial wildlife trade poses additional risks to Australian biosecurity, as trade in wildlife has been linked to the emergence and transmission of various diseases.<sup>92</sup> The consumption of meat from wildlife is associated with some of the most significant emerging disease outbreaks of animal origin of recent times, including Ebola virus,<sup>93</sup> HIV-1,<sup>94</sup> monkeypox virus,<sup>95</sup> severe acute respiratory syndrome,<sup>96</sup> and most recently, COVID-19.<sup>97</sup> Wild meat consumption is an important economic activity in Australia,<sup>98</sup> and the hunting, production and consumption of wild meat can stem from cultural, health and livelihood reasons.<sup>99</sup> Anecdotally there is a growing market for wild-hunted meat in Australia such as goat, deer and rabbits,<sup>100</sup> as well as established and regulated trades in kangaroo, deer and other species.<sup>101</sup>

Australia is also not exempt from illegal wildlife trade, as it is home to an array of valuable reptilian, amphibian and avian species,<sup>102</sup> and is in proximity to established wildlife trade routes in South-East Asia.<sup>103</sup> While the illegal wildlife trade is small compared to other international networks, the trade has been growing and much trade goes undetected.<sup>104</sup> Commonly trafficked animals, such as shingleback lizards, commonly carry diseases (the shingleback can carry a reptilian coronavirus called shingleback flu) and although there is no evidence to suggest transmission to humans, the study of infectious diseases in reptiles is often lacking. Exotic reptiles and birds are also smuggled into Australia, potentially infected with exotic pathogens that may pose a risk to Australian wildlife.

From an international perspective, as globalisation, international trade, and international tourism increase, so does the potential for emergent pathogens to be moved across borders. Southeast Asia is considered a 'zoonotic hotspot' due to factors such as rapid



**International tourism increases the chances of pathogens to move across borders**

urbanisation, high levels of biodiversity and deforestation, a growing demand for animal protein, and high levels of wildlife trade.<sup>105</sup> Australia's close geographic and economic ties to the region,<sup>106</sup> mean that Australia's capacity to reduce pandemic risk is also largely reliant on the stability, prosperity and risk management strategies of South-East Asia.<sup>107</sup>

On a domestic scale, farmers, hunters and trappers, vets, animal carers, and researchers handling wildlife and livestock have an increased risk of zoonoses or spillover of novel potential pathogens, but that risk is largely undefined.<sup>108</sup> While we have some knowledge of farmers' biosecurity practices, the same cannot necessarily be said for hunters and trappers, especially those that partake in such activities as a hobby and not as a commercial enterprise.

## **2.3 Australian risks: our environment**

Anthropogenic pressures on ecosystems and economic development exacerbate conditions for the diversification of pathogens and create conditions that could increase exposure to non-human pathogens, as well as increasing pathogen amplification and evolution. Australia's Fifth National Report



**Longer and more intense bushfire seasons contribute to wildlife dislocation and habitat loss**

to the *Convention on Biological Diversity*, supported by evidence from a range of reports on Australia's environment, stated: 'In general, declines in population size, geographic range and genetic diversity are being seen among a wide range of species across all groups of plants, animals and other forms of life in Australia'.<sup>109</sup> The report demonstrates downward trends in populations of native plant species, wetlands, coral reefs, small mammals, reptiles, amphibians and shorebirds,<sup>110</sup> driven by a range of factors including land clearing, agricultural intensification, and the impacts of climate change.<sup>111</sup> These factors are drivers of pandemics because known wildlife hosts of human-shared pathogens comprise a greater proportion of local species richness and total abundance in areas under substantial human use.<sup>112</sup>

Concerning climate change, Australia is one of the leading countries for greenhouse gas emissions per capita.<sup>113</sup> In Australia's current

policy setting, the Paris Agreement 2030 target will not be achieved and, even if fulfilled, emission rates would remain incompatible with a 2-degree emissions budget.<sup>114</sup> Research indicates that even a 1.5-degree temperature intensification in Australia will increase the risks of biodiversity loss, natural disasters and species extinction, as well as cause significant social and economic implications.<sup>115</sup> As it stands, Australia is experiencing increasing temperature levels and drought, decreasing rainfall levels, and, as a result, longer fire seasons across southern and eastern Australia and higher risks of extreme bushfires.<sup>116</sup>

Spillover hazards, emergent disease and pandemic risks increase in the face of climate-related deforestation, urbanisation and extreme weather events.<sup>117</sup> For example, climate change has been linked to changing distributions of dengue fever and malaria, due to changes in geographic distribution and population density

of mosquitoes.<sup>118</sup> Increased exposure to spillover hazards often compounds existing climate-related vulnerabilities. For example, hunting and wildlife trade are often driven by food insecurity. As climate change exacerbates food insecurity,<sup>119</sup> vulnerable human populations may be driven into closer contact with potential pathogens present in wildlife.<sup>120</sup> Yet, actions to mitigate and adapt to climate change, when not informed by science and place-based knowledges, can also increase pandemic risk.<sup>121</sup> In Australia, for example, climate change mitigation measures such as remediating water retention structures have increased the risk of dengue fever.<sup>122</sup> Other risks specific to the effects of climate change in Australia are largely unknown.

Land-use change is another major driver of zoonotic disease emergence, threatening biodiversity, driving closer contact between humans and wildlife, and contributing to climate change.<sup>123</sup> Agricultural practices, land clearing and deforestation, the encroachment of urban populations into wildlife habitats, the development of new mining sites, and changes to the management of traditionally owned or ancestral Indigenous lands all cause landscape change.<sup>124</sup> Approximately 22% of emerging infectious diseases in humans and animals in Australia have been associated with land use and native vegetation change, and further research into these links is required.<sup>125</sup>

## 2.4 Australian risks: antimicrobial resistance

The management of infectious diseases can be rendered more difficult, or impossible, as a result of Antimicrobial Resistance (AMR).<sup>126</sup> AMR occurs when bacteria, viruses, fungi and parasites evolve over time and no longer respond to antimicrobial medicines, including antibiotics, antifungals, antivirals, antimalarials, antiparasitics and anthelmintics.<sup>127</sup> As a result,

AMR can accelerate future disease outbreaks, as new and existing pathogens become less able to be controlled.<sup>128</sup> Like spillover, AMR occurs naturally, but it is exacerbated by anthropogenic drivers, including the misuse and overuse of antibiotics, particularly in public health and agriculture.<sup>129</sup> The environment can also operate as a transmission site for AMR, through the discharge of antibiotics located in aquaculture systems and wastewater, municipal and housing waste, animal agriculture fields, and landfill sites, among others.<sup>130</sup> The United Nations Food and Agriculture Organisation (FAO) has observed that, although the effects of AMR may not be as acute as a global pandemic such as COVID-19, it is predicted to have a significantly higher mortality rate in the long term.<sup>131</sup> In Australia, there are a variety of regulatory and technical systems in place to improve AMR diagnostics, surveillance, and stewardship in the public health sector.<sup>132</sup> However, Australia lacks a comparable AMR management system in the animal and environment sectors, particularly concerning antimicrobial susceptibility testing and AMR surveillance.<sup>133</sup>

### 3 Where are we now? The status of Australia's pandemic risk management system

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Australia has developed a comprehensive suite of non-binding intergovernmental agreements, plans, and frameworks to deal with emergencies such as a pandemic, after they arise, and has moved promptly to update policy after the COVID-19 outbreak.<sup>134</sup> Nevertheless, the COVID-19 pandemic has revealed several weaknesses in Australia's public health emergency response system, such as a limited on-shore ability to develop, test, approve and manufacture vaccines and other pharmaceuticals. These limitations have been discussed extensively elsewhere.<sup>135</sup>

Significantly, it has become clear that Australia's approach to pandemics, like most jurisdictions around the world, is predominately focused on response and management, and there is a lack of historical investment in 'prevention'. There are strong aspects of Australia's prevention strategies, particularly around the management and monitoring of biosecurity threats to livestock and crops, and there are programs and organisations that are doing the heavy lifting in terms of One Health policy (such as the Indo-Pacific Centre for Health Security and Wildlife Health Australia). However, there remain significant gaps. This section will detail the positive aspects of the existing framework and how they are utilised for prevention, and indicate gaps in law, policy and practice.

#### 3.1 Biosecurity and trade

Australia's biosecurity law and policy are complex. Biosecurity is a matter of national concern, requiring shared responsibility, cooperation and investment across all levels of government, industry bodies, researchers, practitioners and the broader public. At the federal level, a human biosecurity emergency can be declared under the *Biosecurity Act 2015 (Cth)* (Biosecurity Act) to support Australian pandemic risk prevention measures. In response to COVID-19, the Commonwealth Health Minister has issued biosecurity measures to limit international and inter-state travel, as well as access to remote communities, and has established an app for tracking and tracing persons possibly exposed to COVID-19.

Under the Australian Constitution, the Federal Government is responsible for quarantining at the border and regulating international animal health matters. Within the Federal Government, several departments share responsibility. DAWE primarily manages agriculture, the environment and marine biosecurity, and the Department of Health manages human health biosecurity. Several other departments manage national-scale biosecurity concerns, such as the Department of Home Affairs and the Department of Foreign Affairs and Trade.

