Australian Government
Department of Foreign Affairs and Trade

Australian Aid

EVALUATING A DECADE OF AUSTRALIA'S EFFORTS TO COMBAT PANDEMICS AND EMERGING INFECTIOUS DISEASES IN ASIA AND THE PACIFIC 2006–2015: ARE HEALTH SYSTEMS STRONGER?

AUGUST 2017

OFFICE OF DEVELOPMENT EFFECTIVENESS

dfat.gov.au/ode

 ISBN 978-0-9954465-1-9

Published by the Australian Government Department of Foreign Affairs and Trade, Canberra, 2017.

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This document is online at dfat.gov.au/aid/how-we-measure-performance/ode/strategic-evaluations/Pages/strategic-evaluations.aspx

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Cover photo: Women selling poultry, Hanoi, Vietnam, 2005. Photo: Lorrie Graham (from DFAT photolibrary)

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FOREWORD

Since the outbreaks of severe acute respiratory syndrome (SARS) in 2003 and H5N1 highly pathogenic avian influenza in 2004, the Australian Government has demonstrated strong leadership in helping countries in Asia and the Pacific combat emerging disease threats.

The threat of a new pandemic remains a key global risk. The close proximity of large populations of people and animals in Asia means this region faces particularly serious challenges as an epicentre for emerging infectious diseases with pandemic potential. The Pacific island countries and territories have fewer people and fewer animals, but pandemics and emerging infectious diseases are a challenge to their response capacity. This is recognised in DFAT's *Health for Development Strategy 2015–2020* which has the dual objectives of building regional preparedness and capacity to respond to emerging health threats and building country-level health systems and services that are responsive to people's needs.

Applying a health systems lens, ODE's evaluation examines the implementation characteristics and effectiveness of Australia's work to strengthen the human and animal health systems involved in the response to emerging disease threats. In doing so, it addresses an important gap. Whilst the aid program's response to emerging infectious diseases over the last decade has generated a large amount of information, there has been limited analysis of the effectiveness of interventions in different contexts and lessons for future investments.

Given the growing profile of health security as a global development issue and its increasing importance within the Australian aid program, this evaluation is timely. Policy makers and implementers would do well to consider its lessons closely.

Jim Adams
Chair, Independent Evaluation Committee

ACKNOWLEDGEMENTS

The evaluation team comprised three independent consultants—Dr Gill Schierhout (evaluation and health specialist / team leader), Dr Laurence Gleeson (animal health specialist), Adam Craig (infectious disease epidemiologist)—and Irene Wettenhall (evaluation manager / team member) from the Office of Development Effectiveness (ODE) of the Department of Foreign Affairs and Trade (DFAT). David Slattery from ODE participated in the fieldwork in Fiji and Raha Roggero from Health Policy Branch, DFAT, participated in the fieldwork in South-East Asia. David Slattery provided direction and oversight to the evaluation and drafting of the report. The team brought international public health, animal health, monitoring and evaluation, and program management expertise to the evaluation together with a sound understanding of the context and the international response to emerging infectious diseases, and knowledge of DFAT's systems and processes.

The evaluation team would like to thank the DFAT staff at the Australian Government's Suva, Honiara, Bangkok, Phnom Penh and Jakarta posts for facilitating the team's fieldwork. The team is also grateful to the World Organisation for Animal Health's Sub-Regional Representation for South-East Asia and the United States Agency for International Development, which supported field visits and interviews in Cambodia and Bangkok. Sincere thanks also to the partner government officials, implementing organisation representatives, past and present DFAT staff and members of the evaluation reference group who were interviewed by the evaluation team or provided comments on the draft report.

ACRONYMS AND ABBREVIATIONS

ACIAR	Australian Centre for International Agricultural Research
AIP	Australia Indonesia Partnership
AIP EID animal health program	Australia Indonesia Partnership Emerging Infectious Diseases Animal Health Program (2010–15)
AIP EID program	Australia Indonesia Partnership Emerging Infectious Diseases Program (2015–18)
AMR	Antimicrobial resistance
APEC	Asia Pacific Economic Cooperation
APSED	Asia Pacific Strategy for Emerging Diseases
AQC	DFAT Aid Quality Check (formerly Quality at Implementation Report)
AQIS	Australian Quarantine and Inspection Service
ASEAN	Association of Southeast Asian Nations
ASEAN+3 EID program	ASEAN Plus Three Emerging Infectious Diseases Program (2006–10)
AusAID	Australian Agency for International Development
CARE program	CARE Australia Community-Based Avian Influenza Risk Reduction Program—Mekong Region (2006–10)
CDC	Centers for Disease Control
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWR	Department of Agriculture and Water Resources
DFAT	Australian Department of Foreign Affairs and Trade
EIDs	Emerging infectious diseases
EWARS	Early warning and response system

FAO	Food and Agriculture Organization of the United Nations
FETP	Field epidemiology training program
FHI360	Family Health International 360
FMD	Foot and mouth disease
GHSA	Global Health Security Agenda
H1N1	H1N1 swine flu virus
H5N1 HPAI	H5N1 highly pathogenic avian influenza virus
H7N9	Asian lineage avian influenza A (H7N9) virus
ICR	Independent completion report
IHR	International Health Regulations (2005)
iSIKHNAS	Sistem Informasi Kesehatan Hewan Nasional (integrated)—Indonesia's National Animal Health Information System
JEE	Joint External Evaluation
LAMP	FAO Live Animal Marketing and Production Program (2016–19)
M&E	Monitoring and evaluation
NGO	Non-government organisation
ODE	Office of Development Effectiveness
OIE	World Organisation for Animal Health
PDSR	Participatory Disease Surveillance and Response
PEID	Pandemics and emerging infectious diseases
PICTs	Pacific island countries and territories
PNG	Papua New Guinea
PPHSN	Pacific Public Health Surveillance Network
PREVENT	PREVENT Emerging Disease Risk Reduction—Mekong (2011–15), a component of the United States Agency for International Development's Emerging Pandemics Threat Program
PRIPP	Pacific Regional Influenza Pandemic Preparedness Program (2006–10)
PVS	Performance of Veterinary Services

QAI	Quality at Implementation Report (predecessor of AQC)
SARS	Severe acute respiratory syndrome
SEAFMD/SEACFMD	South-East Asia Foot and Mouth Disease/South-East Asia and China Foot and Mouth Disease initiative (2006–11)—SEAFMD became SEACFMD after China, Singapore and Brunei Darussalam joined in 2010
SEARO	WHO's South East Asia Regional Office
SPC	Secretariat of the Pacific Community
STANDZ	Stop Transboundary Animal Disease & Zoonoses (2011–16)
Timor-Leste Biosecurity project	Timor-Leste Biosecurity Strengthening Project (2006–10)
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VAHW	Village animal health worker
Vietnam UN Joint Program	Joint United Nations/Government of Vietnam Avian Influenza Program Phase II (2006–10)
WPRO	WHO's Western Pacific Regional Office
WHO	World Health Organization
World Bank AHI Facility	World Bank Avian and Human Influenza Facility (2006–11)

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BACKGROUND

Since the outbreaks of severe acute respiratory syndrome (SARS) in 2003, H5N1 highly pathogenic avian influenza (HPAI) in 2004 and Asian H7N9 avian influenza in 2013, Asia has been confirmed as an epicentre for emerging infectious diseases (EIDs) with pandemic potential.

The majority (75 per cent) of EIDs are animal diseases that can infect humans (zoonoses). Some zoonoses, such as avian influenza, have the potential to mutate to allow transmission between humans and spread quickly around the world. Scientists believe there is a high likelihood a new highly infectious animal-derived influenza will emerge in Asia over the next decade. The risk of zoonotic disease emergence in Asia is increasing with intensive animal farming close to major urban populations, increased cross-border travel and trade, and weak public health systems. In 2013, the insurance industry rated the risk of a global pandemic as the greatest risk to the industry.[1] The annualised expected loss to the global economy from potential pandemics has been estimated at more than US$60 billion per annum or US$6 trillion this century.[2]

In contrast to Asia, the small Pacific island countries and territories have fewer people and fewer animals of potential zoonotic risk, but are at risk of imported zoonoses. The Pacific region is also particularly vulnerable to climate change, increasing vulnerability to emergence or re-emergence of infectious diseases. The double burden of non-communicable diseases and infectious diseases is placing immense pressure on weak Pacific health systems that are less able to prevent, mitigate and respond to emerging disease threats.

THE EVALUATION

The Australian Government spent around $194 million between 2006 and 2015 through the aid program to help countries in Asia and the Pacific combat EIDs—this was around 4 per cent of Australia's total aid expenditure on health during this period. Investments were guided by two pandemics and emerging infectious diseases (PEID) strategies that aimed to strengthen human and animal health systems for EID prevention and response through technical assistance and capacity building.*

The EID funding was spent on animal health (37 per cent), human health (35 per cent) and joint initiatives targeting both human and animal health (28 per cent). Investments focused mainly on efforts to improve

* AusAID's *Pandemics and Emerging Infectious Diseases Strategy 2006–2010* and its successor, the *Pandemics and Emerging Infectious Diseases Framework 2010–2015*.

disease surveillance systems, health workforce epidemiological capacity, laboratories, and leadership and governance for EID work.

Around 14 per cent of funding was allocated to the Pacific including Papua New Guinea (PNG), 77 per cent to Asia and 9 per cent to global programs.* Around 58 per cent of the funding was from the Australian Agency for International Development (AusAID) / DFAT's regional programs, 40 per cent from bilateral country programs and 2 per cent from global humanitarian programs.

The Office of Development Effectiveness (ODE) commissioned the evaluation to build the evidence base on how to strengthen human and animal health systems to prevent, detect and respond to EID threats. A further purpose was to identify lessons from past assistance and use these to inform decision-making about future DFAT investments and policy engagement on regional health security. The evaluation was concerned with identifying and understanding implementation characteristics that contribute to stronger human and animal health systems, not with assessing the performance of individual programs or implementing partners.

The evaluation was conducted at the portfolio level and covered 35 investments funded by Australia under the two PEID strategies in Asia and the Pacific between 2006 and 2015. The focus was on the 10 largest investments with fieldwork conducted in Fiji, Solomon Islands, Bangkok (to meet regional implementing partners), Cambodia and Indonesia. The largest bilateral investment was in Indonesia ($59 million) and the largest regional investment was in the World Health Organization's (WHO) Asia Pacific Strategy for Emerging Diseases (APSED) ($28.8 million).

KEY FINDINGS

Human health

Australia's EID investments have contributed to substantial improvements in the availability and sharing of EID data in Asia and the Pacific over the last decade. This has resulted in timelier and more open exchange about EID threats and greater awareness of the EID situation within and between countries.

These outcomes came from efforts on a number of fronts:

- the establishment of field epidemiology training programs as a cornerstone of EID surveillance and response in South-East Asia† and a tailored Data for Decision Making course for the Pacific
- the development of surveillance systems including early warning and response systems at provincial level in Indonesia and the Pacific Syndromic Surveillance System
- the development of surveillance and laboratory networks, including the South-East Asian Field Epidemiology Training Network, the Pacific Public Health Surveillance Network and PacNet, which improved the sharing of information between and within countries, and strengthened regional cooperation

* The geographic coverage of global programs extends beyond Asia and the Pacific.
† Australia was instrumental in the success of the field epidemiology training program (FETP) in Indonesia, which is now well established and institutionalised. Australia also contributed to the establishment of FETPs in Cambodia, Lao PDR, Mongolia, Papua New Guinea, Singapore and Vietnam through WHO's APSED. Australia's investments in the Vietnam UN Joint Avian Influenza Program and World Bank Avian and Human Influenza Facility also contributed to strengthening of field epidemiology training in South-East Asia.

- improved preparedness and response planning by ministries of health, especially in South-East Asia, through WHO's APSED
- greater political commitment to EID work in South-East Asia as a result of support provided through WHO and the Association of Southeast Asian Nations (ASEAN).

These are positive developments, but they need to be kept in perspective. In particular, **capacity to use EID surveillance data for policy, planning and response has not kept pace with its increased availability**. Reflecting this challenge, a WHO assessment in the wake of the recent Ebola crisis found that most low- and middle-income countries in the Asia Pacific region do not yet have the capacity to respond adequately to events of public health concern.[3]

Moving forward, a key test of future EID initiatives is whether they can move beyond narrow technical areas and address the policy and institutional constraints to improving EID preparedness and response capacity. This will require strategies to strengthen broader systems through EID investments in areas such as public health policy making, health systems planning and service management (with a focus on primary health care), disease outbreak response and recovery, and health financing. DFAT should also consider the scope for greater integration of health security into disaster risk reduction policies and plans, and the inclusion of emergency and disaster risk management programs in national health strategies.*

A geographically differentiated approach will be needed. In the Pacific, where DFAT still has significant bilateral health programs, there is a need to better integrate EID work with the broader health systems strengthening agenda of DFAT's bilateral health programs. In South-East Asia, the reduction in DFAT's bilateral health programs means that DFAT will need to work with reputable partners with expertise and influence at the country level to ensure that regional health security investments strengthen the capacity of country level systems to prevent and respond to EID crises.

Recommendation 1

That in the design of future EID investments, DFAT require a clear articulation of how these investments will strengthen country health systems, with reference to national, regional and global health initiatives and plans.

i. In the Pacific, where DFAT has significant bilateral health engagement, regional EID investments should clearly complement and seek to strengthen country-level efforts—such as by reinforcing existing health sector structures and planning processes.

ii. In other countries, where DFAT may not have strong health engagement, DFAT should look to work through multilateral and regional partners who have an established and respected country presence in health and are equipped to work in the priority areas.

* The Sendai Framework for Disaster Risk Reduction and the Bangkok Principles for the implementation of the health aspects of the Sendai Framework (www.who.int/hac/events/2016/Bangkok_Principles.pdf) provide direction for future efforts to build resilient health systems and improve health security in the context of disaster risk reduction.

Animal health

The outcomes achieved in animal health need to be understood in the context that veterinary services in the region are weaker than human health services, and veterinary services in the Pacific are weaker than in South-East Asia. The primary drivers for development of animal health systems are economic (livestock production and export of animal products), and these are not strong in the Pacific. This is reflected in the acute shortage of qualified veterinarians—for example, in 2015 PNG was reported as having only six public sector animal health veterinarians and Fiji had one.[4]

In the Pacific, there was little evidence of system strengthening gains from Australia's investments, because of the lack of foundational elements to build on.

By contrast, the outcomes achieved in South-East Asia have built on existing (although still underdeveloped) capacity and laid a modest platform for responses to future zoonotic disease emergencies.

The strongest outcome in animal health was the development of a regional disease control model for foot and mouth disease (FMD), with support from Australia since 1997.* Although FMD is not a zoonosis, the model has provided a foundation for control of zoonotic diseases. The FMD regional approach of strengthening veterinary systems and outbreak investigations was adapted as a basis for ASEAN animal disease control strategies for avian influenza and rabies.

In addition, there was some strengthening of animal health surveillance systems. The best result in this area was in Indonesia where the surveillance model funded and supported by Australia (iSIKHNAS) has achieved impressive engagement with farmers and strong ownership by all levels of the veterinary service in the pilot areas.

Notwithstanding these gains, there are major challenges. **The core challenge is the low level of investment in public veterinary services by governments in the region.** There is the additional challenge of the low priority given to zoonotic disease and human health risks by existing animal health services, outside of emergencies. This again reflects the fact that the main drivers of veterinary service development are economic, and much of the activity of government-funded veterinary services is directed to supporting animal production. Veterinary public health activities are generally not strongly supported.

Given the scale of the challenge of improving animal health systems, it is important that donor support is targeted and sustained. There is also a need for realism about the extent to which work to strengthen animal health systems will produce direct human health dividends. Therefore, we consider the most promising interventions to be ones that focus Australia's efforts in animal health on diseases of economic importance, with benefits for strengthening systems for zoonoses control.

* Australia has invested around $21 million in the World Organisation for Animal Health's (OIE) programs to address FMD since the inception of the South-East Asia and China FMD campaign in 1997.

A clear entry point is FMD, which remains a significant economic burden in South-East Asia* and the most serious biosecurity threat to livestock production facing Australia.†[5] **Continued support for FMD control would serve the dual purpose of promoting trade and strengthening animal health systems for zoonoses control.**

It is also in Australia's interests to continue targeted support for animal health surveillance in South-East Asia to support regional cooperation and transparency in reporting EIDs with human pandemic potential (such as avian influenza). **This should be based on the epidemiological risk of new and existing zoonoses and build off existing capacity and systems, not attempt to create systems and capacity from the bottom up.**

Finally, DFAT should consider the scope to incorporate strategies to address the misuse of antibiotics in animal production systems, which is a factor in the growing problem of antimicrobial resistance (AMR). Any investment in this area should be done using a One Health approach, defined below.

The ASEAN Secretariat is playing an increasingly important role in efforts to counter regional disease threats. It will be important for DFAT to consult with the Secretariat about future Australian regional health security initiatives and to monitor developments with the ASEAN Animal Health Trust Fund and the ASEAN Coordinating Centre for Animal Health and Zoonoses.

In the Pacific, not only are the economic drivers for veterinary service development weak, but the risk factors for zoonotic disease emergence are also not strong. Given the greater risk for the Pacific is from imported animal diseases, at this point Australia's future support for animal health in the Pacific should be limited to biosecurity and quarantine.

Recommendation 2

That DFAT make targeted investments in animal health with the following features:

i. Support FMD control in South-East Asia, as a priority disease for economic development and trade, with benefits for systems for zoonoses control more broadly.

ii. Build on past experience and lessons for strengthening animal health surveillance in South-East Asia to support regional cooperation and transparency, better use of data to improve planning and response to disease, and sharing of data on priority zoonoses with the human health sector.

iii. Limit future Australian assistance for animal health in the Pacific to biosecurity and quarantine, taking into account lessons learned from past investments in these areas.

* Indonesia, the Philippines, Australia, New Zealand and the Pacific island countries and territories (PICTs) are currently FMD free. Outbreaks have occurred in previously FMD free countries including the United Kingdom (2001, 2007), Taiwan (2009), and Japan and the Republic of Korea (2010). The Department of Agriculture and Water Resources estimates that a three-month FMD outbreak could cost Australia around $7 billion while a 12-month outbreak could cost $16 billion in lost productivity and trade (www.agriculture.gov.au/pests-diseases-weeds/animal/fmd).
† (www.agriculture.gov.au/pests-diseases-weeds/animal/fmd/review-foot-and-mouth-disease)

One Health

The One Health approach applies a coordinated, cross-sectoral approach to addressing the risks of disease transmission at the animal–human–ecosystem interface. The One Health logic is sound, but the different capacities and focus areas of the human and animal health sectors make it difficult to operationalise, especially outside of disease outbreaks. The best prospects for One Health approaches are in areas of common ground that threaten public health—such as avian influenza, rabies and AMR. AMR was not addressed in DFAT's past EID strategies but is a growing problem involving both human and animal health sectors. It should receive greater attention in future DFAT human and animal health security investments than it has received in the past—for example through assistance for regulation of antibiotic use.

In considering the animal health aspects of a One Health approach, it should also be recognised that the impact of much of the work to build better animal health systems in protecting human health is indirect. That is, by improving the credibility and functioning of public veterinary systems there is a stronger basis for engagement between human and animal health authorities, and with communities, for detection and response to EIDs.

Community engagement

Communities have a crucial role in prevention, early detection and response to disease. A key lesson from the 2014–15 Ebola response was that aid agencies focused too much on the clinical response and not enough on the social and cultural factors that led to the spread of Ebola within communities.

We identified a number of promising approaches to community engagement in DFAT's past investments but it was a struggle to get these institutionalised. Some combination of lower cost broad-coverage public communications on disease prevention, and more resource-intensive community-level interventions when required, is likely to produce positive results.

Gender

The roles of women in small-scale animal production and food preparation, in protecting the health of their families, and in the health workforce, mean that gender is a significant factor in EID exposure and vulnerability. This is now better understood, but the links between this conceptual understanding and program implementation and outcomes still need to be strengthened. We found good examples of gender analysis and research, but limited evidence of implementation or results. To prevent this problem from re-occurring, DFAT's future investments in regional health security should take a more rigorous approach to ensuring gender differences and their effects are addressed.

There would be benefit in developing and documenting some targeted examples of better practice in this area, including from the international literature, to illustrate the translation of 'theory to practice' for various types of investments, and to demonstrate impact on development outcomes.

Recommendation 3

That the design of new DFAT regional health security investments include gender outcomes and monitoring indicators in monitoring and evaluation frameworks, and implementers proactively monitor progress in addressing gender equality.

Efficiency

Overall, the evaluation found that activities and outputs were delivered on time and in a cost-effective manner for most programs. With a few exceptions, Australia has generally used 'the right partners for the right things', with different funding modalities and partners fulfilling different roles.

A key challenge for efficiency moving forward is ensuring there are sufficient qualified DFAT staff to progress the health security agenda. DFAT will need to consider ways of overcoming the lack of dedicated health staff on the ground in South-East Asia so that it can continue to be informed and influential in ensuring that regional health security initiatives are managed efficiently and contribute in tangible ways to the goals of the aid program.

Recommendation 4

That DFAT identify the level of representation and skills needed to contribute to effective policy dialogue with implementing partners and partner governments in relation to health security and health systems strengthening, taking into account that not all DFAT country programs have dedicated health staff.

Monitoring, evaluation and research

Monitoring and evaluation (M&E) by DFAT and its partners was adequate for the majority of Australia's EID investments, although there is a clear need to improve the capacity of M&E systems to assess outcomes and the contribution of investments to systems strengthening. Research commissioned under Australia's past PEID strategies focused mostly on the animal health side. There were some good examples of research that contributed to evidence-based programming, and capacity building of local research partners, but also examples where there was little evidence of research use.*

Our evaluation did not identify any clear health systems research on the human health side that was linked with specific interventions, which is a gap. In considering future research priorities, it should be recognised that the drivers and recommended intervention approaches in EIDs and neglected tropical diseases (which include neglected zoonoses) are often very similar or overlapping. As such, it would

* DFAT's support for medical research, largely through health Product Development Partnerships, was beyond the scope of this evaluation.

make sense for DFAT to provide scope for institutions and research initiatives to have a broad infectious disease remit, rather than one focused on emerging infectious diseases only.

Recommendation 5

That DFAT's strategy for future EID research:

i. Include a focus on health systems research on the human health side.

ii. Provide scope for researchers to have a broad infectious disease / health security remit, rather than one focused on emerging infectious diseases only.

iii. Require consideration of research governance arrangements and strategies for maximising research uptake.

OVERALL CONCLUSION

The evaluation highlights a decade of progress in improving regional health security in Asia and the Pacific. Since the slow response to SARS in 2003, there has been substantial progress in surveillance and the level of cooperation and exchange of data about EID threats within and between countries, to which Australia has contributed.*

However, recent events have highlighted the fragility of these gains. In 2014 and 2015, the Ebola crisis in Africa overwhelmed countries with weak health systems. Even a country with strong health systems, the Republic of Korea, struggled to deal with an outbreak of Middle Eastern respiratory syndrome coronavirus (MERS) in 2015. These events have been catalysts for renewed global attention to the core health system capabilities required to implement WHO's International Health Regulations (2005) (IHR), which are the key global instrument for prevention and response to the international spread of infectious diseases.†

In moving forward with this agenda, this evaluation underlines the need for DFAT's future health security investments to be better integrated with the health systems of partner countries than has been the case in the past. It also underlines the need for a differentiated approach that takes into account the differences between animal and human health systems, between the Pacific and South-East Asia, and the constraints to implementing a One Health strategy. To be effective, future DFAT health security investments will need to take into account the strengths and weaknesses of implementing partners, and of DFAT itself.

* These findings are consistent with the findings of Coker et al, Emerging infectious diseases in southeast Asia: regional challenges to control, *The Lancet*, 377, 2011; and WHO's *APSED draft evaluation report*, 2015 (unpublished).

† The International Health Regulations (IHR) are an international legal instrument that require the development, strengthening and maintenance of core capacities, and at designated points of entry. The IHR (2005) core capacity areas are: 1. national legislation, policy and financing; 2. coordination and national focal point communications; 3. surveillance; 4. response; 5. preparedness; 6. risk communications; 7. human resources; and 8. laboratory. The IHR require countries to report certain disease outbreaks and public health events and establish procedures that WHO must follow to uphold global health security (www.who.int/topics/international_health_regulations/en/).

LESSONS FOR FUTURE REGIONAL HEALTH SECURITY WORK TO STRENGTHEN HEALTH SYSTEMS

	Overall	Human health	Animal health
Workforce	In order to maximise workplace relevance and impact on human and animal health systems, link efforts to build surveillance and epidemiological capacity to active disease control programs. Require that inputs to workforce development are part of a broader needs-based workforce development strategy, have partner government commitment and assure application of skills gained—for example through considering issues such as post-training supervision, career development, and funding of any needed operational supplies.	Expand support for workforce development beyond technical areas of field epidemiology and laboratory training. Development and application of models to address the issue of lack of supervisory capacity linked to public health training, possibly in partnership with Australian institutions, is an area where future investments could play a useful role—especially in the Pacific.	Be realistic about the scale of the task of building the animal health workforce. Focus on quality rather than quantity in training provided with attention to priority training needs identified in the World Organisation for Animal Health's (OIE) Performance of Veterinary Services (PVS) evaluations. Veterinary education requires targeted support to lift compliance with OIE's 'Day One' competencies for graduates. Particular attention is needed to the quality of train-the-trainer and supervision models for training programs because of the risk of introducing harm—for example through misuse of antibiotics.
Surveillance	Build capacity of partners to collect, analyse and use surveillance data for policy, planning and response. Be mindful that, in both sectors, information flow can be constrained by governance and jurisdictional issues. Exploit advances in information and communications technology to develop more timely, flexible, cost-effective, targeted and fit-for-purpose models for animal and human health surveillance.	Continue to support professional networks and practical collaborative activities to address cross-border disease threats and promote transparency.	Continue to provide targeted support for animal health surveillance in South-East Asia in high-risk areas, building on existing systems. Ensure data are used to improve planning and disease response and data on priority zoonoses, and are available to the human health sector. Limit support for animal health in the Pacific to biosecurity and quarantine in recognition of the low risk it poses as a source of EIDs and the higher risk it faces from imported EIDs.
Leadership	Continue to work at an institutional and political level to promote timely and open exchange between countries about EID threats. Seek to build regional ownership and sustainability through engagement with regional organisations and look for opportunities for co-investment. Build support for One Health approaches in areas of common ground between the human and animal health sectors. Consider potential to bring both sectors together for leadership training in	Build political support for improved public health legislation and regulatory frameworks, and integration of a population health perspective (rather than a disease-centric approach) in management and budgeting decisions. Build EID leadership capacity as part of broader public health leadership capacity development. Seek opportunities to promote the systematic integration of health into disaster risk reduction	Build support for more effective response strategies and policies, including the importance of culling and compensation policies and targeted vaccination. Be mindful that capacity gaps in veterinary public health and leadership are a constraint to effective engagement by the animal health sector in One Health approaches.

	Overall	Human health	Animal health
	One Health cross-sectoral disease management issues.	policies and plans, and the inclusion of emergency and disaster risk management programs in national health strategies.	
Laboratory	Ensure assistance provided in response to specific disease threats can be used to build laboratory capacities that also have benefits for other diseases.	Ensure that public health and EID functions of laboratories are given adequate emphasis in existing laboratory strengthening initiatives.	Ensure there is a reasonable prospect for sustainability and institutionalisation of laboratory strengthening work.
Community engagement	Review past approaches and do further work to understand optimal and affordable community intervention approaches at different epidemic stages and where disease is endemic. Avoid pilot models that are better resourced than local contexts can afford. Develop strategies and partnerships to facilitate institutionalisation of community engagement approaches. Promote a One Health approach at a community level where appropriate.	EID interventions need to be responsive to community concerns about other illnesses, affordable health care, livelihoods and food security. Features of more effective behaviour change communications include context-specific audience research to tailor messages to target groups and working with local partners such as women's groups and farmers' groups.	Lessons learned from models of community engagement piloted under previous investments—including the CARE Australia Community-Based Avian Influenza Risk Reduction Program and the World Bank Avian and Human Influenza Facility—are a resource to inform the design of future investments in community-based EID risk reduction.
Gender	Gender analysis in the design of new investments should include an assessment of capacity gaps and identify incentives for relevant institutions and target groups to better identify and address the gender dimensions of EIDs. Include gender component in broader leadership training for human and animal health sectors. The design of new investments should include gender outcomes and monitoring indicators in M&E frameworks. Develop guidance on the translation of 'theory to practice' for various types of investments, and demonstrate impact on development outcomes.	More needs to be done to promote political commitment and build capacity in gender approaches to EIDs and systems strengthening in partner government ministries. Public health risk communications need to address the different roles and responsibilities of women and men. Women's roles in infection control, both in domestic and health care settings, should receive greater attention.	Monitor the gender-related impacts of interventions in the poultry sector to improve disease surveillance, culling without adequate compensation and the introduction of biosecure farming techniques. These have potential to result in loss of livelihoods, independence and food security for poor rural women. Consider mechanisms to counter these gender equality impacts.

	Overall	Human health	Animal health
Regional differences	Be mindful of the significant differences in capacity between and within South-East Asia and the Pacific, and the different risks they present or face as sources of, or destinations for, EIDs.	In the Pacific, where DFAT continues to have significant bilateral health investments, regional EID investments should clearly complement and reinforce bilateral efforts to strengthen human health systems. In South-East Asia, where DFAT's bilateral health engagement has reduced, DFAT should work through reputable multilateral or regional partners with established country-level presence and expertise to strengthen country-level health systems relevant to regional health security.	In the Pacific, where the greater risk is from imported animal diseases, limit future support for animal health in the Pacific to biosecurity and quarantine, taking account of lessons learned from previous investments in this area. In South-East Asia, continued support for FMD control would serve a dual purpose of protecting Australia's biosecurity and strengthening systems for zoonotic EID control. DFAT should also continue to provide targeted support for animal health surveillance in South-East Asia with a greater focus on use of data for policy, planning and response. DFAT should also support sharing of data on priority zoonoses with the human health sector.
Monitoring, evaluation and research	In order to improve uptake of research findings, DFAT needs to ensure the research purpose is clear and that researchers have specific strategies to promote research uptake. The ACIAR approach to animal health research is a good model. Research with direct links to program activities has proved to be the most useful. It should be recognised that the drivers and recommended intervention approaches to EIDs and neglected tropical diseases are often very similar or overlapping. As such, it would make sense to provide scope for institutions and research initiatives to have a broad infectious disease remit, rather than one focused on EIDs only.		
One Health	Be mindful of the institutional barriers to a One Health approach. Focus efforts on particular diseases (e.g. avian influenza, rabies) and the growing problem of antimicrobial resistance (AMR) where there are shared objectives, shared responsibilities and actions are practical and result in demonstrable change. Where there is insufficient common interest, parallel approaches may be more appropriate as this enables the different jurisdictions to operate according to need and capacity, and to come together to share data or combine actions as required.		

MANAGEMENT RESPONSE

Summary of management response

DFAT welcomes the findings of ODE's evaluation of Australia's support for pandemics and emerging infectious diseases, and the opportunity it provides to identify and share lessons from a decade of support in Asia and the Pacific region.