States and territories have responsibility for disease prevention, management and certain biosecurity matters. For example, the Australian Capital Territory (ACT) has developed a suite of instruments including the *Biosecurity Strategy 2016–2026*, *Animal Diseases Act 2006 (ACT)*, and the *Pest Plants and Animals Act 2005*, all of which contribute to the territory's biosecurity response. State and territories also have a broad range of public health and emergency response powers available under public health and emergency legislation. For example, the legislation most relevant to Queensland's COVID-19 response includes the *Public Health Act 2005* and the *COVID-19 Emergency Response Act 2020*, supplemented by the *Disaster Management Act 2003*, and the *Disaster Management (Extension of Disaster Situation – COVID-19) Regulation 2020*.<sup>136</sup>

While these biosecurity and emergency response measures do not prevent zoonotic disease spillover, they are intended to mitigate the transmission of diseases following spillover

events and have ensured that Australia has been relatively successful in slowing the spread of COVID-19 compared to other countries.

There are also key industry and private bodies involved in biosecurity management in Australia, including, but not limited to, the agricultural industry, landholders, the trade sector, port operators, the public health system, Animal Health Australia, Plant Health Australia, and Wildlife Health Australia. Regarding biosecurity innovation, research and development, Australia's leading institutions include CSIRO, the Centre for Invasive Species Solutions, the Rural Research and Development Corporations (industry RDCs), and several universities and education institutions all play a role.

A key strength of Australia's prevention strategy is the involvement of Aboriginal and Torres Strait Islander communities and Indigenous Rangers. The role of Indigenous communities in Australia's biosecurity system includes both management and research, across each of the human, animal and environmental domains. Much of the on-the-ground biosecurity work and post-border protection mechanisms are undertaken by in-situ land managers and Indigenous Rangers.<sup>137</sup> The federally funded Indigenous Ranger Biosecurity Program ensures that remote regions are monitored in line with Traditional Ecological Knowledge, and this knowledge is shared with government coordinators in the Northern Australia Quarantine Strategy and scientists.

Despite the strong expertise in Australia's current biosecurity system, CSIRO's 2020 report on 'Australia's Biosecurity Future: Unlocking the Next Decade of Resilience (2020–2030)' states that Australia's current framework is not fully equipped to respond to the future of biosecurity threats. Between 2012 and 2017, the annual number of interceptions of biosecurity risk

materials at Australian borders rose by almost 50%, to 37,014 new incursions.<sup>138</sup>

Zoonotic disease emergence events continue to increase in volume and complexity. Key pressures on Australia's biosecurity system include increasing urbanisation due to a growing population, the rise and expansion of cities, inter-jurisdictional travel and trade, increased volumes of imported commodities, antimicrobial resistance, biodiversity loss, climate change, and agricultural intensification. Similarly, key constraints on the systems' resilience and responsiveness include a lack of data and information connectivity, eroding resource budgets, inadequate community engagement and low investments in biosecurity technology development.<sup>139</sup>

### 3.2 Agriculture, farming and livestock

The bulk of post-border biosecurity risk prevention work is undertaken by landholders, Indigenous communities, pastoralists and farmers, coordinated and supported by state and territory governments and the Federal Government. Farmers now have increased roles under the shared responsibility



The bulk of biosecurity work is done by landholders

arrangements for biosecurity,<sup>140</sup> including on-site risk management practices, reporting requirements, and knowledge-sharing with industry and government bodies.<sup>141</sup> The general duty of farmers is to 'ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised'.<sup>142</sup> For farmers, this might include establishing a Biosecurity Management Plan for visitors and farmworkers.<sup>143</sup> Further, livestock owners must properly identify their cattle, sheep, goats and pigs through the National Livestock Identification System, so that livestock may be traced in the event of an animal disease outbreak.<sup>144</sup>

Pest animals and introduced species can also be implicated in zoonotic disease spillover as they can be hosts of zoonotic disease but can also be a significant vector of transmission. Much of the surveillance and management of these species is also left to public and private landholders, with assistance from government and government-led national policies.<sup>145</sup>

Sharing the responsibility for post-border risk management with the agricultural sector has the potential to improve stewardship practices that prevent spillover events, as well as promote adaptiveness in responding to biosecurity events.<sup>146</sup> However, in the absence of strong partnerships, training and coordination efforts, this strategy can result in fragmented biosecurity strategies.<sup>147</sup> Barriers to the coordination of, and compliance with, biosecurity approaches in the agricultural sector include lack of funding,<sup>148</sup> trust in government agencies,<sup>149</sup> risk perception,<sup>150</sup> and clear information sources.<sup>151</sup> This highlights the need for continuous communication and education to enhance awareness and understanding of what best practice biosecurity management is and how it aligns with agricultural practices in Australia.<sup>152</sup> One example of this is the 'Farm Biosecurity' website, a joint initiative of Animal

Health Australia and Plant Health Australia, which provides free biosecurity information and resources for agricultural land-holders.<sup>153</sup> Another example is the Livestock Biosecurity Network, established by industry bodies in collaboration with the federal and state governments, through which officers provide strategies and information to manage disease risks in livestock production processes.<sup>154</sup>

A related group of policies are those that seek to support and strengthen on-property native biodiversity. These include programs and policies such as Landcare Australia, Caring for Country and DAWE's Agriculture Biodiversity Stewardship Package. While these policies have heralded many successes,<sup>155</sup> they also demonstrate the need for continued development of partnerships, institutional support and funding.<sup>156</sup>

### 3.3 Environment and wildlife management

No agency, department or organisation has historically been dedicated to reducing spillover by managing its environmental drivers. However, DAWE has a growing and beneficial presence in zoonotic disease monitoring and management. Recently, DAWE, led by the Chief Veterinary Officer, has partnered with CSIRO and Wildlife Health Australia to initiate a One Health Surveillance Initiative which allocates funding to an Investigation Fund, to support and fund field, laboratory, and epidemiological research into selected wildlife disease events.<sup>157</sup> DAWE also has a relatively newly formed Chief Environmental Biosecurity Office and Chief Veterinary Office, both of which are extensively involved with monitoring and environmental/zoonose surveillance. DAWE works closely with WHA including wildlife disease surveillance, pathogen investigation and monitoring, and provides advice and recommendations.

Legally, environmental and wildlife management is undertaken under the guidance of the principle of 'ecologically sustainable development (ESD)', which can, and should (but does not), have the effect of incorporating spillover risk into its decision-making framework. Under national legislation, ESD includes economic, environmental, social and equitable considerations. Unfortunately, the links between human, animal and environmental health are not explicit considerations in Australia's raft of environmental legislation, which means that One Health is largely left to non-binding policy and non-governmental stakeholders, as we have seen with the current program of governmental work. While this program is beneficial and the people working in, and pushing for, these policies are admirable, the lack of a legal basis for One Health has flow-on effects on its transparency, monitoring and enforcement.

Formally, the role of the Commonwealth in environmental and wildlife management is limited to fulfilling international treaty obligations and harmonising the jurisdictions across Australia. This is achieved by restricting its legislative power to Matters of National Environmental Significance (MNES).<sup>158</sup> However, the main piece of federal environmental legislation, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), has recently been found to be 'ineffective', 'outdated', leading to 'piecemeal decisions' and 'not fit to address current or future environmental challenges'.<sup>159</sup> These findings are echoed by recent environmental assessments.<sup>160</sup>

Of specific concern to pandemic risk management is Section 193 of the EPBC Act, which states that the minister may decline to include a species in the national threatened species list if they pose a threat to human health. While this appears to result in a human wellbeing gain in most instances, it does not require consideration of the numerous ways



Zoonoses are linked to species abundance

that zoonoses are linked to species abundance, genetic diversity and habitat health.<sup>161</sup>

The Commonwealth also has power over environmental biosecurity under the *Biosecurity Act 2015*, which has the purpose of managing diseases and pests that may cause harm to human, animal or plant health or the environment, but does have the capacity to address environmental drivers of increased zoonotic transmission and resulting outbreaks.

The states and territories retain residual responsibilities over other environmental matters and the living and non-living resources managed within their jurisdictions. In practice, this means that the states and territories have greater responsibility for maintaining the environment and so have the greater ability to incorporate spillover prevention management into planning and development laws. One way this can be achieved is through the Environmental Impact Assessment (EIA) process, undertaken for proposals that are likely to cause significant environmental impact, under state and local environment and planning laws.<sup>162</sup> It is, however, rare for legislation to require decision-makers to consider zoonotic spillover risk as part of an EIA. Most often,

state and territory legislation provides a basis for consideration of public health but does not require it. For example, Regulation 79 of the *Northern Territory Environment Protection Regulations 2020* lists human health or wellbeing as a matter that may be included in an EIA.

While not legislatively required, health implications are often considered at the policy level or referred to in an EIA or by the body responsible for the EIA process. For example, the Western Australian Environment Protection Authority has listed five 'themes' to be considered in a systematic approach to organising environmental information and drafting an environmental impact assessment, one of which is 'human health'.<sup>163</sup>

At a local level, municipal councils are often responsible for activities related to the effects of land use and associated natural resources, urban design, and planning, all of which influence the frequency of human-wildlife interactions.<sup>164</sup>

### 3.4 Existing One Health structures

Australia is currently the only OECD country without a national multidisciplinary body focused on disease prevention, investigation and control.<sup>165</sup> Various jurisdictions have adopted One Health policies, but there is a lack of formalisation of the One Health approach and it is fragmented in practice.