Since the PEID strategies were developed, DFAT policies have endorsed the fundamental and foundational role of health systems strengthening in all our health assistance. DFAT's *Health for Development Strategy 2015–2020* prioritises building core public health systems and capacities, and strengthening regional preparedness to respond to existing and emerging health threats.

The evaluation is timely given the Australian Government's commitment to regional health security, announced in June 2016. A new regional health security initiative is being developed by DFAT. Under the strategic framework of DFAT's *Health for Development Strategy 2015–2020*, the ODE evaluation and recommendations will inform the development of DFAT's new regional health security investments, with a view to building on achievements and working to address the gaps and challenges identified in pandemic and emerging infectious disease control in the region.

DFAT agrees with recommendations one, three, four and five in full and partially agrees with recommendation two. DFAT agrees that future regional and global EID investments should clearly articulate how they strengthen country health systems (Recommendation 1), and that targeted investments in animal health should build on past experience and lessons (Recommendation 2, part ii). DFAT partially agrees to part (i) of Recommendation 2 on support for FMD control in South-East Asia, as future investments would need to be considered against funding priorities and the priorities of partner governments. DFAT also partially agrees to part (iii) on limiting future assistance for animal health in the Pacific to biosecurity and quarantine. Although there is currently a very low likelihood of a zoonotic emergency arising from Pacific countries, there may be a need for animal health surveillance and response in the future.

DFAT agrees that gender requires increased attention in the design of future investments (Recommendation 3), and that we need to have the appropriate level of representation and skills to effectively carry out the Government's regional health security agenda (Recommendation 4). DFAT also agrees to Recommendation 5 on future EID research, including the focus on human health systems research, a broader research approach to emerging health threats, and strong governance arrangements to maximise research update.

Individual management response to the recommendations

Recommendation	Response	Explanation	Action plan	Timeframe
Recommendation 1 That in the design of future EID investments, DFAT require a clear articulation of how these investments will strengthen country health systems, with reference to national, regional and global health initiatives and plans. i. In the Pacific, where DFAT has significant bilateral health engagement, regional EID investments should clearly complement and seek to strengthen country-level efforts—such as by reinforcing existing health sector structures and planning processes. ii. In other countries, where DFAT may not have strong health engagement, DFAT should look to work through multilateral and regional partners who have an established and respected country presence in health and are equipped to work in the priority areas.	Agree	DFAT agrees with the recommendation that future regional and global EID investment designs articulate how they strengthen country health systems. This is consistent with DFAT's *Health for Development Strategy 2015–2020* and its prioritisation of investments which are country-led and strengthen health systems. DFAT agrees that there are opportunities to harness global and regional partnerships with strong in-country presence in health, to support priority areas of work.	i. DFAT's future Pacific regional EID investments will seek to align with and strengthen country-level health systems (whilst noting that some programs support regional level functions, such as reference laboratories or regional information-sharing platforms). Alignment with country systems is a principle applied to all of DFAT's regional health investments, as reflected in the draft Pacific Regional Sector Investment Plan for Health (2017). DFAT is working with regional implementing partners to ensure that support aligns with country priorities and systems. For example, DFAT's funding support for WHO on health security in the Pacific region requires consideration of the health systems implications for all country-level activities. ii. In countries where DFAT does not have significant bilateral health engagement, DFAT will engage with key partners (including UN agencies, global health funds, development banks, and private foundations and corporations) with a strong track-record for effectiveness and in strengthening health systems. We will give priority to partnerships that enable us to leverage the finance, innovations, and ideas of multilateral and regional partners, and that will contribute to development of regional and global public goods for health security. We will seek to invest in research and partnerships that can assist in embedding these global public goods into country and local-level systems. This includes efforts to understand procurement, supply, quality and distribution networks as well as capacity, social and cultural contexts of future investments.	Ongoing
Recommendation 2 That DFAT make targeted investments in animal health with the following features: i. Support FMD control in South-East Asia, as a priority disease for economic development and trade, with benefits for	Agree in part	i. **Partially agree.** DFAT notes the impact of FMD on economic development and trade in South-East Asia. DFAT also acknowledges limitations in its capacity to engage on specific animal diseases given resource limitations.	i. DFAT will continue to support the responsible conclusion of existing FMD-related investments. Future support for FMD control will be considered in the context of funding priorities, capacity to deliver, benefits for systems of zoonoses control more broadly and the needs and priorities of partner governments. ii. Future investments in animal health surveillance in South-East Asia will be considered through the regional health security initiative. Any new investments will build on past work	Ongoing

Recommendation	Response	Explanation	Action plan	Timeframe
systems for zoonoses control more broadly. ii. Build on past experience and lessons for strengthening animal health surveillance in South-East Asia to support regional cooperation and transparency, better use of data to improve planning and response to disease, and sharing of data on priority zoonoses with the human health sector. iii. Limit future Australia assistance for animal health in the Pacific to biosecurity and quarantine, taking into account lessons learned from past investments in these areas.		ii. **Agree.** Capacity for early detection and response to animal diseases and zoonoses is critical for South-East Asia, and we note the identified key gaps in previous assistance and country capacity. (iii) **Partially agree**. In the Pacific region, DFAT has no current or pipeline investments in animal health at bilateral or regional level, and current support to WHO and SPC on health security does not include animal health. Although there is currently a very low likelihood of a zoonotic emergency arising from Pacific countries, there may be a need for animal health surveillance and response in the future.	and lessons learned, and will engage with key partners in Australia (including ACIAR and DAWR) and in the region (including OIE, the FAO Animal Production and Health Commission for Asia and the Pacific, USAID, WHO and ASEAN). The new initiative will play a key role in catalysing regional and transboundary cooperation and DFAT will work closely with regional organisations to achieve this. iii. DFAT will tailor future responses to animal health in the Pacific region according to circumstances and taking account lessons learned from this review and previous investments. DFAT notes the review finding that, in the absence of major effort by partner governments to strengthen animal health systems, investments are likely to be unsustainable.	
Recommendation 3 That the design of new DFAT regional health security investments include gender outcomes and monitoring indicators in monitoring and evaluation frameworks, and implementers proactively monitor progress in addressing gender equality.	Agree	Gender equality is a major focus of Australia's aid program. The Government has made a commitment that 80 per cent of Australia's aid investments, regardless of their objectives, should effectively address gender equality issues in their implementation. DFAT notes that gender is a significant contributor to EID vulnerability that requires increased attention.	DFAT will use gender analyses to inform the design and implementation of future regional health security investments. This will include incorporating gender outcomes and indicators in monitoring and evaluation frameworks. DFAT will also consider capacity and track-record in gender integration in the selection and performance management of implementing partners and managing contractors.	Ongoing
Recommendation 4 That DFAT identify the level of representation and skills needed to contribute to effective policy dialogue with implementing partners and partner	Agree	Strong health policy dialogue and program management skills will be key to DFAT effectively managing its existing and new investments in regional health security and health systems	DFAT will maintain a focus on ensuring it has the skills, systems and resources needed to deliver on its mission, including in the health sector. DFAT's Capability Action Plan examines capability across the department. DFAT is also considering staffing and skill requirements as part of the development of the new regional health security initiative. The	Ongoing

Recommendation	Response	Explanation	Action plan	Timeframe
governments in relation to health security and health systems strengthening, taking into account that not all DFAT country programs have dedicated health staff.		strengthening. DFAT agrees to continue to identify the capabilities required to contribute effectively to policy dialogue, particularly in countries with limited bilateral health investments or health staff.	new initiative is being implemented within existing staffing levels, and DFAT has identified staffing (numbers and capability) as a risk that will be closely monitored during implementation. DFAT has approached five departments for secondments across a number of specialist areas including health, animal health and research. DFAT will continue to use its diplomatic leverage and trade tools, domestic expertise, engagement with partner governments, and relationships with development partners, research institutions and the private sector to further its objectives in health security and health systems strengthening, including to influence partner country decisions on health policy and domestic resource allocation. The Foreign Minister recently announced a Regional Health Security Ambassador who will engage at a senior level with partner governments and development organisations in the region.	
Recommendation 5 That DFAT's strategy for future EID research: i. Include a focus on health systems research on the human health side. ii. Provide scope for researchers to have a broad infectious disease / health security remit, rather than one focused on emerging infectious diseases only. iii. Require consideration of research governance arrangements and strategies for maximising research uptake.	Agree	DFAT agrees future EID health research should include a focus on health systems. This recommendation is aligned with DFAT's *Health for Development Strategy* (investment priority 5), which provides for a broader research approach to emerging health threats than previous PEID strategies. The strategy explicitly targets investments which promote innovative solutions to combat disease threats. We agree that a successful program of health security research requires strong governance arrangements, and a focus on ensuring research is linked to uptake.	i. Health security research is a core component of DFAT's new regional health security initiative, and human health systems research will be included as a priority for new research programs. ii. DFAT will continue to invest in research and development of new diagnostics and medicines targeting infectious disease threats; support for practical, applied research into health systems and policy; and building the evidence base for health security. iii. Governance arrangements for new research under DFAT's regional health security initiative will take into consideration what is working well and where efforts could be strengthened, including in maximising research uptake.	Ongoing

1. BACKGROUND AND INTRODUCTION

CONTEXT OF AUSTRALIA'S RESPONSE TO EMERGING INFECTIOUS DISEASES

Background and rationale for response

The outbreaks of severe acute respiratory syndrome (SARS) in 2003, H5N1 highly pathogenic avian influenza (H5N1 HPAI) in 2004 and Asian lineage avian influenza A (H7N9) virus in 2013 have confirmed Asia as an epicentre for emerging infectious diseases (EIDs) with pandemic potential. The majority (75 per cent) of EIDs are zoonoses, animal diseases that can infect humans, some of which have potential to mutate to allow transmission between humans. Scientists believe there is a high likelihood of a new highly infectious animal-derived influenza emerging in Asia over the next decade. H7N9 is circulating in poultry in China and is currently rated by the United States Centers for Disease Control (CDC) as having the greatest pandemic potential.* This and other EIDs pose a major threat to global and regional health security, economic development and trade.[6,7]

In 2013, the insurance industry rated the risk of a global pandemic as the greatest risk to the industry.[8] In addition to the human toll, the annualised expected loss to the global economy from potential pandemics has been estimated at more than US$60 billion per annum or US$6 trillion this century.[9] The World Bank estimates the cost of a severe pandemic like the 1918 Spanish influenza could be up to 5 per cent of global GDP.[10] Contributing factors include productivity losses resulting from sickness and deaths; downturns in consumer spending, tourism and trade; increased health care costs and the costs of pandemic response and recovery.

The risk of zoonotic disease emergence in Asia continues to increase. Risk factors include intensive animal farming close to major urban populations to meet growing demand for animal products; increased cross-border travel and trade; and weak public health systems with variable capacity to detect and contain disease outbreaks.

* Since 2013 when Asian lineage avian influenza A (H7N9) virus it was first detected in humans, there have been five annual H7N9 epidemics in China with a 40 per cent mortality rate of people infected. There is no evidence of sustained person-to-person transmission, however influenza viruses mutate and may become transmissible between humans. H7N9 is currently rated by the United States Centers for Disease Control's Influenza Risk Assessment Tool as having the greatest pandemic potential and posing the greatest risk to public health (www.cdc.gov/flu/avianflu/h7n9-virus.htm).

The small Pacific island countries and territories (PICTs) have fewer people and fewer animals of potential zoonotic risk, but wider population dispersion means that delivering health services in the Pacific is more expensive and logistically difficult than in Asia. Pacific health systems struggle with basic skills and resource constraints, and the double burden of non-communicable and infectious diseases. The reported mortality rate in the 2009 H1N1 pandemic was higher in the Pacific region than in other regions of the world.[11] The PICTs are also particularly vulnerable to climate change, which increases the likelihood of epidemic-prone disease outbreaks in these countries.[12]

The Ebola outbreak in West Africa of 2014–15 was the catalyst for renewed global attention on the need to strengthen core health system capabilities and implement the World Health Organization's (WHO's) International Health Regulations* (IHR).[13] A WHO assessment of Ebola preparedness in the Asia Pacific region found that most low- and middle-income countries in this region do not yet have the capacity to respond adequately to events of public health concern.†[14] The assessment highlighted the PICTs' unique situations and support requirements.

Veterinary systems in many countries are poorly equipped to detect and respond to emerging zoonoses that may pose a threat to human health. While there is no directly equivalent international legal framework to the IHR (2005) for animal health, the World Organisation for Animal Health's (OIE) Performance of Veterinary Services (PVS) evaluation tool‡ provides an objective approach to assessing the status of country veterinary services. OIE's PVS gap analysis tool (2009) assists countries to prepare costed strategic plans to strengthen their veterinary services, and identifies remedial actions needed. These plans enable donors and implementing partners to harmonise efforts and target animal health priorities.

Australia's response

Recognising the gravity of these disease threats, the Australian Government has invested around $194 million over the last decade to help countries in Asia and the Pacific prepare for and combat EIDs. Investments were guided by the Australian Agency for International Development's (AusAID) *Pandemics*

* The International Health Regulations (IHR) are an international legal instrument that require countries to report certain disease outbreaks and public health events and require WHO to follow specified procedures to uphold global health security. The IHR also require the development, strengthening and maintenance of core capacities, and at designated points of entry. Revised as a result of concerns about the slow response to the SARS pandemic, the IHR (2005) core capacity areas are: 1. national legislation, policy and financing; 2. coordination and national focal point communications; 3. surveillance; 4. response; 5. preparedness; 6. risk communications; 7. human resources; and 8. laboratory (www.who.int/topics/international_health_regulations/en/). Progress in these areas is self-assessed by countries through completion of an annual IHR Monitoring Questionnaire. Post-Ebola, a new Joint External Evaluation (JEE) process has been introduced to increase transparency and accountability in IHR implementation. Country participation in a JEE is voluntary and involves a mix of self-evaluation, peer review and evaluation by an external team (WHO, *Joint External Evaluation Tool: International Health Regulations (2005)*, WHO, Geneva, 2016).

† When the revised IHR (2005) came into effect in 2007, member states were required to meet the IHR core capacities by June 2012. This has proved to be a moving deadline. Although progress has been made across the core capacity areas, 9 of the 27 member states in WHO's Western Pacific region and 9 of the 11 member states in WHO's South-East Asia region have requested second extensions to the deadline for full IHR compliance (the deadline was originally 2012, then 2014, then 2016) (WHO, *APSED Progress Report 2015*, Annex 1, Status report on IHR).

‡ The OIE is mandated by the World Trade Organization to safeguard world trade by publishing health standards for international trade in animals and animal products (www.oie.int/en/) and monitoring animal diseases. It also provides support for veterinary sector development to help countries meet these standards. OIE's Performance of Veterinary Services (PVS) evaluation tool is organised as an assessment of 46 basic competencies under four component areas: 1. human, physical and financial resources; 2. technical authority and capability; 3. interaction with interested parties; and 4. access to markets (www.oie.int/en/support-to-oie-members/pvs-pathway/).

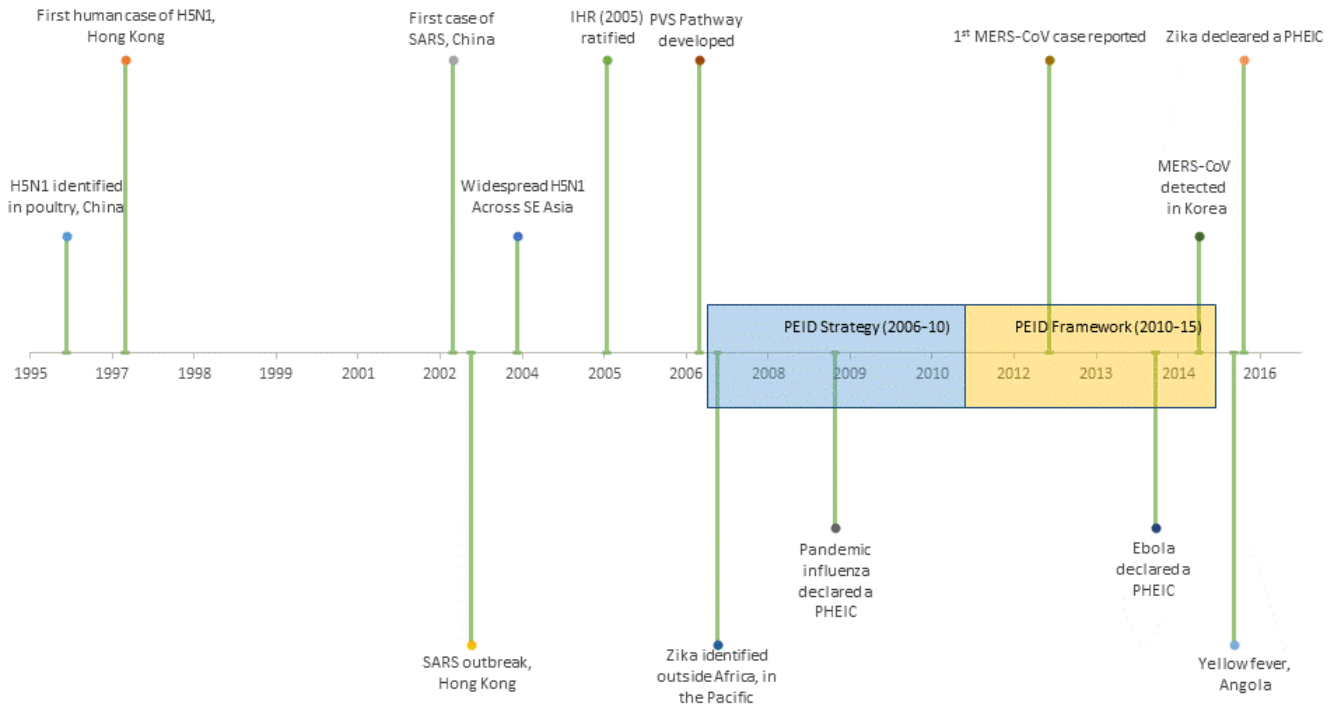
and Emerging Infectious Diseases (PEID) Strategy 2006–2010 and its successor, the *Pandemics and Emerging Infectious Diseases (PEID) Framework 2010–2015*. Both strategies aimed to strengthen human and animal health systems through technical assistance and capacity building.

The *PEID Strategy 2006–2010* was developed to guide investments through the Australian Government's $100 million funding allocation for the global emergency response to H5N1 HPAI.* The strategy aimed to help partner countries build capacities, systems and protocols in four main areas:

1. planning and preparation
2. recognition, control and prevention
3. underlying animal and human health systems
4. outbreak response (in animal and human health).

A 2009 review of implementation of the *PEID Strategy 2006–2010*[15] identified that the avian influenza response had unmasked many critical needs for system development. To address these needs, the review argued for a shift from short-term emergency responses to specific disease threats to strengthening the health systems that underpin effective preparedness and response. The review also found that community engagement and the gender dimensions of EID vulnerability were neglected in past approaches to EIDs, and argued for greater attention to these issues.

Figure 1 Timeline of notable public health events, 1996–2016, and Australia's PEID strategies†



* This followed a more ad hoc response to the outbreaks of SARS and avian influenza in 2003 and 2004, for which Australia provided $4.5 million to WHO to manage SARS outbreaks in the Western Pacific region, engage technical expertise, strengthen WHO's Global Pandemic Outbreak Alert and Response Network and surveillance and response in Indonesia; and $1.65 million to ASEAN to build regional capacity for disease outbreak response.
† Abbreviations used in Figure 1: Public Health Emergencies of International Concern (PHEIC); Middle East respiratory syndrome coronavirus (MERS).

The second strategy, the *PEID Framework 2010–2015*, was developed to update the earlier guidance, taking account of the 2009 review and lessons learned. The objectives of the *PEID Framework 2010–2015* were to:

- promote adherence to international standards of human and animal health (the IHRs and competencies of the OIE's PVS)
- strengthen systems for prevention, detection and control of EIDs, particularly at district and community level
- ensure a rapid response to outbreaks of EIDs when they occur
- build the evidence base for the response to EIDs.

The *PEID Framework 2010–2015* also included the principle of 'promoting greater collaboration between animal and human health sectors guided by the One World One Health Framework', which emphasises collaboration across sectors to address potential or existing risks that originate at the animal–human–ecosystem interface.

THE EVALUATION

Purpose, aims and scope

This evaluation was commissioned by the Office of Development Effectiveness (ODE) of the Australian Government's Department of Foreign Affairs and Trade (DFAT) to address gaps in the evidence base on how to strengthen human and animal health systems to prevent, detect and respond to EID threats in Asia and the Pacific. The purpose was also to identify lessons from past assistance and use these to inform decision-making about future DFAT investments and policy engagement on regional health security.

The terms of reference (TOR) required the evaluation to:

- identify and make recommendations on implementation approaches for 'building regional preparedness and capacity to respond to emerging health threats' (one of the strategic priorities of DFAT's *Health for Development Strategy 2015–2020*)
- contribute to the literature on lessons learned from previous responses.

In June 2016, during the early stages of the evaluation, the Australian Government announced an intention to establish a regional health security partnership fund to harness Australia's world-leading research institutions, scientific expertise, innovators and entrepreneurs to tackle emerging health security risks in our region. While the scope of our evaluation is narrower than the scope of the proposed fund, the evaluation's findings will inform development of this new initiative.

Evaluation questions

The evaluation was guided by the following questions provided in the TOR:

1. **Relevance**
   a. Was it the right set of initiatives for the time and place?
   b. Did the initiatives address the interface between human and animal health systems and EIDs?
   c. Did initiatives address the different risks and drivers of EIDs in Asia and the Pacific?
2. **Effectiveness**
   a. What was the evidence of impact on key elements of human and animal health systems?
   b. What was Australia's contribution to catalysing regional collaboration?
   c. What were the relative effectiveness, implementation characteristics and results of capacity building approaches?
   d. What was the effectiveness of engaging with communities?
   e. What was the effectiveness of approaches to address gender dimensions of EIDs?
3. **Efficiency**
   a. What is the evidence of the 'best buy' / value for money investments for Australia?
4. **Sustainability**
   a. Has sustainable capacity been built to better prepare for and respond to EIDs at country and regional levels? Were the PEID strategies influential in this?
5. **Monitoring and evaluation**
   a. To what extent was monitoring and evaluation by DFAT and partners credible and sound?
6. **Lessons learned**
   a. What lessons can be learned from past implementation that can be applied in future to promote successful outcomes?
   b. What examples of innovative approaches should be disseminated?

The scope of the evaluation covered 35 initiatives funded by Australia under the two PEID strategies over the period 2006–15 in Asia and the Pacific (see Annex 1 for program descriptions). The evaluation excluded investments made in infectious diseases that receive separate funding from Australia (e.g. polio, HIV, malaria, tuberculosis), medical research, plant diseases and investment in immunisation programs that were outside the scope of the two PEID strategies.*

* A broader evaluation of Australia's contributions to strengthening regional health security could include other communicable diseases such as HIV, malaria and tuberculosis; the growing problem of drug resistance; and our contribution to emergency responses to plant diseases, such as fruit fly, that impact on trade. These were beyond the scope of the two PEID strategies and of this evaluation.

Thus, the evaluation covered a part of the broader regional health security agenda, but not all of it. The evaluation also did not include DFAT's bilateral or regional health systems strengthening programs, which were outside the scope of the PEID strategies. The 35 investments under the PEID strategies were equivalent to around 4 per cent of Australia's total health sector aid expenditure from 2006 to 2015.* These other health sector programs, some of which share the overall health systems strengthening goal, are also clearly relevant to stronger systems for EID preparedness and response—a theme picked up at various points in this report.

The evaluation included the PEID investments addressing control of foot and mouth disease (FMD) in livestock.† Although FMD is not a zoonosis, these investments included a strong focus on veterinary system strengthening, with benefits for EID detection and response.

Evaluation methods and approach

The evaluation was conducted at the portfolio level. It was largely concerned with identifying and understanding implementation characteristics that contribute to stronger human and animal health systems, not with assessing the performance of individual programs or implementing partners.

The evaluation used the following methods to identify and analyse the main areas of activity of the investments, the main system strengthening outcomes achieved, and the challenges and lessons learned. Evidence was triangulated where feasible, with the major evaluation findings drawing on multiple sources of data.

Data were collected through:

- desk review, including program documentation‡ and the literature on human and animal health systems strengthening and infectious disease control
- Australia-based consultations with key implementing partners, including DFAT, the Department of Health, the Department of Agriculture and Water Resources (DAWR) and the Australian Centre for International Agricultural Research (ACIAR)
- site observations and semi-structured interviews with partner government officials, program implementing partners and other stakeholders in the Pacific (Fiji and Solomon Islands), the Mekong (Bangkok and Cambodia) and Indonesia (Jakarta, Yogyakarta and South Sulawesi). Fieldwork was supplemented where feasible by telephone interviews with former DFAT/AusAID and implementing partner staff who had held key positions in the programs at the time.

To ensure rigour, interviews were conducted jointly with more than one team member present, and the team took detailed interview notes. Records of meetings were written up and peer reviewed by at least one other team member. The categories of stakeholders interviewed and documentation reviewed are at Annex 2.

* Total health expenditure during the period 2006–15 is estimated at $5.1 billion (DFAT Official Development Assistance Statistics and Reporting).
† Australia has supported the South-East Asia Foot and Mouth Disease (SEAFMD) campaign since its inception in 1997. China, Singapore and Brunei Darussalam joined the campaign in 2010, after which SEAFMD was renamed the South-East Asia and China FMD (SEACFMD) campaign. In this report, we use SEACFMD throughout.
‡ PEID Strategy Review (2009); AusAID/DFAT annual initiative quality reports, midterm reviews, independent completion reports and select design documents.

We approached data collection and analysis from a health systems strengthening perspective. There is no widely accepted standard about what health systems strengthening entails and how to measure it. However, the 'four key questions' (see Box 1)[16] provided in DFAT's *Health for Development Strategy 2015–2020* help to distinguish activities that strengthen the health system and build long-term sustainable capacities from those that support the system without changing the way that it functions. We drew on these four questions as evaluative criteria in our assessment of relevance and sustainability, and as points of reference in addressing all of the evaluation questions.

Box 1 Is it health systems strengthening?

1. Do the interventions have cross-cutting benefits beyond a single disease?
2. Do the interventions address policy and organisational constraints or strengthen relationships between the different system areas?
3. Will the interventions produce permanent systemic impact beyond the term of the project?
4. Are the interventions tailored to country-specific constraints and opportunities, with clearly defined roles for country institutions?

We also drew on the WHO's framework of health systems,[17] which conceptualises health systems as comprising six 'building blocks'.* We used this framework to structure our collection of data and analysis across both human and animal health systems,† and to reflect on areas of activity and identify gaps relevant to EIDs. However, it proved too cumbersome to use the framework to present our findings. Rather, we present our findings in this report against the main areas covered by Australia's investments in human and animal health.

We dealt with the diversity in implementation contexts by first reflecting on the key findings separately for the main fieldwork sites of the Pacific, Mekong and Indonesia. This report provides an overall synthesis across the sites and identifies the common findings, and the most significant differences and commonalities between them.

Portfolio description, trends and arrangements

Where and by whom was the money spent?

Of the approximately $194 million invested, around 14 per cent was allocated to the Pacific region and Papua New Guinea (PNG), 77 per cent to South-East Asia and 9 per cent to global programs.‡ An estimated 58 per cent of the funding came from AusAID/DFAT's regional programs, 40 per cent from bilateral country programs and 2 per cent from global humanitarian programs. The largest bilateral investment was in

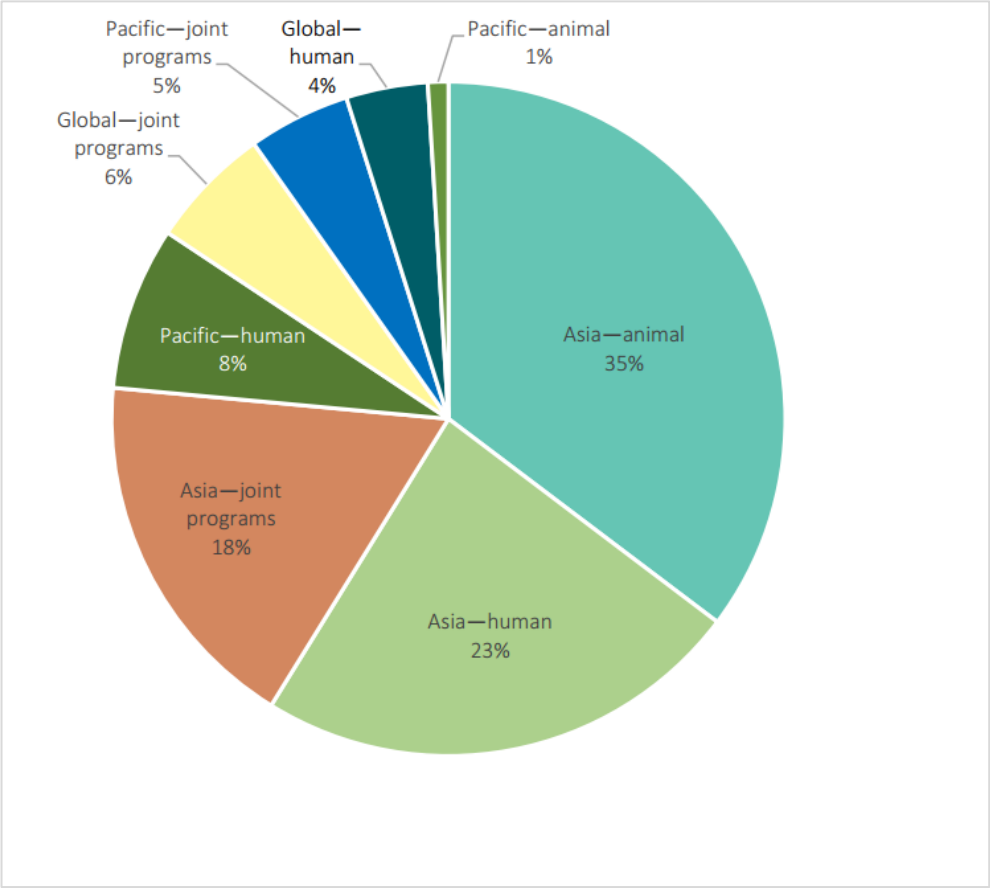
* WHO's six health systems building blocks are: 1. leadership and governance; 2. health information systems; 3. health financing; 4. health workforce; 5. medicines, vaccines and technologies; and 6. service delivery.

† The source reference to develop the comparative evaluation approach for human and animal health was the *WHO Framework for Action: strengthening health systems to improve health outcomes* (WHO, 2010). For the animal health section, the team considered the tool developed by the OIE and WHO (*WHO-OIE Operational Framework for good governance at the human-animal interface: bridging WHO and OIE tools for the assessment of national capacities*) which aligns the PVS evaluation competencies with the IHR monitoring questionnaire, however we assessed this did not meet the needs of the evaluation.

‡ The geographic coverage of global programs extends beyond Asia and the Pacific. For example, some support was provided outside Asia and the Pacific through humanitarian programs. In addition, $2.5 million of Australia's contribution to the World Bank Avian and Human Influenza Facility was notionally allocated to Africa.

Indonesia ($59 million) and the largest regional investment was WHO's Asia Pacific Strategy for Emerging Diseases (APSED) ($28.8 million).