Despite this fragmentation, individual departments and organisations are leading One Health policy across the country. As mentioned in the preceding section, DAWE has an increasing presence and policy basis for One Health disease monitoring and surveillance. At the national level, the Department of Foreign Affairs and Trade (DFAT)'s Indo-Pacific Centre for Health Security has One Health as a core principle and co-funds research with the

Australian Centre for International Agricultural Research (ACIAR) on One Health approaches and policy across the region. DAWE and the Department of Health have prioritised a One Health approach in their 'One Health Master Action Plan for Australia's National Antimicrobial Resistance Strategy – 2020 and beyond'.

The states and territories have also adopted 'One Health' policies at various interfaces. For example, South Australia Health have published the 'State Public Health Plan 2019-2024', which commits to adopting a One Health approach to maintaining and improving public health, by monitoring and responding to spillover events on the human-animal-environment interface. Queensland's interdepartmental policy document – 'Memorandum of Understanding between Queensland and the Department of Agriculture and Fisheries and the Department of Education for the management of Zoonotic Incidents 2019' – was designed to facilitate a multiagency emergency management approach to zoonotic incidents. The Victorian EPA's policy on Q-fever follows a One Health model which promotes cross-sector collaboration among multiple stakeholders. South Australia Health's commitments include adopting a 'One Health' approach to maintaining and improving public health protection services. These are just a few of many examples.

While there is evidence of a genuine commitment to implementing the One Health approach on a national level,<sup>166</sup> such as through collaborative efforts between human and animal health sectors,<sup>167</sup> there remains limited environmental sector engagement in Australia's One Health approach.<sup>168</sup> Although we note the growing role of the Chief Environmental Biosecurity Office here, there remains a tendency for public health and biosecurity responses to emerging infectious diseases to focus on controlling cross-border pathogen transfer and community outbreaks, and



investigating existing and new zoonoses, rather than addressing the ecological sources related to the emergence of the threat. Expert bodies such as Wildlife Health Australia and the Australian Veterinary Association, who already have solid partnerships with government, have identified a need for expert advice from the environmental health sector to contribute to a One Health surveillance system and robust One Health policy.<sup>169</sup>

The disciplinary fragmentation of Australia's One Health approach is further exacerbated by the siloed funding of research activities, with financial constraints inhibiting interdisciplinary collaboration in One Health research projects.<sup>170</sup> Additionally, a lack of tertiary education about One Health leads to professionals thinking in a confined way within their respective fields.<sup>171</sup> Moving forward, collaborative and intersectoral management of pandemic risk management that equally considers all three pillars of the One Health triangle is essential to ensure not only national responsiveness to emerging zoonotic diseases but global leadership in this area.

### 3.5 International standing and collaborations

Australia is a trusted broker and has good international standing in the zoonotic risk/pandemic space. This has been developed as a result of Australia's strong biosecurity laws, respected expertise and robust regional partnerships. A predominant partnership is that held with the World Organisation for Animal Health (OIE). DFAT's Indo-Pacific Centre for Health Security has also partnered with the OIE ('Australia-OIE One Health Partnership') to 'anticipate, avert and arrest infectious disease threats in the Indo-Pacific'.

Inter-departmental collaborations, such as the partnership between the Indo-Pacific Centre

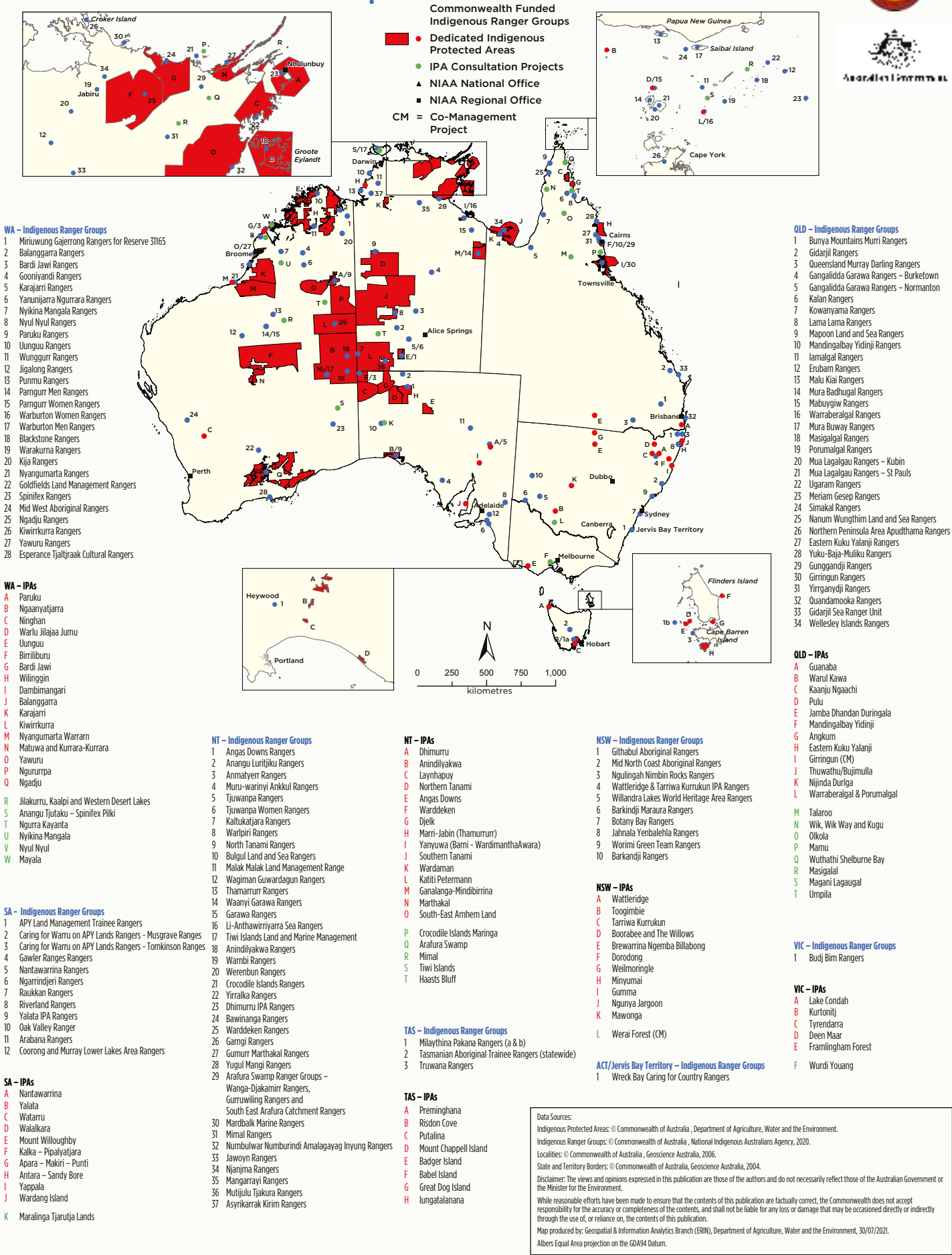
for Health Research and ACIAR, strengthen our ability to support our regional neighbours in their pandemic risk management by providing funds to undertake research addressing zoonotic malaria in Indonesia, antimicrobial resistance in Fiji, extrapulmonary tuberculosis and zoonotic arboviruses in Papua New Guinea, and policies on highly pathogenic avian influenza in Cambodia, Laos PDR and Vietnam.<sup>172</sup>

Australia has also invested in pandemic data aggregation in Asia and the Pacific, resulting in the establishment of field epidemiology training programs in South-East Asia, a tailored 'Data for Decision Making' course for the Pacific, the development of the Pacific Syndromic Surveillance Systems and several surveillance and laboratory networks, including the South-East Asian Field Epidemiology Training Network, the Pacific Public Health Surveillance Network and PacNet, which have improved the sharing of information between and within countries.<sup>173</sup>

The scientific, technical, social and economic research supported by these partnerships helps to address pandemic risk management in the Asia-Pacific while also bolstering multi-level governance coordination. These activities position Australia as a respected international actor in biosecurity and One Health. However, the focus of these activities has largely been on improving animal health, veterinary capacities and reporting systems. Thus far, the environmental drivers of pandemics are not prioritised in the Australia-OIE One Health Partnership's stated objectives or priority research fields. There has been little substantive action taken to engage professionals in the environmental domain. As One Health encompasses transdisciplinary approaches to the human, animal, and environmental interface, further steps are required to ensure a holistic preventative approach to pandemic governance.

# Indigenous Protected Areas

## Commonwealth Funded Indigenous Ranger Groups – July 2021



## 3.6 Overview of gaps in the system

Overall, Australia's biosecurity and pandemic response policies are relatively strong. However, below we list the key gaps in our pandemic risk management system. Each of these gaps will be the subject of the recommendations and discussions in the following sections.

### 3.6.1 Limited Indigenous leadership and partnerships

Indigenous people have historically not been considered primary stakeholders in agricultural, biosecurity and environmental regulation. Not only are Indigenous groups primary stakeholders, but willing, engaged and knowledgeable stakeholders that need to be given primacy in collaborative efforts toward pandemic prevention. In response to the COVID-19 pandemic, Indigenous community-controlled health organisations demonstrated their leadership by lobbying governments to close remote communities, supporting testing and contact tracing efforts, preparing Indigenous and public health videos for social media, and supporting vulnerable groups in their communities, including elders, homeless persons and those with underlying medical conditions.<sup>174</sup> Despite this, Indigenous peoples around the globe were 'left behind in the COVID-19 response', as a consequence of insufficient resources, data gaps and discrimination in the health care system.<sup>175</sup> In Australia, Indigenous-led actions demonstrate the continued need for self-determination and Indigenous-led policy but have also shown that the current pandemic mental health plan and system are not sufficient to prevent the worst-case scenario for Indigenous people moving forward.<sup>176</sup>

From a positive perspective, there are growing government-supported Indigenous land and sea management programs with specific examples

in Indigenous Ranger programs and community-based management under registered Aboriginal Corporations.<sup>177</sup> Most of the work done by the individuals in these programs consists of monitoring and survey work, but also includes fire, weed and pest management, and while funding has increased, so has the remit of the rangers.<sup>178</sup> These programs can be considered successful from an environmental perspective, as well as a social and economic perspective, with Indigenous partners and participants reporting an increase in satisfaction with their access to Country, greater participation in cultural activities and native languages, and an improved sense of feeling that Country was being cared for.<sup>179</sup> However, the examples remain limited and gaps remain. For example, Indigenous practices are rarely accounted for in ecosystem accounting and other forms of data collection and measures of effectiveness, and when they are, cultural values are not considered.<sup>180</sup> They are largely limited to remote areas in northern and western Australia, and neglect urban and peri-urban areas, even where there are large Indigenous land holdings and Indigenous People in urban areas are eager to follow the models being set in remote areas.<sup>181</sup> Funding also comes from National Indigenous Australians Agency and there is scope for further collaboration with, and funding from, other areas such as the agriculture departments.

### 3.6.2 Low historical investment in pandemic risk management

Globally, COVID-19 resulted in economic damages of between \$8.1 and \$15.8 trillion in 2020 alone.<sup>182</sup> Comparatively, the measures proposed to prevent pandemics have been estimated at \$22 to \$31.2 billion.<sup>183</sup> Further, those proposed prevention measures are predicted to produce ancillary benefits of between \$17.7 and \$26.9 billion, accounting for the social cost of carbon, decreased deforestation, and reduced CO<sub>2</sub> emissions.<sup>184</sup> Nevertheless, Australia

has historically invested little in preventing pandemics by addressing their drivers, instead spending billions on additional health measures since COVID-19.<sup>185</sup> This is indicative of the national focus on monitoring and managing pandemic pathogens, as opposed to preventing pandemic drivers.<sup>186</sup>

### **3.6.3 An informal and fragmented One Health system**

Public health, animal health, and environmental matters are monitored and managed by separate sectors, with several stakeholders across the three levels of government (federal, state or territory, and local).<sup>187</sup> Vertically, there is clear fragmentation and disharmony between policies at the local, regional, state and national levels, while horizontally, there is a disparity in emphasis between the human, animal and environmental health pillars. The fragmentation of pandemic risk prevention, monitoring, and management, has resulted in a lack of timely communication, cooperation and data sharing between relevant departments and disciplinary bodies.<sup>188</sup> Australia's informal and fragmented One Health system means it has little normative value, and the ability of ad hoc One Health policy documents to engage the relevant stakeholders, garner economic funding and direct holistic prevention policies is limited. Further, different perceptions of the One Health framework have led to narrow implementation in the veterinary and health sciences, and the environmental/wildlife drivers of spillover events (as opposed to environmental surveillance) are rarely considered.

### **3.6.4 Gaps in national environmental laws**

There are significant gaps in Australia's response to the environmental drivers of pandemics. Much of environmental protection and

regulation has been delegated to non-binding and subnational policies, creating a fragmented national governance system that lacks enforcement capacity.<sup>189</sup> While state and local-level regulation can go some way to fill the gaps in the national environmental legislative system, Australia's fragmented policy approach has thus far proven inadequate. There has been a failure to establish adequate climate commitments to meet international climate goals. Resultant environmental degradation, climate change, land-use change and biodiversity loss are all key driving factors in zoonotic spillover risk. To prevent pandemics at their source, it is critical that substantive environmental commitments, focused on sustainability and environmental health outcomes, are introduced.

### **3.6.5 Suboptimal national wildlife surveillance system**

There are few policies to actively seek out, identify and assess future potential biosecurity risks in the wild animal space, although this may improve with the recent establishment of the DAWE and Department of Health jointly managed Human-Animal Spillover and Emerging Disease Scanning Group. Syndromic surveillance and diagnostic exclusion testing are heavily relied upon for known biosecurity risks, with legislation and protocols to follow in the event of a positive detection. Often lacking are guidelines on what to do in the event of a negative result, but where an unknown infection is suspected. Further, there remains incomplete knowledge of Australia's wildlife population demographic and distributions, with the supporting architecture for the surveillance system based on Australia's livestock biosecurity framework.<sup>190</sup> For Australia to advance pandemic risk prevention, there is a need to improve animal and wildlife and environmental surveillance systems for both known and unknown biosecurity risks.<sup>191</sup>

### **3.6.6 Gaps in non-native animal knowledge and management**

There is a need for reforms to enable non-native species regulation between states in a harmonised manner. Australia has the second largest number of invasive alien mammals causing impacts on human health.<sup>192</sup> We have a limited social understanding of how feral animals interact with native species and people, and vice versa, and whether interactions are likely to lead to zoonotic spillover. There is also a gap in knowledge and policy around hunter interaction with animals, particularly those who engage in such activities on a non-commercial basis.<sup>193</sup>

### **3.6.7 Low public awareness of environmental drivers of pandemics**

Public engagement related to COVID-19 has focused on how to respond to the ongoing public health crisis, and how to mitigate its economic and social impacts. While these are important questions, the need for public education about the root causes of zoonotic diseases is being overlooked. This is a failure of governance because top-down pandemic risk management policies (that is, governmentally-mandated and managed policies that are implemented 'from the top' and apply to a widespread population) are unlikely to be accepted and/or complied with if there is no preexisting knowledge of their necessity.<sup>194</sup> Further, without knowledge and education in this area, bottom-up policies (also known as grassroots participation and/or policy development, which are usually more specific and may or may not be institutionally supported) are unlikely to develop.

### **3.6.8 Biosecurity is seen as more of a technical than social challenge**

A lack of coordination in zoonotic disease prevention and management planning and implementation across stakeholders has been shown to directly impact primary producers' understandings of biosecurity.<sup>195</sup> Research indicates that Australian producers are uncertain about the roles and responsibilities of stakeholders involved in zoonotic biosecurity management, which in turn affects management practices.<sup>196</sup> There is a need for the development of a consistent, integrated pandemic risk management approach across all relevant sectors and the development of strategies that consider stakeholder priorities, knowledges, barriers and practices in animal health and production.

### **3.6.9 Lack of support for, and gaps in research related to, prevention**

There is a lack of support for research concerning the environmental drivers of zoonotic spillover and pandemic risk management in general. This is associated with decreased trust in science and research institutions,<sup>197</sup> as well as a lack of available funding. A lack of funding for interdisciplinary One Health projects in Australia exacerbates disciplinary siloes. While the National Health and Medical Research Council (NHMRC) only funds medical and public health research, the ARC generally avoids funding such research. The opposing mandates of Australia's leading research funding sources limit the ability for interdisciplinary collaboration across the human-animal-ecosystem interface.

## 4 Where do we want to be? Key values and stakeholders

**A Pandemic Risk Management Policy needs to have a strong underlying foundation that emphasises the values held by the wider Australian community, as well as the sciences. The One Health framework has gained traction in this space because of the growing science indicating the connections between animal, environmental and human health, and the understanding that diseases of zoonotic origin can and have been rapidly transmitted across and within jurisdictional borders.**

The values systems suggested in this report combines the One Health policy framework with Indigenous 'First Lores'<sup>198</sup> and knowledge, and also strongly emphasises the values that are generally considered important to the broader public.