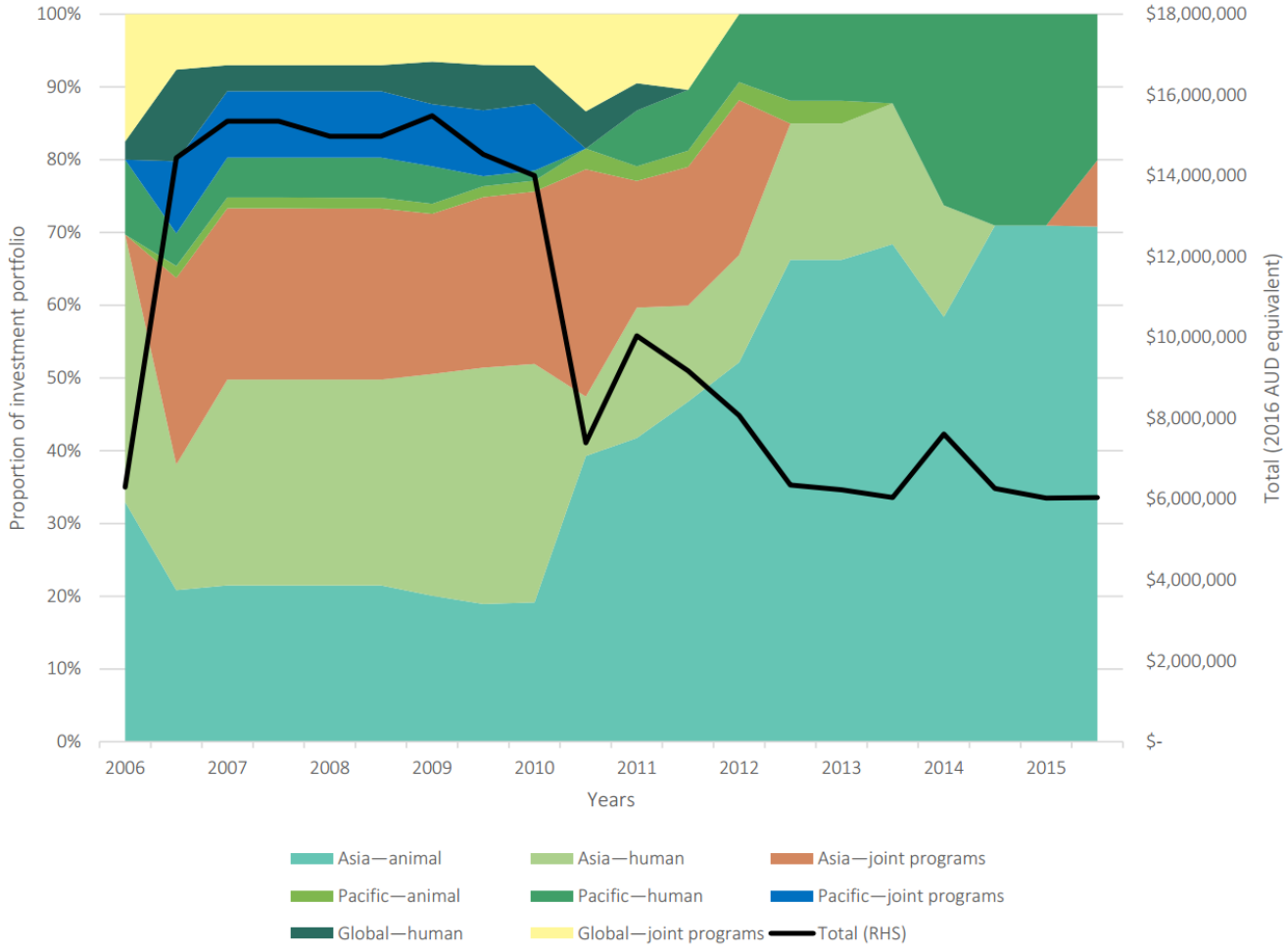
Figure 2 Estimated allocation of EID investments by sector and region, 2006–15



Overall, an estimated 37 per cent was directed to animal health, 35 per cent to human health, and 28 per cent made to joint investments targeting both human and animal health (Figure 2).

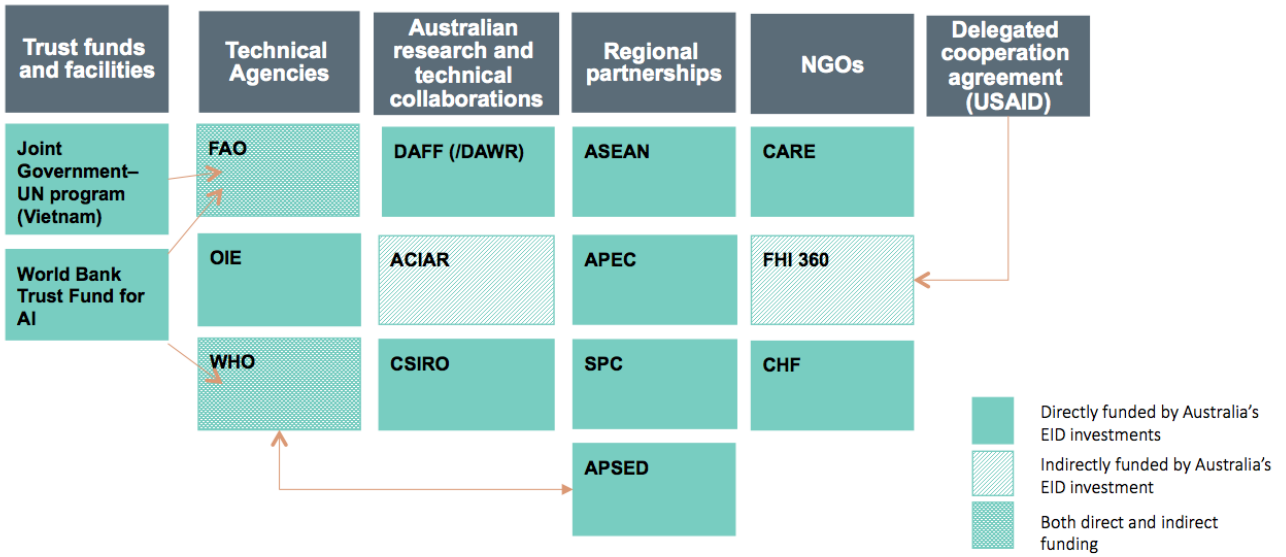
The pattern of spending has changed over time. Under the *PEID Framework 2010–2015*, the overall spend declined, and the proportional share to animal health systems increased relative to spend in human health and joint programs (Figure 3).

Figure 3 Proportional distribution of Australia's EID investments, by sector and region (multicolour area graph, left vertical axis scale) and total EID-specific spending (standardised to 2016 AUD) over time (black line, right vertical axis scale)



Investments used a range of implementing partners. Some implementing partners were funded by Australia through more than one modality (Figure 4), and in some cases, this involved work in the same or overlapping geographic areas.

Figure 4 Main modalities used by the two PEID strategies, 2006–15, and indicative linkages between recipients and implementing partners



Acronym list: UN—United Nations; AI—Avian influenza; FAO—Food and Agriculture Organization of the United Nations; OIE—World Organisation for Animal Health; WHO—World Health Organization; DAFF—Department of Agriculture, Forestry and Fisheries (formerly DAWR—Department of Agriculture and Water Resources; ACIAR—Australian Centre for International Agricultural Research; CSIRO—Commonwealth Scientific and Industrial Research Organisation; ASEAN—Association of SE Asian Nations; APEC—Asia Pacific Economic Cooperation; SPC—Secretariat of the Pacific Community; APSED—Asia Pacific Strategy for Emerging Diseases; FHI 360—Family Health International; CHF—Cooperative Housing Foundation.

What did the investments do?

Approximately 82 per cent of the funding was directed to 10 main groups of investments. Across both human and animal health systems, the strongest area of focus was disease surveillance (part of the health information systems building block), followed by the areas of leadership and governance support, then laboratory (part of the medicines, vaccines and technologies building block) (Table 1). Not surprisingly, we found the strongest results were in the main areas of focus and investment.

Support for the health workforce was mostly in the areas of field epidemiology and training of paraveterinarians, village animal health workers and veterinarians.

The specific activities and implementation approaches used are identified in the subsequent chapters. A complete list of the investments with funding amounts and program description is at Annex 1.

Table 1 Areas of focus of the largest 10 groups of investments

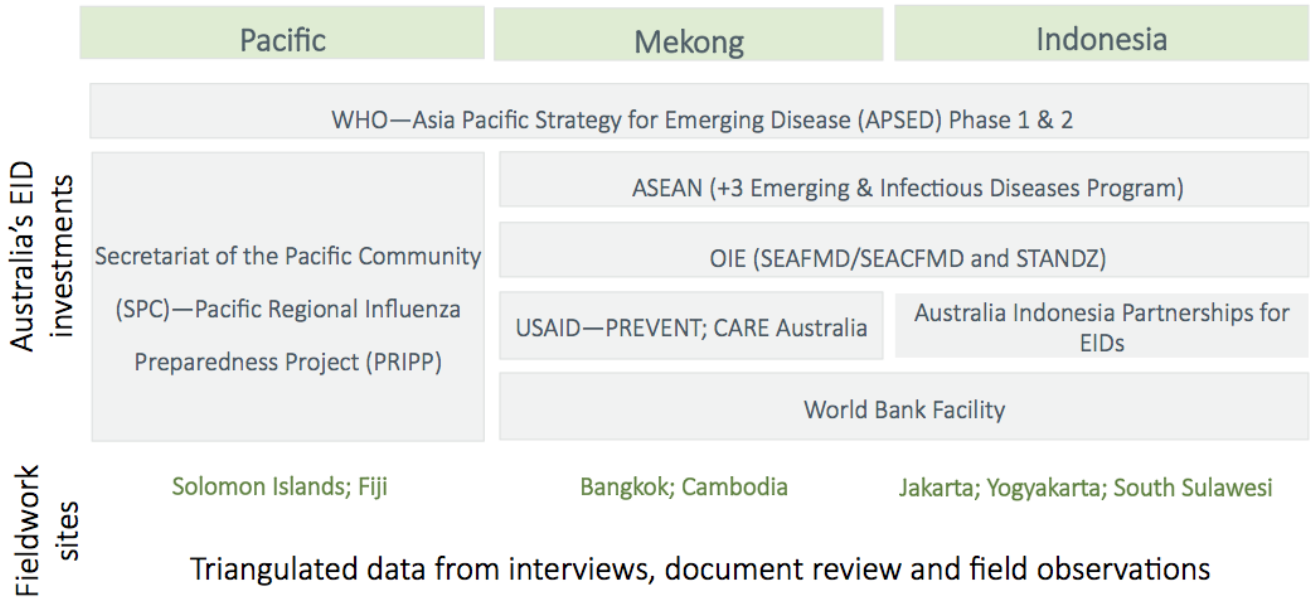
Main areas of focus*	Disease surveillance	Laboratory	Health workforce (includes FETP)	Leadership and governance	Community engagement and gender	Research and evidence	Total funding in AUD*
Indonesia EID programs	✓✓	✓	✓✓	✓✓	✓		$59,342,412
WHO APSED	✓✓	✓✓	✓✓	✓✓	✓	✓	$28,880,000
OIE programs	✓✓	✓	✓	✓✓	✓	✓	$21,121,845
World Bank AHI Facility	✓✓	✓		✓	✓	✓	$10,500,000
SPC—PRIPP	✓	✓✓	✓	✓✓	✓		$9,101,400
APEC PEID		✓		✓			$7,821,654
CARE	✓				✓✓	✓	$6,923,536
Timor-Leste Biosecurity project	✓	✓		✓	✓		$5,910,339
PREVENT/LAMP	✓				✓	✓✓	$5,892,433
ASEAN+3	✓	✓		✓✓	✓		$4,461,766
Total							$159,955,385

*Key: animal figures = investments in avian influenza, FMD and rabies and mainly focused on animal health systems; = mainly focused on human health systems = focused on both animal and human health systems.

Coverage of investments by fieldwork

All investment groups, with the exception of the Timor-Leste Biosecurity Strengthening Project (2006–10), were implemented in at least one of our fieldwork sites (Figure 5). Most of the fieldwork sites included a number of main investment groups. Selection of fieldwork sites included pragmatic considerations, since the evaluation team relied on DFAT posts to facilitate visits.

Figure 5 Major investment groups implemented in the fieldwork sites



Strengths and limitations

ODE believes that the approach and methodology employed has resulted in a robust evaluation. Key strengths of the evaluation were the spread of fieldwork sites, including a good range of investments and implementation contexts; the diverse group and large number of stakeholders interviewed; and the multidisciplinary evaluation team. However, there were several limitations.

The documentation was weak for a number of key investments. For other investments, the available documentation, while providing assessments against individual program objectives, or management arrangements, was not designed to report against contributions to health system strengthening. This meant that the desk review, which covered a large number of investments over a long period, was quite demanding, as was the analysis and triangulation against the interview notes. There were challenges also in the interview process. There were many possible intersections between the investments and human and animal health systems, yet for many interviewees, viewing the activities and their achievements through a health system strengthening lens was new. Therefore, it was necessary to include both open-ended and direct / more 'closed' or 'theory informed' questions to get as clear a picture as possible of the range of system strengthening outcomes, and the gaps. This resulted in the interviews being quite long, and in some cases it was not possible to cover all areas of enquiry.

Members of our team have had previous roles as technical advisers, consultants and evaluators to several of the programs included in this evaluation. We minimised potential conflict of interest by bringing a team perspective to bear. More than one team member was involved in almost all interviews, all team members participated in document review, and all reviewed and commented on subsequent drafts of the report—helping to refine data interpretation.

A reference group, comprising staff from DFAT and other government departments involved in Australia's effort to strengthen regional health security (Department of Health, DAWR, ACIAR), provided advice to ODE

to improve the quality and relevance of the evaluation to DFAT decision-makers. Members of the reference group also provided feedback on the evaluation plan and draft report and participated in a workshop to discuss and refine the recommendations.

2. EFFECTIVENESS AND IMPACT ON HUMAN HEALTH SYSTEMS

OVERVIEW

Across the Asia Pacific region, Australia's emerging infectious diseases (EID) investments in human health systems were focused largely on development of health workforce skills in field epidemiology, strengthening of EID surveillance systems, and support for leadership and governance (strategies, plans and policies). Assistance was mostly delivered through regional programs in the form of technical assistance and capacity building. Investments also provided technical support for laboratory functions.

This chapter outlines the approaches used by Australia's EID investment, provides our assessment of their contributions to system strengthening outcomes and identifies the remaining gaps. These are summarised in Table 2. It also assesses the integration of EID programs and activities within health systems and implications for future work.