### 4.1 'Healthy Country, Healthy People';<sup>199</sup> integration of indigenous knowledges

Indigenous people now hold an estimated 26.6% to 54.17% of Australia's landmass,<sup>200</sup> a vast range, due to the uncertainties of Native Title and the identification of private Indigenous landholdings. The National Indigenous Australians Agency represent that 'Aboriginal and Torres Strait Islander peoples' rights and interests in land are formally recognised over around 40 per cent of Australia's land mass'.<sup>201</sup> Whilst the majority of this land is deemed not suitable for western agriculture practices, it is believed that climate change will lead to an increasing reliance on Indigenous-held lands for food production and conservation purposes.<sup>202</sup>

Additionally, Indigenous-managed lands have biodiversity levels that are equal to, if not higher than, Australia's protected areas.<sup>203</sup> Recent studies show that up to three-quarters of Australia's threatened species have ranges that occur or overlap on Indigenous-managed lands, and almost one-quarter of all threatened animals were subject to some formal conservation action by Indigenous people.<sup>204</sup> Indigenous land management practices are associated with improved biosecurity, weed and non-native animal control, general conservation of

threatened species, improved fire management and lower greenhouse gas emissions.<sup>205</sup>

One Health and Indigenous First Lores, including ways of Caring for Country, share many similarities. Both see the connections between a healthy environment and the health and wellbeing of people.<sup>206</sup> The Australian formulation of One Health can, and should, learn from Indigenous knowledges and caring practices. Additionally, Indigenous groups need to be further supported in their land management practices, given their land holdings and their effective conservation practices. The need for Indigenous cultural and natural resource management and biodiversity conservation is foregrounded in the 'Healthy Country, Healthy People' policy approach.<sup>207</sup> 'Healthy Country, Healthy People' recognises that the interdependent relationship between Indigenous peoples and their ancestral lands provides benefits for the health of Indigenous peoples and the environment,<sup>208</sup> as well as cultural, social, education, health, employment and economic development outcomes more broadly.<sup>209</sup> A One Health policy framework informed by 'Healthy People, Healthy Country' has the potential to deliver ecosystem services that also contribute to pandemic prevention, including wildfire mitigation, carbon sequestration, sustainable resource use and control of invasive species.<sup>210</sup> To realise these benefits, One Health policies should support Indigenous peoples' land management, amend policies that constrain Indigenous connections with Country, and promote Indigenous leadership and community health initiatives.<sup>211</sup>

However, while studies are increasingly incorporating One Health as a holistic rhetoric, they are still ultimately applying western scientific methods with narrow visions of health, ecosystems and species connections.<sup>212</sup> The small body of literature developing at the intersection of One Health and Indigenous knowledges emphasises that understanding how Indigenous knowledges could complement and enhance the foundational concepts within One Health would strengthen the approach.<sup>213</sup>

As a pathway to the future, One Health may serve as a model to facilitate open cross-cultural dialogues.<sup>214</sup> To develop an effective One Health strategy that foregrounds Indigenous knowledges and experiences, One Health strategies must be developed through collaborative and participatory methods that focus on the long term.<sup>215</sup> Emphasis should be placed on community engagement and agency within One Health programs and community interventions.<sup>216</sup> Underpinning the 'success' of One Health strategies is the need to secure adequate funding sources with the flexibility to meet identified community needs, collaborative and multidisciplinary research approaches, Indigenous workforce and skills base development, and community capacity building, including leadership and governance. Finally, One Health approaches should operate in partnership with Indigenous Peoples and organisations,<sup>217</sup> rather than displacing or mimicking their Traditional Knowledges without benefit to the Traditional Owners.<sup>218</sup> To this end, One Health researchers and policymakers have a responsibility to inform themselves about the past and current experiences of Indigenous Peoples with research and interventions, to ensure One Health responses in the future support the long-term goal of self-determination,<sup>219</sup> This is not only an underlying 'value' but a key Australian international obligation.<sup>220</sup>

## 4.2 Systems thinking

Systems thinking allows problem solvers to reframe how they think about a problem, and what potential solutions might look like.<sup>221</sup> It is interdisciplinary and may act as a bridge between the natural and social sciences, and balances the focus between the whole and its parts, taking multiple perspectives into account.<sup>222</sup> Similarly, Indigenous Ecological Knowledges centre on the complex interdependence of lands, waters and their people.<sup>223</sup>

One Health is a systems-thinking model. It recognises that all human and environmental systems are themselves complex and that each system interacts with other systems in multiple and complex ways. For example, biosecurity systems contribute to planetary security via plant, animal and health systems, and in turn, those systems affect our ability to manage planetary boundaries.<sup>224</sup> Global human and environmental health functions through systems of law, politics, trade, infrastructure, technologies, economics and a wide range of actors, and the relationships between them discussed throughout this report. A One Health systems thinking approach avoids silo-isation of expertise and highlights the interactions between human health systems and land-use, trade and climate systems. Employing a systems-thinking One Health model requires stronger engagement with Indigenous ways of thinking and connection to Country.<sup>225</sup>

## 4.3 Long-term thinking

To process change systemically, and through a systems approach, long-term goals are preferable over short-term, political term related goals. In the future, we want a world-leading holistic One Health system, with support for our regional neighbours to develop their own approach. This will catapult Australia to a

leadership position in pandemic risk prevention. But these goals cannot be achieved overnight. Issues like food and climate security, critical to global health and sustainability more generally, require long-term paradigm shifts in how we manage the integration of human, wildlife and environmental health. An integrated Australian One Health system needs to be formulated with longevity in mind, supported by monitoring activities over time. This is also consistent with the focus on intergenerational stewardship and equity within Indigenous communities.<sup>226</sup>

#### 4.4 Integration and balance

Current One Health and pandemic risk management policies are haphazard and siloed. There is a need for integration and harmonisation of research, instruments, policies and legislation across federal, state and local governments, industry and organisations. There also needs to be a balance between environmental (and animal/wildlife/biodiversity) aspects of One Health, compared to human health. This will involve deconstructing notions of human exceptionalism and prioritisation of certain interest and corporate groups.

Balance requires a sensitive and agile One Health approach that is adaptable and can move in response to changing systems and emerging threats. Ultimately, at the large systems level, it will redistribute the burdens and benefits of thriving in Australia, for human populations, species and environments. It requires shared commitment between government, industry and people, that moves beyond discussion to true collaboration. The recognition of Indigenous ways of being, which are centred on the interdependence of all living systems and the need for balance through reciprocity,<sup>227</sup> is critical to developing a truly balanced One Health policy framework.

#### 4.5 Collaboration

The aims of any new One Health system should include linking the current fragmented policies in Australia through disciplinary, governmental, and social collaboration. A top-down, federal government-formulated One Health system simply will not work. Laws and policies are often the cause of social conflict when participatory and collaborative design methods are not used.<sup>228</sup> On the other hand, collaborative and stakeholder co-designed legal mechanisms can increase engagement and improve outcomes.<sup>229</sup> A One Health system should bring stakeholders together to bring a holistic and community-driven approach to pandemic risk management. This includes Australia's international neighbours, given the international nature of the problem. On a national scale, a collaborative One Health hub should focus on creating space for Indigenous leadership, co-creating holistic health interventions consistent with Indigenous ways of being, and addressing the biocultural dislocation of Indigenous Peoples.<sup>230</sup>

#### 4.6 Honesty and transparency

This pandemic has been characterised as an 'infodemic' of inaccurate and harmful information that has perpetuated existing distrust in government and science.<sup>231</sup> Key stakeholders tailor their pandemic risk management as a result of the level of trust they hold in government and government policy.<sup>232</sup> There is a resulting need to manage distrust in the development of new policy through improved open and transparent political communication and vertical linkages with the community on the ground. To ensure this required level of honesty and transparency, a One Health system should have quantifiable and measurable public reporting requirements, similar to that of the United Nations Sustainable



Development Goals. Building honesty and transparency in Indigenous partnerships is an ongoing and place-based process that must recognise the diverse historical, cultural and social relationships that Indigenous Peoples have with the institutional bodies involved in their dispossession.<sup>233</sup>

#### 4.7 Multispecies wellbeing

One Health systems need to go beyond striving for ‘human health’ to ‘multispecies wellbeing’. While health can be used to refer to the absence of disease or impairment,<sup>234</sup> wellbeing is a more holistic concept, integrating mental and physical health as well as social connectedness, longevity, self-perceptions of health, life satisfaction, personal fulfilment, and positive functioning.<sup>235</sup>



Figure 4 Wellbeing Framework comprising twelve domains of wellbeing. Source: ACT Government<sup>236</sup>

Multispecies wellbeing is when two or more species' interdependent needs are met.<sup>237</sup> It is relation-based, and cannot be met through maximising human wellbeing at the expense of other species. Its 'diverse, interdependent, changing and inseparable needs can only be met through adapting, self-regulating systems'.<sup>238</sup> Wellbeing includes empowered, diverse and resilient communities, and community connections.

## 4.8 Justice

Ensuring justice in pandemic risk management goes beyond access and equality in public health (although these too are vitally important). We need to acknowledge that inequities can contribute to and exacerbate pandemics, and address those inequities at the source. As such, Aboriginal and Torres Strait Islander lores and relational thinking are imperative for change and focusing on intergenerational equity. It removes or amends practices that externalise costs onto other species, vulnerable groups and the environment. It requires a paradigm shift away from putting humans at the apex of the ecosystem and integrating them as part of the ecosystem. It recognises that different communities have variable economic, environmental and social contexts.

Each of these values foregrounds the policy priority areas in the following sections and should drive any future pandemic risk management policy.

## 4.9 Key stakeholders

The list of stakeholders in an integrated One Health system is long. It includes, but is not limited to:

- 1 All levels of government
- 2 Indigenous Rangers, farmers and communities
- 3 Farmers and the agricultural industry
- 4 The extractive industries
- 5 Biosecurity practitioners
- 6 Conservation and environmental science practitioners
- 7 Animal welfare organisations
- 8 Public health bodies and human health service providers
- 9 Veterinarians and animal health officers
- 10 Other animal carers/practitioners such as groomers, pet daycares and kennel staff.
- 11 Wildlife carers and organisations
- 12 NGOs and policy bodies such as Animal Health Australia, Plant Health Australia and Wildlife Health Australia.
- 13 Pet owners
- 14 International organisations such as the Food and Agricultural Organisation and the United Nations Environment Program
- 15 Researchers, including laboratory staff
- 16 Everyday consumers and the general community.