Table 2 Approaches and system strengthening outcomes—human health

Focus	Approaches used	System strengthening outcomes
Health workforce to support EID detection, preparedness and response	Funded EID technical advisory positions Supported professional networking forums Supported trainees to apply skills, e.g. through operating surveillance systems supported through other investment Supported establishment of rapid response teams Strengthened Indonesian Field Epidemiology Training Program (FETP) Developed and delivered an 'adapted FETP' for the Pacific—Data for Decision Making	Field epidemiology as a cornerstone of effective surveillance and response established in South-East Asia Revitalised, accredited and highly regarded FETP with supervisory capacity and a community of practice for graduates Regional EID networks established, valued and used by countries in the region
EID surveillance	Supported technical aspects of EID surveillance along with EID networks, thus developing complementary 'hard' and 'soft' surveillance capacities Supported pilot of an early warning surveillance system in Indonesia and contributed to the development of the Pacific Syndromic Surveillance System	Increased expectations/norms around sharing of data A virtuous cycle of increased EID data sharing, with improvements in quality and timeliness of event reporting
Leadership and governance for EIDs at regional and country levels	Supported foundational governance structures with key roles in identifying and responding to outbreak threats Supported development of APSED roadmap and the capacity of WHO regional and some country offices to provide technical support for APSED implementation Advocated for greater inclusiveness, including advocating for greater recognition of the importance of gender issues in EID preparedness and response Achievements in EID surveillance and FETP helped build leadership and governance through greater availability and use of data in governance forums	A shared vision of what needs to be achieved in EID preparedness and response resulting in increased harmonisation of multi-donor EID funding and regional platforms supporting capacity building Graduates of FETP in health system leadership and management roles
Laboratory	Supported laboratory networking and established mechanisms for referral of specimens where countries lack capacity for own testing Supported cost of laboratory verifications and specimen shipping; directly supported training in how to ship specimens correctly Used injections of money received in response to specific disease threats to build laboratory system capacity benefiting other diseases	Networks established supporting ongoing quality improvement and peer support Laboratory quality assurance systems and diagnostic verification in place and used

Increased transparency and timeliness of communication about events and outbreak threats between and within countries

FIELD EPIDEMIOLOGY TRAINING AND PUBLIC HEALTH WORKFORCE DEVELOPMENT

The International Health Regulations 2005 (IHR) lists skills and competencies of public health personnel as a core capacity, noting that these are *critical to the sustainment of public health surveillance and response … and to the effective implementation of the IHR.*[*]

In this area, Australia's EID investments were focused on building basic technical capacities. They funded EID technical advisory positions in country governments and World Health Organization (WHO) country offices, helped develop field epidemiology training, supported trainees to use skills and supported the establishment of rapid response teams in various countries.

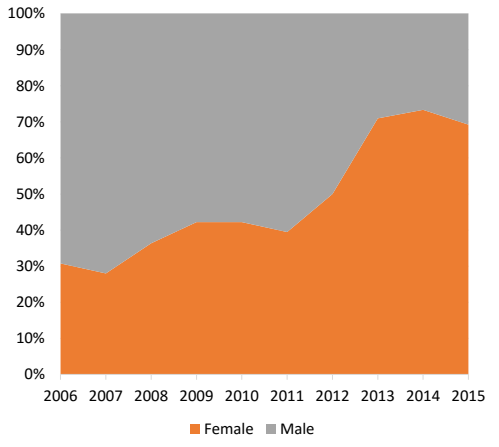
A cornerstone of effective EID surveillance and response established in South-East Asia

Field epidemiology is one of the essential components of EID preparedness and response. Several of Australia's EID investments supported establishment of field epidemiology training programs (FETPs) in South-East Asia.[†] Six member states in the WHO Western Pacific region have started an FETP since 2005.[‡] In the Pacific, through the Secretariat of the Pacific Community (SPC) investment, Australia supported a Pacific adaptation of a United States Centers for Disease Control course—Data for Decision Making. Partners in the Pacific Public Health Surveillance Network (PPHSN) implemented this course in 14 Pacific island countries and territories (PICTs). WHO delivered Australia's contributions to the FETPs in South-East Asia through the Asia Pacific Strategy for Emerging Diseases (APSED), with WHO country offices playing a strong role.

The two-year FETP program in Indonesia is now well established and institutionalised. Between 2006 and 2015, 311 people graduated (48 per cent women) through the FETP, with female participation increasing (Figure 6).

Australia was instrumental in the success of the FETP in Indonesia through placement of a long-term epidemiologist to provide technical assistance. Australia's bilateral EID investment also supported a secretariat for the FETP based in Indonesia's Ministry of Health. The secretariat provides high-level administrative and advocacy functions, supporting integration of the academic training with field learning opportunities and facilitating a network of alumni for professional development. The secretariat has successfully built the credibility of the FETP, linked it with international agencies and universities, and developed FETP offerings at universities in different provinces. This has increased throughput while encouraging a better distribution of

Figure 6 Increasing proportion of female graduates of Indonesia's FETP, 2006–15



* International Health Regulations (2005).
† WHO's APSED, the bilateral human health investments in Indonesia, the Vietnam UN Joint Program, and the World Bank Avian and Human Influenza (AHI) grants in some countries all contributed to establishing FETPs in South-East Asia.
‡ Cambodia, Lao PDR, Mongolia, PNG, Singapore and Vietnam.

graduates across the country. As a result of several inputs, including the advocacy and leadership provided by the FETP secretariat, the FETP is included in the Ministry of Health by governmental decree (unusual in the region), and the Indonesian Government funds FETP training scholarships. However, despite this progress, Indonesia is still in the process of developing optimal human resource placements and career progression for all FETP graduates.

Regional EID networks established, valued and used

Support to professional networks enabled FETPs contribute to system strengthening. These networks allowed graduates to build relationships with others in similar roles in their own and neighbouring countries, hear about relevant resources and developments in the field, and learn from one another.

Support to professional networks, where this occurred, was valuable, resulting in tangible and practical collaborative activities to address cross-border disease threats. Interviewees from ministries of health in Cambodia and Thailand valued the face-to-face meetings, where relationships were established, and these in turn led to bilateral cross-border simulation exercises and joint training. For example, in 2013 Indonesia hosted a joint Vietnam, Thailand, Cambodia and Indonesia training, with cross-border simulation exercises—partly as a result of the relationships established through networking activities. Also, as part of the preparedness for Ebola, and with support to SPC and WHO, the PICTs came together to develop capacity in infection prevention and control, use of personal protective equipment, and health facility disaster response training. While the evaluation did not have access to the amount spent on EID networks,[*] qualitative data from partner interviews suggest that in many cases this area of activity was likely a 'good buy' for outcomes achieved.

Main gaps—workforce

The bulk of the investment in the human health workforce area was in field epidemiology training and related technical areas (e.g. laboratory training). While this addressed an important need, the skills required to embed EID preparedness and response in health systems are not just in technical areas. To effectively progress a regional health security agenda, country health systems need champions with skills in:

- using population and public health data to inform resource allocation decisions
- planning and managing health systems (with a focus on primary health care, rather than hospitals)
- advocacy and budgeting for public health.

These areas were neglected in past EID investments.

The Pacific Data for Decision Making course was an attempt to produce a Pacific-tailored solution, and we found evidence of solid benefits to some individuals. The course is now accredited with the Fiji National University, which is a positive for the future. However, there are some serious limitations to the system strengthening potential and sustainability of the current model. While the course continues with donor

* These regional networks were enabled by Australia's support to the ASEAN+3 EID initiative ($4.6 million from 2006–10) and to WHO's APSED ($28.8 million from 2007–14, with additional support from other development partners)—noting that networking activities were just one component of these programs.

support, PICTs did not seem to have good ownership of this course (no PICTs contributed to participant costs). The selection of trainees was poorly targeted, and it is unclear whether trainees went on to use their skills in places they were needed. Similarly, there did not seem to be long-term alignment with a strategic approach to health workforce development. While it is still unclear what the right model for public health workforce development in the Pacific would look like, it seems that a more strategic, demand-driven—rather than supply-led—approach is needed.

While the use of networks is valuable as a means to build and sustain a public health workforce, not all networks are equally effective. Some Pacific interviewees questioned the value of using limited aid budgets for expensive regional meetings, while their country's needs in EID preparedness and response remained unaddressed. Overall, the documentation about the functioning of the networks, the inputs required to maintain them, and their outcomes was weak.

In all regions, but especially in the Pacific, the shortage of supervisory capacity was a serious constraint to progress in health workforce development generally, and public health workforce development specifically. Development and application of models that address the issue of supervisory capacity linked to public health training, possibly in partnership with Australian institutions, may be an area where future investments could play a useful role.

BUILDING EID SURVEILLANCE AND RESPONSE SYSTEMS FOR HUMAN HEALTH

Australia's EID investments have supported the development of both 'hard' capacities in EID surveillance (such as support to information technology, design of forms and reporting systems) and 'soft' capacities (such as promoting relationship building and trust through information-sharing platforms). Both 'hard' and 'soft' capacities are important and have helped to build momentum in EID surveillance and reporting in South-East Asia and the Pacific.

A 'virtuous cycle' of sharing of EID data within and between countries

Overall, Australia's investments have contributed to substantial improvements in the availability and sharing of EID data in the Asia Pacific region. This has resulted in more timely and open exchange about EID threats and greater awareness of the current EID situation within and between countries. This was the view of interviewees in all stakeholder categories, and is evidenced by the increased sharing of EID data over the past decade.

Box 2 Independent evidence for faster recognition and reporting of EID outbreaks

A recent study of the global capacity for EID detection provides independent evidence of a general improvement in the speed with which outbreaks were recognised in the period 1996–2015.[*18] The Western Pacific and Eastern Mediterranean regions improved the most. There were also fewer extreme delays in reporting. A caution, however, was that there has been little improvement since 2010. Further improvements are likely to require international collaboration, with a focus on countries with low or unstable human development indices, and further development of local surveillance systems.

The Association of Southeast Asian Nations Plus Three EID Program (2006–10) (ASEAN+3 EID) initiative helped bring political legitimacy to surveillance activities. The initiative was highly regarded by interviewees from development partner agencies and ministries of health in South-East Asia. This is notable because at the time of the investment closure in 2011, AusAID's quality reporting suggested that this investment had not been a great success. Our fieldwork has found encouraging evidence of the legacy of some of the program's outputs.

ASEAN has become an increasingly important facilitator and promoter of greater transparency and sharing of information on EIDs within its member state network. This has been critical to building momentum for EID surveillance. Some development partner interviewees said that they considered ASEAN+3 EID to be the best investment Australia had made, as they believed that it laid the foundation for this significant development. While not uniformly effective, success factors for the ASEAN+3 EID initiative were country ownership of the approach taken to build EID surveillance and reporting (not externally imposed or compliance driven like the IHR capacity assessments), and the program's incremental country-owned learning and improvement approach to capacity building. The work of WHO, through APSED, supported these developments by bringing a strong technical legitimacy to EID preparedness and response planning within ministries of health, particularly in South-East Asia.

The EID networks (described in 'Regional EID networks established, valued and used' earlier in this chapter) were also critical to the development of EID surveillance systems. In addition to the networks supported through APSED and the ASEAN+3 EID initiative, Australia's support to the SPC to coordinate the Pacific Public Health Surveillance Network (PPHSN) and its peer communication channel, PacNet,[†] also helped to establish platforms for sharing of information and experience. The networks organised, managed and disseminated information from the network members—including in some cases to Australian organisations. For example,

* (www.nc.cdc.gov/eid/article/22/10/15-1956_article).

† The Pacific Public Health Surveillance Network (PPHSN) is a voluntary network of countries and organisations dedicated to the promotion of public health surveillance and appropriate response to the health challenges of 22 PICTs. The core members are the 22 ministries and departments of health in the PICTs, who endorsed the network and its function, and whose authority or consensus guides its work. The network is further supported by regional and international agencies, training institutions, laboratories and other partners who can supplement the network with technical expertise and in-kind and financial support. It is governed by a coordinating body with a rotating membership, and SPC, WHO and Fiji School of Medicine as permanent members, with SPC designated as the focal point. PacNet is an email discussion list with more than 900 members primarily intended to alert regional neighbours to outbreaks to trigger preparedness. It is also the main PPHSN media for wider communication and coordination (www.pphsn.net/index.htm).

the Pacific EID networks provided information to Queensland Health. The networks thus had both 'filtering' and 'amplifying' roles.

Local EID surveillance systems strengthened

Along with platforms and mechanisms to share information about disease outbreaks and responses, there is also a need for stronger local EID surveillance systems in the region. Countries are currently at different stages of development in this area.

Australia's bilateral support in Indonesia and regional investments in many other countries supported development of information technologies, forms, data capture processes and data analysis ('hard capacities'). This is an important element because countries cannot share data as required by the IHR unless they have functioning internal data collection and reporting systems. WHO country offices are actively engaged in this work in many countries in South-East Asia. In Cambodia, the evaluation team were impressed by the gains made in the EID surveillance system with the support of WHO, establishing the use of information communication technology through an early warning and response system (CamEWARS). This resulted in improved timeliness and completeness of data collection, reporting and analysis.* Vietnam's surveillance system for communicable diseases was strengthened by Vietnam's Ministry of Health, with support from the Joint United Nations/Government of Vietnam Avian Influenza Program Phase II (2006–10) (Vietnam UN Joint Program). The 2011 evaluation of this Joint Program highlighted the systematic way in which capacity building work in this (and other areas) was undertaken.

The launch of the Pacific Syndromic Surveillance System in 2010 was a key advance in the development of local EID surveillance systems in the PICTs. Partly supported by Australia, the system was developed and endorsed as a common system for the PICTs. However, it is implemented by the participating PICTs as a local EID surveillance system, with local modifications where needed and a commitment to data sharing and regional analysis. Factors contributing to the success of the Pacific Syndromic Surveillance System are the low data burden (simplicity), flexibility of implementation (allowing countries to adapt aspects of the approach to suit context), and its participatory development and piloting prior to finalisation, which promoted good country ownership. Box 11 in Chapter 4 outlines how this initiative has benefited from an integrated approach that links surveillance, training and EID networks. The development of an early warning and response surveillance system (EWARS) in Indonesia was also a key factor in strengthening EID surveillance in the region, outlined in Box 3.

* CamEWARS is based on a Microsoft Access database that records suspected and confirmed cases as well as deaths due to 12 identified diseases and syndromes: acute watery diarrhoea, bloody diarrhoea, measles, acute flaccid paralysis, acute lower respiratory tract infection, dengue fever, meningoencephalitis, acute jaundice, diphtheria, rabies, neonatal tetanus, and clusters of unknown disease. Data are collected weekly from health care facilities. In addition, telephone text messaging from government facilities is used to share surveillance data.

Box 3 Results snapshot—support to EID surveillance in Indonesia

In Indonesia, the establishment and rollout of the early warning and response system (EWARS) was a significant achievement. Through the bilateral Australia Indonesia Partnership (AIP), Australia supported the pilot of the EWARS in six provinces. Less than eight years after its development, EWARS is now operational in 34 provinces of Indonesia, 514 districts and 9754 subdistrict health facilities. All of the provincial and most of the district-level operators have access to the web interface for data entry and retrieval, as do many of the health facilities.

Australia continues to provide niche support to the Indonesian Government's rollout of EWARS, providing ICT troubleshooting, training and other inputs necessary for smooth running of the system. The intention is that, in time, the Indonesian Government will take over these functions. At the time of the evaluation team visit, the EWARS system had signalled alerts approximately 15 000 times and around half of these signals resulted in the Ministry of Health verifying that an outbreak had occurred, or other actions taken in response.

The AIP bilateral EID investment also supported the transition of the POSKO (a national-level 'command post' or incident room that receives alerts and coordinates responses) into a disease reporting and response mechanism. The POSKO, originally established as a hotline for members of the public and concerned clinicians to report suspected cases of avian influenza, now receives reports of any suspected issues of public health concern such as food poisoning, suspected Middle Eastern respiratory syndrome coronavirus, measles, rabies, diarrhoea and dengue fever.

The graduates of Indonesia's field epidemiology training program, which also receives some technical support from the bilateral investment, play key roles in staffing both the EWARS and the POSKO.

Main gaps—EID surveillance

Addressing wide variation in use and timeliness of surveillance systems

While the establishment of surveillance systems is a key advance in the region, the systems are not always consistently used. This variation in uptake compromises the integrity of surveillance, particularly where there is low reporting from areas at high risk of EIDs. Reporting through the EWARS in Indonesia is a good example—currently 15 per cent of provinces (5 out of 34) report through the EWARS more than 85 per cent of the time. Indications are that reporting may have decreased slightly in recent years.[*†]

* Although not directly comparable, it would appear to be a little lower than the (undated) baseline provided in the design document for the successor AIP EID program (8 out of 34 provinces reporting more than 80 per cent of the time). This suggests the reporting rates have not increased, and may have dropped off slightly since the design baseline. It is also lower than reports from the 2013 midterm review, from fieldwork in Nusa Tenggara Timur (NTT), which reported that 9 out of 21 districts in NTT province were sending reports more than 80 per cent of the time.