This non-exhaustive list demonstrates that a One Health system is needed across all federal government agencies and portfolios. In many instances, engagement is evident and ongoing. For example, Indigenous land managers engage in environmental management with multiple stakeholders, such as government, scientists, producers and conservationists.<sup>239</sup> This is undertaken through Indigenous Ranger schemes,<sup>240</sup> Native Title agreements and co-managed protected areas, amongst others.<sup>241</sup> These networks are already part of an informal One Health system.

Biosecurity systems, such as those enabled by DAWE, engage with multiple stakeholders. They fund rangers, ecological and social research, and engage at various levels with farmers and industry. However, research indicates that producers remain uncertain about the roles of stakeholders in biosecurity, including their own.<sup>242</sup>

Many stakeholders remain on the periphery of public health and pandemic risk management policies and they need to be brought more directly into policy design and implementation. For example, currently, One Health frameworks are not explicitly considered by the extractive industries nor is public health widely considered in environmental assessments, especially when it comes to zoonoses.<sup>243</sup> Elsewhere, it has been demonstrated that miners and mining operations increase the risk of spillover events, and this risk needs to be more closely studied in Australia.<sup>244</sup> As previously discussed, environmental practitioners, in particular, need to be more included.

## 5 How do we get there? Policy and strategy

**Policy-makers should begin efforts to collaborate in new ways to reshape the way Australia thinks about, prevents and prepares for pandemics.**

We recommend three focus areas:

- 1 An integrated One Health system
- 2 An increased focus on research and development
- 3 Inclusion of pandemic risk in existing laws and policies.

### 5.1 An integrated and well-supported 'One Health' system

A world-class pandemic risk management system requires a One Health governance body. To date, the fragmentation of One Health policies across different levels of government, and across Australia's human health, animal health and ecosystem health sectors has led to a lack of integration and collaboration across sectors. Moving forward, Australia's One Health approach should be both **integrative**, across governance scales and disciplinary siloes, and **collaborative** with diverse stakeholders, including Indigenous Traditional Owners, lawyers, farmers, rangers, researchers, ecologists and community members, among many others.

Integration across disciplinary siloes and governance scales is key. One Health is the overarching approach under which biosecurity, trade, agriculture, private land management, and environmental and wildlife management are governed. Preventing pandemics by managing environmental drivers—such as climate change, land-use change, and biodiversity loss—requires stakeholder engagement across all sectors and scales, in all communities. A report by the United Nations Environment Programme in 2020 emphasised the need for greater efforts to educate politicians about the importance of interdisciplinary surveillance, detection and prevention measures.<sup>245</sup> However, mainstreaming

a One Health approach will also require increased awareness-raising and proactive mitigation action at local levels, requiring individual consumers, communities, companies and industries to consider the environmental impacts of their actions. For this to happen, greater education on the drivers of spillover and pandemics is required from the global to the local level. Thereafter, policies should prioritise working with locals to identify the opportunities and barriers, to enable support that empowers desirable One Health actions.

A new One Health governance body should sit in the federal government but be designed and steered by a cross-sectoral and transdisciplinary group. The recommendation for an integrated governance system is not new, nor limited to the One Health paradigm. The CSIRO biosecurity report noted the need for connective governance that included digitising and data sharing between jurisdictions and sectors, strong stakeholder engagement, streamlining domestic trade, strengthening international relationships and improving supply chain risks.<sup>246</sup>

There are currently several research and policy groups around Australia, outside of government, that have prioritised a One Health approach and that would be complementary to a nationally integrated system. These include CSIRO's Infectious Disease Resilience Mission,<sup>247</sup> the Indo-Pacific Centre for Health Security,<sup>248</sup> the Australian Centre for International Agricultural Research,<sup>249</sup> the Murdoch University Centre for Biosecurity and One Health,<sup>250</sup> and those involved with the One Health Master Action Plan for Australia's National Antimicrobial Resistance Strategy.<sup>251</sup> A nationally integrated governance body should seek to connect the dots between these initiatives and policies by ensuring the inclusion of deep prevention research and policy.

## The Murdi Paaki Regional Assembly

Alternative modes of devolved governance have already been developed and these can be used as a starting point for future policy. The Murdi Paaki Regional Assembly (MPRA) is one such example of an organisation founded on LDM and Indigenous self-determination. The MPRA is the peak representative structure that represents the interests of Aboriginal and Torres Strait Islander Peoples in 16 communities across Western NSW.<sup>252</sup> Since its creation in 1990, the MPRA has served as an enduring model of equitable representation for all Aboriginal and Torres Strait Islander Peoples in the region to enfranchise and empower all involved. The MPRA also has a clear approach

to relationships with government bodies, NGOs and private sector partnerships; two-way accountability is required, including commonly developed systems for assessing, monitoring and evaluating project outcomes through the lens of community-relevant values, targets and data.<sup>253</sup> To promote a similar Indigenous-led LDM approach in One Health governance requires recognition of local knowledges and capacities, a prioritisation of self-determination, a willingness to co-create culturally-led partnerships and an alignment of policies and laws with Indigenous values and ways of being.

An overarching centralised body is not antithetical to a shared, collaborative governance scenario but can provide the institutional stability, leadership and drive needed for collaborative and bottom-up mechanisms to thrive. A shared responsibility approach to biosecurity – including the governance of prevention, preparedness, detection, response and recovery has been supported since the 1996 Nairn Review of Australian Quarantine<sup>254</sup> and the 2008 Beale Review.<sup>255</sup> Likewise, the recent Independent Review of the EPBC Act highlighted that the management of Australia’s environment is a shared responsibility, requiring coordination across jurisdictions, disciplines, and community groups. However, effecting a shared responsibility approach to One Health governance requires a common understanding of priorities, values and roles throughout the socio-ecological system.<sup>256</sup>

In Australia, a shared responsibility approach to One Health governance should be congruent with the **‘Healthy Country, Healthy People’** policy and Aboriginal and Torres Strait Islander lores. As no one group can create a healthy

country without institutional support, Australia’s One Health governance system must be **collaborative**. Most importantly, this requires engagement and collaboration with Indigenous Peoples and local voices to co-create policies, laws, programs and services, with strong partner and feedback processes and some devolution of power to the local level. Local decision-making (LDM) provides an opportunity to reinvigorate governance arrangements for both Indigenous communities and governments at all levels. LDM is intended to strengthen the relationship between Indigenous communities and government bodies. Through this process, LDM organisations and government bodies can establish common priorities and coordinate the delivery of government and non-government services. Ultimately, this model aims to:

- decrease the duplication of services
- increase the effectiveness of service delivery to better meet local needs
- increase the skill and capacity of local governance bodies.

Finally, a coordinated One Health governance system must give equal priority to environmental health as a means of pandemic

prevention. Currently, in Australia, public health and biosecurity responses to emerging infectious diseases largely focus on controlling cross-border pathogen transfer and community outbreaks, rather than addressing the ecological sources from which the threats emerge. For example, Australia's National Plan for Health Security 2019-2023 states that Australia's Health Security Initiative with the Asia-Pacific offers an opportunity to accelerate new research on drugs and diagnostics but fails to discuss efforts to improve understanding of, or action on, the underlying environmental drivers of emerging infectious diseases.<sup>257</sup> While the National Plan provides a series of recommendations centred on the coordination of the human and animal health sectors, with the purpose of building, strengthening and maintaining strategic One Health partnerships, the environmental realm is missing from the policy goals. Most national One Health policies suffer the same fault.

Finally, to have an integrated One Health system that exceeds international standards, it needs to have clearly defined and reportable targets underlined by the values highlighted in Section 4. Deliverables should be reported against clearly agreed priorities and goals. The Sustainable Development Goals may be used as a model here. Clear communication of goals, supported by effective legislation and governance regimes, is necessary. Some examples of legislation and governance regimes are discussed in the following section.

## 5.2 Networked policies and laws

Given the complex and multisectoral nature of zoonotic risks, it is unlikely that a single institution or instrument could adequately prevent the 'era of pandemics'.<sup>258</sup> Top-down regulation – generally referring to legislation or otherwise binding legal obligations – rarely mirrors the dynamism and complexity of

environmental challenges, especially those that scale across ecosystems and jurisdictions.<sup>259</sup> Equally, bottom-up policies – such as self-regulation, voluntary initiatives, or education programmes – can result in the fragmentation of global environmental challenges.<sup>260</sup> As suggested above, Australia's One Health system would benefit from a coordinated governance approach, with stakeholders across disciplinary and societal sectors collaborating. Implementing such an approach into laws and policies will require a toolbox of both top-down and bottom-up policies, from the international to the local scale.

There are numerous international standards already relevant to pandemic prevention, including those in the *Convention on Biological Diversity* (CBD), the *United Nations Framework Convention on Climate Change* (UNFCCC), the *Convention on the International Trade in Endangered Species of Wild Fauna and Flora* (CITES), the *United Nations Convention to Combat Desertification* (UNCCD) and the *Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (Ramsar), as just a few examples. Recently, there have been calls to develop a new multilateral pandemic treaty. However, given the complex and multisectoral nature of zoonotic risks, a single institution or instrument may be ill-equipped to address the various drivers of pandemics.<sup>261</sup> Moreover, attempting to govern an already governed space may result in the new pandemic treaty conflicting with the above international environmental law regimes. Instead, the synergies between environmental law regimes should be harnessed and enhanced to take a **systems thinking** approach to pandemic prevention. As many of the environmental drivers of pandemics are global challenges (e.g. climate change and international wildlife trade), international standards are necessary. However, international standards are

only effective when complied with, and enforced by, national jurisdictions.

On a national scale, One Health policies should incorporate and exceed relevant international standards, applied in a way that best addresses the risks and opportunities in Australia. For example, Australia could outline a series of Healthy Country, Healthy People and One Health targets that are similar to the United Nations' Sustainable Development Goals, while also highlighting how these targets are consistent with the values outlined in Section 4. National standards should also adopt a whole-of-country management perspective, including the integration of human, animal and environmental health priorities. Many of the recommendations of Professor Graeme Samuel for amendment of the *EPBC Act* are the very kinds of transformative actions that align international and national priorities and have the potential to reduce the environmental risks of zoonotic spillover. For example, the key recommendation of the Independent Review is the development of robust, measurable and legally enforceable national environmental standards that establish clear outcomes and limits for decision-makers and prescribe how activities should contribute to the outcomes of the *EPBC Act*.<sup>262</sup> The Review recommends that the national environmental standards address **Indigenous engagement and participation** in decision-making, environmental monitoring and restoration, and wildlife permits and trade, all of which are key to a holistic One Health policy framework in Australia.<sup>263</sup> This could be done in conjunction with applying the principles of the United Nations Declaration of the Rights of Indigenous People.

Collaboration and consolidation are required between existing One Health policies. In practice, the requirement for certain zoonoses to be monitored and reported differs across jurisdictions.<sup>264</sup> Further, reports of animal disease outbreaks are collected primarily

to mitigate adverse impacts on trade.<sup>265</sup>

Accordingly, there is a disparity between human and animal health surveillance and reporting systems in Australia, with progress much slower in animal health and food production in comparison to biosecurity and public health surveillance.<sup>266</sup> These deficiencies in Australia's zoonotic disease monitoring indicate a need for a centrally coordinated, systematic and ongoing surveillance system, with concurrent human, animal and environmental research, to better understand emerging infectious disease threats. The need for a multi-sectoral One Health surveillance system is endorsed by Australia's National Antimicrobial Resistance Strategy, which recommends sustainably funding evidence-based surveillance of human, animal, food and environmental usage and resistance data.<sup>267</sup> A coordinated and multi-sectoral One Health surveillance system is an example of a policy centring **systems-level and long-term thinking**, to prevent spillovers at the human-animal-environment interface.

Several actions are necessary on a more immediate and localised scale to implement a One Health system in Australia. As discussed in section 5.1 above, LDM is critical to engaging the knowledges of Indigenous and local stakeholders to co-create effective One Health policies and laws. LDM may include the expansion of existing Indigenous conservation projects. Currently, most Indigenous conservation projects are contained in western and northern Australia.<sup>268</sup> Expanding those projects out to other states is necessary, to promote holistic, **multispecies and socio-ecological wellbeing**, consistent with **One Health/Healthy Country** policies.

Further, One Health should be incorporated into land-use and development planning documents. Environmental Impact Assessments (EIAs) can incorporate Health Impact Assessment in most jurisdictions. However, health criteria in

EIAs should be made more explicit. Zoonotic disease risk should also be a defined factor for consideration from both an environmental and health impact assessment perspective. To enable this, EIAs should consider not only direct environmental impacts but also the indirect and cumulative effects of proposed development projects. The consideration of indirect impacts in EIAs is consistent with Australian case law.<sup>269</sup> However, cumulative impacts — environmental effects arising from ‘either persistent additions from one process or development or compounding effects involving two or more processes or developments’<sup>270</sup> — have yet to be sufficiently accounted for. This may be because of the fragmented and siloed nature of EIA assessments under the EPBC Act, which rely on project-level assessments as opposed to taking a **long-term and systems thinking** approach to ecosystem management. To incorporate indirect and cumulative effects into EIAs, frameworks that address the social, cultural and biodiversity values in the assessment process, including Indigenous engagement, have been previously proposed.<sup>271</sup>

Promoting this network of One Health laws and policies, from the local to the global scale, will require economic support. First, government funding requires redirection and realignment towards One Health/Healthy Country priorities. In 2021, researchers found that spending \$2 billion annually for 30 years could restore 13 million hectares of degraded land without affecting intensive agriculture and urban areas (111% of the cost of which would be received through carbon market revenue).<sup>272</sup> This is dwarfed by the tens of billions of dollars spent annually on fossil fuel-related subsidies.<sup>273</sup> Another recent research paper found that redirecting Indigenous government expenditure can lead to economically viable, culturally appropriate, country-based, sustainable solutions that enhance peoples’ **wellbeing**, as

well as having benefits for natural resource management.<sup>274</sup>

Currently, biodiversity loss is driven by economic incentives, such as subsidies for mono-crop agriculture and industrial overfishing. However, as established in Section 2.4, biodiversity loss, intensive agriculture and unsustainable resource exploitation are all key drivers of zoonotic spillover risk. Accordingly, economic incentives should be redirected towards incentivising positive action for biodiversity management, such as species or ecosystem restoration. This system of ‘biodiversity credits’ would finance ‘investments in biodiversity conservation with a net biodiversity gain from the pre-existing baseline’.<sup>275</sup> The credits generated by those who conserve biodiversity may subsequently be purchased by stakeholders interested in conserving biodiversity.<sup>276</sup> Biodiversity credits should be contrasted to biodiversity offsets; the former is directed towards net biodiversity gain, while the latter can be used to compensate for biodiversity loss elsewhere.<sup>277</sup>

A carbon and biodiversity credit scheme is currently being trialled by the Australian Government’s Department of Agriculture, Water and the Environment with the Australian National University, to pay farmers who plant native trees, in compliance with a biodiversity protocol currently under development.<sup>278</sup> Not only do farmers receive financial benefits from this program, but the planting of trees also promotes valuable ecosystem services on their land, such as shelter for livestock and improved soil health.<sup>279</sup> The Carbon and Biodiversity Pilot adopts a **long-term thinking** approach to biodiversity credits, by requiring that the plantings are protected and maintained for a minimum of 25 years.<sup>280</sup> The pilot also encourages **transparency and trust** by requiring participating landholders to comply with measurement, reporting and auditing requirements.<sup>281</sup>



### 5.3 Research funding and support

The current state of limited coordination and prioritisation of Australia's One Health efforts has led to gaps in Australia's understanding of national risks and drivers regarding spillover and pandemics. Building an effective network of One Health stakeholders and policies in Australia requires insights across the natural and social sciences, Indigenous and local knowledges, business and economics, humanities and the arts, and many other diverse experiences and sources of expertise. Some relevant Australian research programs tie into the One-Health/Healthy Country approach, such as the Murdoch Harry Butler Institute's research program concerning the establishment of a new training centre dedicated to Aboriginal-led restoration of degraded landscapes.<sup>282</sup> However, the majority of research on zoonotic diseases continues to be conducted in disciplinary siloes, and thus, cannot be categorised as One Health research.<sup>283</sup> There is much that needs to be learned to direct investments in pandemic risk management more precisely and to upscale and evaluate the pilot and local programs to scale.

Looking forward, research priorities need to include, but are not limited to:

**1 Movement towards identifying zoonotic risks in Australian wildlife, livestock and companion animals, as well as invasive species:** Effective surveillance for known and potential zoonoses in wildlife, livestock, pets and invasive species is critical to pandemic prevention. This may include mapping zoonotic hotspots within Australia to effectively allocate resources to regions and communities at most risk of zoonotic spillover events. This will also require further examination of environmental drivers in Australia, such as climate change, and their impact on zoonoses. Further knowledge about the zoonotic risks associated with environmental

drivers would support the creation and coordination of policies to reduce both anthropogenic environmental impacts and pandemic risk.

**2 One Health/Healthy Country research with an emphasis on Indigenous knowledges:**

There is an enduring and robust body of Indigenous ecological knowledges consistent with both positive environmental outcomes and reduced zoonotic disease risk. With Indigenous Peoples leading the way in terms of sustainable ecological practices and biodiversity conservation, the Australian government must also recognise the import of Indigenous knowledges in pandemic prevention. The Indigenous-CSIRO joint initiative, 'Our Knowledge, Our Way' should be seen as the first port of call for best practice guidelines in Indigenous knowledge sharing and collaboration.<sup>284</sup> However, researchers and policy-makers alike need to ensure that principles are not generalised and recognise that Indigenous groups are diverse.<sup>285</sup> The lived experiences and understandings of Indigenous people at the local level should be respected so that communities can determine their needs and priorities.

**3 Collaborations with Indo-Pacific and wider neighbours to underpin regional resilience:** Australia cannot prevent pandemics through nationally-coordinated approaches alone. Due to global trade routes and tourism, as well as migratory species and other transnational zoonotic disease risks, Australia must also collaborate with its Indo-Pacific partners to promote regional resilience. The research partnership between the Australian Government, Indo-Pacific Centre for Health Security and World Organisation for Animal Health (OIE) is an important first step in fostering regional resilience.<sup>286</sup> Additional collaborations with Indo-Pacific researchers

and communities, considering local knowledges, cultures, social norms, political and power structures, and ways of being, is critical to sustainable and embedded One Health transformations. This may include developing robust and green COVID-19 recovery plans and funding arrangements, to ensure vulnerable communities in the region can identify and address gaps in their biosecurity systems.