† The wide variation in reporting reflects the wide variation in capacity in the country. While making reporting mandatory (as the Indonesian Government intends to do through ministerial decree) could help strengthen the system, it is difficult to see how districts with huge infrastructure and resource constraints will be able to comply. Where uptake is low, this raises some questions about whether the surveillance systems are fit for context, or whether some modification of design may be needed to suit different environments. This area needs further investigation.

There was limited integration evident between the various EID surveillance systems and the increasingly important private sector in health in South-East Asia. We noted instances of private institutions participating as sentinel sites in country EID surveillance systems. However, we did not find evidence of the private sector sharing EID data through the regional networks. Depending on the country context, this gap may be significant. This should be explored in the design of future investments in this area.

The EID surveillance systems were not well linked with country health information systems in the countries that we visited. Establishing better links and optimising synergies between EID surveillance and other health information systems will help to address variation in the use of surveillance systems. It will also help to identify the implications of each variation, although other strategies will also be needed. There may be some lessons to be drawn from the malaria program in the Solomon Islands. The program is taking steps to better integrate its work with the health system by funding monitoring and evaluation (M&E) officers in provincial health departments to work in surveillance / health information functions across other diseases, while providing the malaria program with specific local capacity.

The timeliness of surveillance systems is also an issue. The Pacific Syndromic Surveillance System addressed an important gap at the time of its development (2010) and continues to do so. However, this largely paper-based system of reporting is falling behind the more rapid and timely surveillance systems that take advantage of mobile technology—some of which have been developed as EID surveillance tools during and following emergencies, with good country support. For example at the time of our visit to Fiji, there were efforts to continue a mobile-based EWARS established with donor funding following the cyclone. Champions within Fiji's Ministry of Health were pursuing more sustainable funding sources for this surveillance system from 'mainstream' health funding. Australia's support to EID surveillance under the pandemics and emerging infectious diseases (PEID) strategies has not, in the past, been optimally linked in to the EID surveillance systems developed by humanitarian investments, such as the mobile-based EWARS (or to those surveillance systems developed for other diseases, e.g. malaria). While these different surveillance systems fulfil different purposes, the increased availability of mobile technologies—and increasing emphasis on integration of disease-specific programs into health systems—will provide opportunities for greater synergy in the future.

Increasing capacity to act on surveillance signals

Capacity to respond to the greater volume of surveillance signals has not kept pace with data availability. The main constraints continue to be the state of development of primary health care systems, and some lack of clarity about the roles and responsibilities of different parts of the health system in relation to disease outbreak response. For example, a common limitation to better response in countries we visited was inadequate access to funds to respond to outbreaks that were not designated a public health emergency. Ministry staff in some countries expressed a preference for approaching donors for response funds because it was difficult to get funding quickly enough from the national budgets—checks and balances, often in place to protect against corruption, meant delays of weeks, when timely response was of the essence.

The wide variation in development of EID systems, both within and between countries, suggests that different places may need different interventions to 'bring the system along' to ensure that response capacity keeps pace with developments in surveillance. While regional frameworks for surveillance and response were important to provide the 'scaffolding' for EID systems, and to develop and sustain

momentum for change, countries also require targeted country-specific support to address contextual issues and develop systems that work and are sustainable.

LEADERSHIP AND GOVERNANCE

Leadership and governance of human health systems are fundamental drivers of system improvement in any area of health, not just EIDs. In the IHR, legislation and policy development is emphasised as the first core capacity area. There are also references to leadership and governance across other IHR capacity areas, including surveillance and response, laboratory and infection control. From a health systems strengthening perspective, sustainable gains in EID preparedness and response require more than enlisting good managers to lead specific EID initiatives. People whose job it is to develop health policy, allocate resources, manage services, and so on need to understand the importance of EIDs, and public health, and factor this into their decision-making.

For the most part, Australia's EID investments focused on leadership and governance relevant to the EID area of work, and did this well—making a strong contribution to the vision of what needs to be achieved for EID preparedness and response. The activities also achieved some (more limited) penetration into the leadership and governance of health systems. This was achieved through support to foundational governance structures—for example, the SPC Public Health Division and WHO, which provide secretariat support to the Heads of Health meetings in the Pacific. This penetration into the health system was also achieved by a number of FETP graduates taking up leadership and management roles in different parts of Indonesia's Ministry of Health. This, in time, should help to bring a stronger population health orientation to country health systems.

A shared vision of what needs to be achieved in EID preparedness and response

APSED contributed to a clear vision of what was needed in the Asia Pacific region for EID preparedness and response. This bi-regional initiative, implemented by WHO's Western Pacific Regional Office (WPRO) and South East Asia Regional Office (SEARO), brought countries from these two WHO regions together[*†] and provided technical support for implementation of a common strategy. This filled an important gap in EID leadership at the time of its development in 2005. The APSED strategy and roadmap were influential in helping countries advocate for greater political commitment to EID work, particularly in South-East Asia. APSED also promoted greater coordination and harmonisation of use of EID funding by WHO in the region.

In the Mekong, there was a clear legacy of the work of the ASEAN+3 investment (ended in 2011), and the work of APSED (ongoing) in supporting EID leadership and governance. ASEAN brought political legitimacy to EID preparedness and response work plans. The model used by this initiative—giving individual countries the

* The WHO Western Pacific region comprises Australia, Brunei Darussalam, Cambodia, China, Cook Islands, Fiji, Japan, Kiribati, Lao PDR, Malaysia, Marshall Islands, Micronesia, Mongolia, Nauru, New Zealand, Niue, Palau, PNG, Philippines, Republic of Korea, Samoa, Singapore, Solomon Islands, Tonga, Tuvalu, Vanuatu and Vietnam.
† The WHO South-East Asia region comprises Bangladesh, Bhutan, DPR Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste.

lead role in driving action in designated priority areas—resulted in excellent country ownership and good sustainability of some of the projects undertaken in countries in the Mekong.

Countries in the region show growing leadership in EID preparedness and response. For example, Indonesia was the 2016 chair of the Steering Committee for the Global Health Security Agenda (GHSA), an initiative launched in 2014 to accelerate global health security through greater regional and global collaboration. Other countries in the region are leading aspects of the GHSA and have incorporated products resulting from the ASEAN+3 EID investment into their GHSA work plans. As part of the GHSA, countries in the region have also supported the Joint External Evaluation (JEE), a process of external independent evaluation of IHR core capacities, through being among the first to volunteer to participate. WPRO and SEARO were strong advocates for the JEE and helped to shape the formulation of this process, now being used globally.

Main gaps—leadership and governance

Overall, building leadership and governance capacity to address the underlying contributors to risk of disease emergence, including the enormous issue of growing drug resistance in our region, was not well addressed. We found little evidence of Australia's EID investments supporting the revision of public health legislation or regulatory frameworks, and little work towards integrating a population health perspective (rather than a disease-centric approach) into management and budgeting decisions. Policy and legislation development was not a major focus of the regional EID investments. There was work in this area by the Vietnam UN Joint Program but it was primarily related to avian influenza. These gaps fit with a general picture of a strong technical focus to the investments, with lesser focus on the upstream issues that influence the implementation and effectiveness of technical solutions.

APSED was influential in building political commitment to addressing EIDs in South-East Asia, but it had less traction in the Pacific region. We consider a bi-regional strategy to have been overly ambitious, and while the strategy and roadmap worked for the larger South-East Asian countries, the concerns and priorities of the PICTs were reported (by them) to be somewhat 'drowned out'—particularly during the early phase of APSED. For PICTs, a more systems-focused strategy that helped to get some of the basics right—such as reliable access by health centres to clean water, and a systematic approach to building the core public health skills of the health workforce—may have garnered greater political commitment.

For bilateral investments, the gaps in this area are closely linked to gaps in the health workforce area, and are not repeated here. At a regional level, however, there is also the question of how future investments might help to contribute to greater political commitment to public health among political leaders and policy makers. This is an area where donor harmonisation and commitment through establishment of a regional 'learning platform' to support evidence-based public health / EID policy making could make a real difference.

LABORATORY STRENGTHENING IN HUMAN HEALTH SYSTEMS

Access to public health laboratory service with capacity to produce accurate and timely results is a cornerstone of any country's capacity to investigate public health events such as disease outbreaks. In order to do this, laboratories need standardised methods, sufficient funds, suitably trained staff and laboratory

supplies.[19] Public health laboratory capacity varies widely across the region. Australia's EID investments supported laboratory strengthening in both South-East Asia and the Pacific. Investments supported technical capacity development and the establishment and operation of laboratory networks and referral systems. Generally, we found the assistance provided in response to specific disease threats was used to build laboratory capacity that had benefits for other diseases.

Strengthening laboratory capacity for EIDs has been one of the core focus areas of APSED since 2005.* The ASEAN+3 EID investment, the Vietnam UN Joint Program and Pacific investments through SPC and WHO also worked to strengthen laboratory capacity for EIDs. In the Pacific, Australia's investments provided direct training in specimen shipping, and SPC and WHO continue to support costs and logistics for this task.

In both Asia and the Pacific, laboratory networks supported by the initiatives resulted in greater openness between countries in sharing information, peer support and troubleshooting technical issues. The establishment of a laboratory network (Labnet) and referral systems were particularly important for PICTs. Labnet, supported by Australia through the SPC, links smaller islands' national laboratories with the Fiji national laboratory, Mataika House,† and both SPC and WHO support the cost and logistical arrangements for specimen shipping. This resulted in increased access to laboratory facilities for many of the smaller island nations.

Main gaps—laboratories

The public health functions of laboratories still have a number of unaddressed needs, especially in the Pacific region. Many PICTs are still developing basic laboratory functions to support inpatient clinical care, and are uncertain about how to develop public health laboratory functions with their limited resources. For example, the evaluation observed that in the Solomon Islands there is no dedicated public health laboratory. The laboratory at the National Referral Hospital in Honiara does not prioritise collection and testing of specimens for public health unless there is a major emergency. It relies on additional funding, often provided by donors, to conduct public health tasks. We were told that this is because collection and testing of these specimens is not funded by the health budgets and is not seen to be directly relevant to inpatient care—so they are not funded by the hospital budget either. These types of problems are system problems, for which more than a technical approach is needed. There are ongoing initiatives to support laboratories in some PICTs through DFAT's general health investments, and investment by other development partners. There is a need to ensure that public health and EID functions of laboratories are given adequate emphasis in existing laboratory strengthening initiatives, rather than developing new initiatives.

INTEGRATION BETWEEN EID WORK AND HEALTH SYSTEMS

Australia's EID investments in many countries were a relatively small component of the total health system investment. This was especially true in the Pacific and in Cambodia. It was also the case in Indonesia, where

* The 2015 draft APSED evaluation report (unpublished) noted that from 2005–15, SEARO and WPRO allocated 12 and 7 per cent of their APSED funds respectively to laboratory strengthening activities.
† Mataika House, the Fiji Centers for Diseases Control National Laboratory, conducts complex diagnostic and confirmatory testing for priority outbreak-prone diseases, including capacity to conduct polymerase chain reaction-based tests for a number of key pathogens.

large bilateral health programs resulted in some good systems-level achievements. Among these was the AIP for Health Systems Strengthening 2007–13, which specifically sought to link policy development with local implementation. In the Pacific, where there has been a long history of bilateral health programs, it was apparent that these programs contributed significantly to country EID surveillance and response capacity.

In the Solomon Islands fieldwork, the team observed that Australia's long-term support for the health system helped with response and containment of several recent outbreaks of infectious diseases, including the rotavirus outbreak of 2015–16 and the measles outbreak of 2014–15. However, Australia's regional EID investments (through the SPC and WHO) in strengthening the EID surveillance capacity of Solomon Islands' Ministry of Health and Medical Services were instrumental in the identification of these outbreaks through the syndromic surveillance system. Although the bilateral support was more visible than the regional EID investments, the regional support for surveillance was complementary and helped set the stage for the Solomon Islands' response.

Overall, activities were tailored reasonably well to the health systems in which they were implemented, but they had less of an influence on 'host' health systems than the health systems had on them. A range of health system factors influenced the implementation and effectiveness of the EID investments. These included access to funding at appropriate levels, health workforce policies and procedures, health facilities and infrastructure development, vertical fragmentation of health systems, and a lack of population health orientation (Box 4 provides some examples).

Box 4 Upstream health system factors meant that the full value of emerging infectious disease (EID) investments was not realised—illustrative examples

- In Indonesia, investment in EID surveillance created less public health value where health facilities, districts or provinces were unable to respond promptly to outbreak signals. This was generally because of difficulties accessing funds at the appropriate level and the variable priority given to the issue by accountable authorities.
- Investments in training people in field epidemiology did not realise their full value unless people were employed in places where they could use their skills. Indonesia and Cambodia were still developing effective human resource placement and career progression systems for graduates, so it was a challenge to make optimal use of all those trained. In the Pacific, delivery of the Data for Decision Making course was not part of a wider workforce development strategy. The training was not well targeted and the opportunity costs of participation were not given adequate consideration. Since the course was not well linked with a needs-based health workforce development strategy, there was a lack of consistency in identifying who would benefit from training, and also in post-training support and supervision.
- Where health facilities lack the basics of sanitation, safe water supplies and soap (noted in some areas of some PICTs), infection prevention control activities and preparedness for outbreaks are unlikely to be optimally effective. EID work is not well linked to water, sanitation and hygiene efforts at country level.
- Starting with EID activities at the point of care, the evaluation noted a tendency to implement EID investments as siloed programs—this risks contributing to health system fragmentation and inefficiencies and does not build systems longer term. For example, in Indonesia, the evaluation field visit to one of the provinces noted that the province's surveillance focal points were entering disease-specific data on four separate laptops—each provided by a different disease-specific development initiative.
- Strong political pressure for financing and governance efforts to prioritise curative and personal services over preventive population health services, together with weak leadership to drive an evidence-based public health agenda, continues to contribute to the lack of sustainable public health financing for EID work in some countries.

We identified no examples of good integration between Australia's EID investments and Australia's other investments in strengthening country health systems. Where investments were complementary at country level (for example, support to regional EID surveillance in the Pacific was complementary to more general support to the country health systems), this was a positive. However, complementarity cannot be taken for granted or left to chance. Some former and current DFAT interviewees noted that the lack of a more explicit approach to integrating EID and general health system investments was a missed opportunity. In Indonesia, the concern was raised that the bilateral AIP EID investments were not better aligned with the Australia Indonesia Partnership for Health System Strengthening (2007–13). Other interviewees, particularly from the technical agencies and the Ministry of Health, were more comfortable with the purely 'technical' focus of the

EID investments. Assessing the potential for greater synergies would need a more detailed review of the relevant investments.

A further risk of a siloed approach to EID work is that it may lead country governments to see EID preparedness as separate from core business, and something that a particular group or unit (or development partner) takes care of for them. This risk was realised in some settings, particularly in the Pacific. There is a 'two-way relationship' between the health system and EID activities, and better integration between the different forms of investment is required. The size of the investment in EID simply cannot do the work required on its own.

CONCLUSION

Australia's EID investments have helped to strengthen EID surveillance, the technical (field epidemiology) side of the health workforce, EID leadership and governance, and laboratories.

Overall, Australia's investments contributed to substantial improvements in the availability and sharing of EID data in Asia and the Pacific over the last decade. This resulted in more timely and open exchanges about EID threats and greater awareness of the current EID situation within and between countries.