- 4 Programs collaborating with the Department of Health:** to identify and monitor high-risk human populations who have high rates of exposure to wildlife pathogen sources for signs of zoonotic infection. Programs like the South Australian ‘Health in all Policies’ framework could be scaled up to other jurisdictions and could include animal and ecosystem health.<sup>287</sup> The newly established DAWE and Department of Health jointly managed Human-Animal Spillover and Emerging Disease Scanning Group, is a good (but limited) example of such collaboration.

A non-exhaustive list of research questions that should be the subject of further exploration includes, but are not limited to:

- What specific characteristics of Australia make it susceptible to pandemics/zoonotic spillover (e.g. wildlife trade, agricultural intensification, land-use change, climate change, natural disaster etc.)?
- Can genome mapping be used to predict spillover risk and pandemic potential?
- Does viral discovery research itself increase spillover risk?
- How can data mapping play a role in prevention and how can we improve mapping processes?
- Which occupations, groups and pastimes are likely to be the first human infections of newly emerged zoonotic pathogen?

- Are there zoonotic pathogens in Australia that are transmitted by vector species such as ticks, fleas and mosquitoes?
- How do socio-economic and cultural disparities in Australia contribute to pandemic vulnerability, and how do we build more resilient communities?
- What human/consumer behaviours, laws and policies contribute to the spread of, or the prevention of, pandemics and spillover events (for example, how do we get people to eat less meat, consume less, cease importation of wild animals)?
- How does government use/disuse/misuse of science/research contribute to the spread of pandemics?
- How can we build an ‘infrastructure of trust’ to increase community respect for government and scientists?
- How can we better communicate One Health policy?
- How do global/national trade markets contribute to zoonotic spillover?
- How do Australian consumer patterns increase spillover risk in low-income countries and how can these patterns be disrupted?

These research priorities should be pursued with a focus on:

- 1 Outcomes, rather than outputs:** Output-orientated research is measured by the number of deliverables. In contrast, the value of outcome-focused research is dependent on its quality and the level of impact it made on the challenge in question. Outcome-orientated research requires **long-term** evaluation. One important aspect of outcome-orientated research in Australia is the extent to which research is consistent with, and further supports, Indigenous land stewardship and ‘Healthy Country, Healthy People’ policies.

## **2 Improved and continuous communication and education about One Health research,**

to enhance awareness and understanding of zoonotic diseases, biosecurity risk and the prevention responsibilities of farmers, industry and consumers. This should include a strong social sciences dimension including consumer behaviour, communication and collaboration methods, distrust/conspiracy theories and benefits of economic incentives.

## **3 Funding interdisciplinary and collaborative research that seeks to identify and close major knowledge gaps:**

A lack of funding for interdisciplinary One Health/Healthy Country projects exacerbates disciplinary siloes. While the National Health and Medical Research Council only funds medical and public health research, the Australian Research Council generally avoids funding such research. Further, while National Environment Science Program (NESP) hubs support social science research, they are grounded in the environmental sciences and not health-related research. The opposing mandates of Australia's leading funding sources limit the ability for genuine collaboration across the human-animal-environment interface. To better support interdisciplinary and collaborative research, there should be a specific One Health funding program, akin to a NESP hub, that allows research funding centred on interdisciplinary One Health research.

## **5.4 Concluding comments**

Pandemics are becoming more frequent and more severe, and are a threat to the wellbeing of every Australian. The current pandemic strategy depends on responding to spillover events after they occur with public health measures and technological responses. However, COVID-19 has demonstrated that such response actions are not comprehensive nor fast enough to avoid global disruption and harm.

Overall, the question of how to best work together to help Australia reduce the likelihood and impact of future pandemics does not come with an easy answer. In this report, we have sought to summarise the current state of pandemic risk management policies in Australia, the need for improvement and strategies to start to reshape the way that Australian governance systems define, prevent and prepare for pandemics. Australian leaders can and should strive for healthy and resilient communities and landscapes by taking steps to further understand and evidence the linkages between environmental change and emerging diseases in Australia and building new communities of expertise. Most importantly, Australian leaders should prioritise the development of an integrated, highly sensitive and holistic One Health/Healthy Country system and become a world leader in pandemic risk management.

## Appendix A: List of Collaborators

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## PREVENTING PANDEMICS BLUESHEET

Last updated 8 November 2021

### A Where are we now?

#### AROUND US

- Sustained global focus on responding to ‘unforeseen’ COVID-19 pandemic
- Increased awareness of economic and social value in preventing further pandemics
- Growing human population/natural system interfaces
- Complex web of potential pandemic drivers including land-use change, agricultural intensification, wildlife and other trade patterns, knowledge gaps and climate change
- Growing distrust in governments and scientific advice

#### CURRENT AUSTRALIAN SYSTEM

- Requirement for Australia to have ‘capacity to respond promptly and effectively to public health risks and public health emergencies of international concern’
- Standing health and biosecurity legislation and emergency preparedness and response plans in place
- State and territory governments with primary responsibility for management of communicable disease emergencies and biosecurity responses
- National coordination activated if national response deemed necessary
- Some states with One Health policies
- Some understanding of zoonosis risks

#### ‘GOOD’ ASPECTS

- Strong international standing/trusted broker
- Well connected within the region
- Comprehensive suite of ‘response’ legislation and associated support activities in place
- Staff generally well educated, with good skills and expertise (particularly diagnostic and research)
- Relatively good livestock surveillance / farmers and rangers aware of biosecurity risks

#### ‘NOT SO GOOD’ ASPECTS

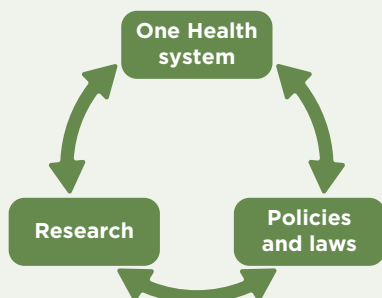
- Relatively low historical investment in ‘preventing pandemics’
- Low public awareness of environmental drivers of pandemics
- One Health system not formally in place & fragmented in practice (horizontally –human, animal, environmental; vertically –local, regional, state, national, global)
- Lack of political support for long-term goals with real outcomes
- Limited knowledge & application of Indigenous knowledge
- Scaling back of environmental & other ‘non-economic’ laws
- Past lessons not always applied
- Gaps in non-native animal knowledge & management
- Greater focus on pathogens than drivers
- Declining support for research
- Limited on-shore manufacturing of vaccines /pharmaceuticals
- Biosecurity seen as more of technical than social challenge
- National wildlife surveillance suboptimal



### C What do we do to get there?

#### STRATEGY

Work together in new ways to help reshape the way Australia thinks about, prevents and prepare for pandemics



#### STRATEGIC FOCUS AREAS

- 1 **One health system:** Designed and steered by new cross-sectoral group to deliver against clear agreed priorities; with integrated human, animal and environmental focus; involving all layers of government; supported by effective legislation, governance and communication
- 2 **Research:** Emphasis on Indigenous knowledges and on outcomes, with adaptive management and feedback loops to ensure policy change has impact; nationally-coordinated support/funding structures to identify and close major knowledge gaps; strong social dimensions including consumer behaviour, communication methods, distrust/conspiracy theories, benefits of economic incentives and mobilising enduring bipartisan political support; collaborative with Indo-Pacific neighbours to underpin regional resilience
- 3 **Policies & laws:** Engage Indigenous and local voices in co-creation of new policies and laws; address pandemic risk and incorporate environment/animal/human health nexus; enhance alignment between different levels and functions of government and with international standards; at a minimum, target town and development planning, biodiversity credits, national standards, extraction vs wellbeing subsidies, and better integration of socio-ecological health within public health policies

## B Where do we want to be?

### GUIDING PRINCIPLES

- 1 Bring together transdisciplinary expertise from across diverse knowledge systems (including Indigenous and social sciences) and build new communities of expertise
- 2 Understand and evidence linkages between drivers of emerging diseases, characteristics of diseases with pandemic potential and risky human behaviours
- 3 Aim to establish one highly sensitive and holistic health system
- 4 Strive for complementary system changes –both horizontally and vertically
- 5 Think and work in a unified way across human, animal and ecosystem domains
- 6 Strive for healthy and resilient communities and landscapes
- 7 Support both top-down and bottom-up leadership
- 8 Recognise and factor-in that different communities have highly variable social, economic and environmental contexts
- 9 Through our work, anticipate concurrent progress in important related agendas including food security, climate security, externalised costs and human exceptionalism



### VALUES

- Diverse knowledge
- Systems thinking
- Long-term thinking
- Integration and balance
- Collaboration
- Honesty and transparency
- Justice
- Human wellbeing



### MISSION

Help leaders understand and address the drivers of disease emergence and thus prevent future pandemics



### VISION

A world without pandemics

## D How do we make this happen?

- 1 Formalise and expand 'PP group' to ensure broad representation (including health sector, NGOs, regions, Regional)
- 2 Prepare & socialise policy brief document
- 3 Enhance communication of relevant information (including video, infographics, website, information exchange sessions)
- 4 Explore new funding opportunities (consistent with clear criteria)

### FOCUSING QUESTION

How can we best work together to help Australia reduce the likelihood and impact of future pandemics?

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