These improvements resulted from efforts on a number of fronts. First, there has been a focus on building EID technical capacities in partner countries through field epidemiology training and developing surveillance and reporting systems. Second, investments supported surveillance and laboratory networks for sharing information between and within countries, which have led to stronger regional cooperation. Third, WHO through APSED brought a strong technical legitimacy to EID preparedness and response planning within ministries of health, particularly in South-East Asia. Finally, investments in regional forums—especially ASEAN—have brought political legitimacy to EID activities, fostering a shared vision of what is needed to address emerging threats.

These are positive developments, but it is important to keep them in perspective. In particular, capacity to use surveillance data for policy, planning and response has not kept pace with its increased availability.

It is important to be realistic about what relatively modest levels of investment can be expected to achieve. However, a key test of future EID investments will be whether they can move beyond narrow technical areas to address systemic constraints to EID preparedness and response capacity. This will require work in areas such as public health policy making, health systems planning and service management (with a focus on primary health care), disease outbreak management and recovery, and health financing.

We found marked differences in the effectiveness of EID investments in strengthening health systems between South-East Asia and the Pacific. In the Pacific, there are still significant DFAT bilateral health programs in some countries and Pacific health staff at all levels wear many 'hats'. With few specialist infectious disease or public health personnel, there is a clear need to integrate EID work and bilateral health investments. This integration should, in time, help to address some of the challenges that beset past EID programs in the PICTs—specifically the need for greater political commitment allocating sustainable funding for core public health functions, including but not limited to EID surveillance and response. Given the high exposure of the PICTs to natural disasters, there is an opportunity for greater integration of health security

into disaster risk reduction policies and plans, and the inclusion of emergency and disaster risk management programs in national health strategies.*

In South-East Asia, Australia's support to ASEAN helped bring political credibility and country ownership to EID work in South-East Asia. However, over the evaluation period, neither the technical agencies nor ASEAN engaged with the institutional side of health system strengthening, which limited the public health value that was achieved. Engagement with the institutional side of health system strengthening would, for example, include addressing factors such as financing flows to accountable authorities; human resource policies and practices; availability of sanitation and safe water supplies; and evidence-informed resource allocation processes that give appropriate weight to core public health and preventive functions. With the reduction in DFAT's bilateral health programs in South-East Asia, DFAT will need to work with reputable partners who have expertise and established relationships at the country level. The quality and influence of DFAT's engagement with these implementing partners will become increasingly important to progress the Australian Government's regional health security and health systems strengthening agendas.

Recommendation 1

That in the design of future EID investments, DFAT require a clear articulation of how these investments will strengthen country-level health systems, with reference to national, regional and global health initiatives and plans.

i. In the Pacific, where DFAT has significant bilateral health engagement, regional EID investments should clearly complement and seek to strengthen country-level efforts—such as by reinforcing existing health sector structures and planning processes.

ii. In other countries, where DFAT may not have strong health engagement, DFAT should look to work through multilateral partners who have an established and respected country presence in health and are equipped to work in the priority areas.

* The Sendai Framework for Disaster Risk Reduction and the Bangkok Principles for the implementation of the health aspects of the Sendai Framework (who.int/hac/events/2016/Bangkok_Principles.pdf) provide direction for future efforts to build resilient health systems and improve health security in the context of disaster risk reduction.

3. EFFECTIVENESS AND IMPACT ON ANIMAL HEALTH SYSTEMS

OVERVIEW

Australia's emerging infectious disease (EID) investments in animal health focused on a number of areas. The bulk of funding was used to establish animal health surveillance systems, and train people to use them.* The EID investments also built partnerships and collaborations for disease control, supported training for the animal health workforce and upgraded infrastructure and skills in animal health laboratories.

This chapter identifies the approaches used by Australia's EID investments and our assessment of their contributions to the main system strengthening outcomes. The areas of focus, approaches used and system strengthening outcomes are summarised in Table 3.

* The main investments contributing to animal health surveillance were Australia's regional contributions to the World Bank Avian and Human Influenza (AHI) Facility, the Vietnam UN Joint Avian Influenza Program, the CARE Australia Community-based Avian Influenza Risk Reduction Program—Mekong Region, and the bilateral EID animal health investments in Indonesia.

Table 3 Approaches used and system strengthening outcomes—animal health

Focus area	Main approaches used	System strengthening outcomes
Leadership and governance	Building a regional disease control model for a single disease of high economic importance (foot and mouth disease [FMD]) with supporting activities for wider application and veterinary system strengthening—country-led disease control with regional support and network of national coordinators System-wide, multifaceted partnership approach with long-term embedded technical assistance (Indonesia)	Regionally owned vision about a regional disease control strategy Animal health legislation and country governance and coordination structures Raised profile of veterinary services in South-East Asia
EID surveillance	Establishing and maintaining the link between the animal owner and the surveillance system—included paraveterinarian training and support to district-level service Developing user-centred, multipurpose animal information platform (Indonesia) Mapping of FMD information, promoting data sharing and building capacity in outbreak investigation	Wide uptake of an animal health information platform in Indonesia, substantially resourced by the Indonesian Government Establishment of a regional disease reporting platform for FMD with indications of increased event reporting
Animal health workforce	Worked with peak bodies and governments to provide training packages for veterinarians and paraveterinarians Training included development of new workforce (paraveterinarians and improving quality of veterinarian pre-service training) and upskilling of existing workforce	None yet. It will take time for foundational improvements to filter through and become embedded
Laboratory and quarantine services	Avian influenza–specific laboratory infrastructure, supplies and equipment, supplemented by establishing general laboratory system quality assurance systems in some settings Regional laboratory network for FMD	Establishment of quality assurance systems in animal health laboratories No substantial systemic outcomes from quarantine work

LEADERSHIP AND GOVERNANCE OF VETERINARY SERVICES

Leadership and governance for EID preparedness and response in animal health systems is situated within leadership and governance of the veterinary services overall. It is difficult to get governments in low resource settings to invest in public veterinary services due to the low priority given to zoonotic disease and human health risks (outside of emergencies). The main drivers of veterinary service development are livestock production and trade, and there are differences between countries depending on the role of exports in the economy. If animal exports are not a significant revenue earner, a country's veterinary services tend to be poorly resourced. In such cases the global public good arising from EID preparedness and response, while evident to donors, does not have much traction unless there is a significant disease outbreak. There are also issues related to transboundary animal diseases. Large livestock movements

between countries have ramifications for disease spread, and there may be trade implications if countries report outbreaks or implement containment measures.

Established country EID governance and coordination structures and animal health regulatory frameworks

The *Pandemics and Emerging Infectious Diseases (PEID) Strategy 2006–2010* predominantly focused on leadership and governance related to H5N1 highly pathogenic avian influenza virus (H5N1 HPAI). The establishment of governance mechanisms contributed to whole-of-government responses to H5N1 HPAI, including greater collaboration between animal and human health systems in different countries.* Interviewees generally felt these governance structures had laid a foundation for coordination between sectors.

Early investments also contributed to the development of animal health regulatory frameworks and legislation in several countries. The World Organisation for Animal Health's (OIE) Stop Transboundary Animal Disease & Zoonoses (STANDZ) regional initiative, which followed and built on these earlier investments, played an important role in drafting legislation and pushing it through to adoption or finalisation. In Cambodia, the World Bank Avian and Human Influenza (AHI) Facility grant supported the initial drafting of animal health legislation, and support from STANDZ was instrumental in getting the draft approved and passed after a seven-year development process. In Vietnam, support from the Vietnam UN Joint Program and the World Bank AHI Facility commenced the drafting process and the STANDZ investment made inputs to finalise the draft. This animal health legislation will have long-term impacts on disease control, animal trade and the control of veterinary drugs that are relevant to public health.

In the later period, the Australia Indonesia Partnership EID Animal Health Program (AIP EID animal health program) (2010–15) in Indonesia achieved good results in supporting policy development. Under the program, exercises in disease control planning were conducted at national, provincial and district levels. A key outcome was establishing governance mechanisms to encourage different levels of government to participate in implementation of disease control plans. This was important because poor implementation of national disease control plans at the district level was a constraint. The program also supported a pilot project on developing a budget advocacy model in Makassar (South Sulawesi). This was aimed at providing Indonesian Government officials with a template and guidance to develop budget proposals when seeking funding from government to detect or control EID. The development of the information platform iSIKHNAS (see 'Development of an information system for animal health surveillance' later in this chapter) also

* Examples were the technical working group for H5N1 HPAI in Cambodia and the secretariat for the Partnership for Avian and Human Influenza, funded by the Vietnam UN Joint Program. Both the Vietnam UN Joint Program and the World Bank AHI Facility supported the activities of a Biosecurity Working Group in Vietnam. This forum engaged a range of stakeholders to examine issues related to biosecurity in smallholder producer systems and advised the Vietnamese Government on policy matters.

contributed to stronger governance through improving the availability of data and relationships and feedback between different stakeholders.

A regionally owned vision about a regional disease control strategy

Foot and mouth disease (FMD) is the priority livestock disease in South-East Asia due to its economic impact. Australia has invested around $21 million in OIE programs to address FMD since the inception of the South-East Asia and China FMD (SEACFMD) campaign in 1997.* Initially this investment was through SEACFMD, but it is now through STANDZ. Australia has also made important technical contributions to the establishment of a regionally owned vision for FMD control in South-East Asia. In addition to controlling the disease in affected countries, SEACFMD seeks to reduce the risks of importing FMD for those countries that are now FMD free. FMD is the most costly biosecurity threat to Australia's livestock industries, and a major constraint to livestock production and trade in South-East Asia. Eliminating FMD from the region is in Australia's national interest as FMD remains endemic in South-East Asia, including Malaysia.†

The SEACFMD strategy has provided an effective framework for implementing country-led national FMD control plans. It is highly regarded as a model for regional coordination and cooperation. Although FMD is not zoonotic, the FMD control approach of strengthening veterinary systems and outbreak investigations was applied to the avian influenza response.

This approach is now being used as a basis for Association of Southeast Asian Nations (ASEAN) regional animal disease control strategies for avian influenza and rabies. The SEACFMD program is formally linked to the ASEAN Sectoral Working Group on Livestock, helping to ensure complementarity. Key stakeholders interviewed by the evaluation team expressed support for greater integration of SEACFMD with ASEAN structures after Australia's investment through STANDZ finishes in December 2017. There is also recognition that Cambodia, Lao PDR and Myanmar in particular will need continuing external support to control FMD. Rabies activities undertaken through STANDZ (including in the Philippines) could also be integrated with the ASEAN rabies strategy.

Raised profile of veterinary services in South-East Asia

Outcomes of OIE's advocacy work at ministerial level were not reported, and it is difficult to assess what these were. Some interviewees said that OIE could be more effective by influencing the ASEAN Sectoral

* Originally known as SEAFMD, the regional campaign was joined by China, Singapore and Brunei Darussalam in 2010, after which it was renamed SEACFMD. In this report, we use SEACFMD throughout.

† Brunei, Indonesia, East Malaysia, the Philippines, Australia, New Zealand and the PICTs are FMD free. The Australian Bureau of Agriculture, Resources, Economics and Sciences has identified FMD as the most costly biosecurity threat to Australia. A large FMD outbreak would cause severe direct economic losses to the livestock and meat processing sector with potential to reduce Australian GDP by $10.3 billion to $16.7 billion over 10 years (K Matthews, *A review of Australia's preparedness for the threat of foot-and-mouth disease*, Department of Agriculture, Fisheries and Forestry, 2011,10).

Working Group on Livestock and raising matters at the Senior Officers Meeting (part of the biannual meeting of the ASEAN Ministers of Agriculture and Forestry).*

OIE's Performance of Veterinary Services (PVS) evaluation tool and gap analysis provide an objective basis to assess the state of a country's veterinary services. They are supported by Australia's SEACFMD and STANDZ investments, and have been a useful way to advocate for greater support to veterinary services. The PVS gap analysis has helped countries to prepare costed strategic plans for strengthening their veterinary systems. In Cambodia, it was used to advocate for increased resources from the Cambodia Ministry of Finance. We were told that, as a result, the 2016 livestock budget tripled. In Vietnam, the PVS approach led to a significant increase in the veterinary services workforce. The PVS evaluation tool and gap analysis were helpful in fostering country ownership over the design of animal health investments in Cambodia and Indonesia.

STANDZ's FMD pilot vaccination programs in Cambodia and Lao PDR have enhanced the credibility of veterinary services, built stronger links between communities and the animal health service, and increased capacity of the animal health service. These pilots introduced the veterinary service and the community to the concept of targeted vaccination, the most practical approach for vaccine delivery in a resource-poor environment. In Lao PDR, the credibility of the veterinary service was bolstered by the economic benefits of profitable trade with China. However, concerns were expressed about the sustainability of the FMD vaccination programs if there is no external support.

* As there is already a relationship between the OIE Sub-Regional Representation and the ASEAN Sectoral Working Group on Livestock, there may be other constraints to effectiveness here that we did not identify.

Image 1 FMD vaccination, Steung village, O'Saray commune, Tramkok district, Takeo province, Cambodia, 2016. Photo: Adam Craig

Main gaps—leadership and governance

Overall, the various animal health authorities responded as well as they could given the lack of preparedness, limited resources and, in some cases, lack of political support. A lot of international support, including from Australia, went to patching the gaps in EID response capacity. However, significant foundational leadership and governance issues in EID preparedness and response were not addressed by these past investments. These need continued attention. In particular, response strategies and policies are not well developed—this is an area where investments have not generated strong outcomes and there are gaps in the policy frameworks to deal with a serious new EID or zoonosis. National plans and activities have tended to emphasise the technical aspects of disease control. There has been less contribution to some foundational policy aspects.

One neglected aspect relates to policies covering culling and compensation as a disease control and eradication strategy. Culling with adequate market-based compensation is a cornerstone of control and eradication designed to maintain or restore economic benefits associated with international trade, or local market supply of animal products. Management of H5N1 HPAI in the absence of an equitable compensation scheme for farmers whose flocks are culled (either because of active disease or to limit spread of disease) is an area where a clear policy environment is needed but is often lacking. Area-wide culling without compensation cannot be justified once a disease becomes endemic and/or where poor households bear the brunt of control measures. To deal with this, some countries introduced 'focal culling' in H5N1 HPAI outbreaks—the destruction of infected birds and poultry in direct contact with infected birds—coupled with intense public and animal health risk communication. Compliance with OIE standards is difficult in such circumstances, and there is no standard for focal culling or guidelines on how to deal with such issues in resource-limited endemic disease situations.

Finding resources for compensation has been challenging. Early in the disease control effort in Indonesia, the national government paid some (albeit inadequate) compensation. Subsequently, the World Bank AHI Facility allocated a significant portion of a grant towards a compensation fund for H5N1 HPAI control, but the Indonesian Government did not activate that part of the grant. In Cambodia, the policy is not to pay compensation, and donors are forbidden to support it. The fact that many countries do not have policies or procedures for compensation is a problem for zoonotic EID response.

Box 5 Policy challenges in responding to an emerging infectious disease in South-East Asia

The response to H5N1 HPAI in South-East Asia illustrated the issues arising from lack of clear policies to deal with a serious disease outbreak in animals. Initial efforts to control H5N1 HPAI were not particularly effective. Across the region, a range of disease control measures were used, including culling of infected birds, compensation for poultry owners and pilot vaccinations.

In some places, such as Indonesia, area-wide culling was used initially but this was scaled back to focal culling of infected birds and poultry in direct contact with infected birds, with attention paid to disinfection and other measures to protect public health. In general, these standard sanitary measures were relatively ineffective in controlling avian influenza in Indonesia because the disease was more

entrenched than realised, and ducks were not recognised to be silent reservoirs of infection. A further constraint to control was the continued large movements of poultry to traditional live bird markets. A review of the Participatory Disease Surveillance and Response System (PDSR) in Indonesia* noted that, while village-based focal culling in Indonesia was acceptable to poultry owners, it did not contribute much to disease control—thus, in that sense, it was not good policy for Indonesia where avian influenza was widespread.

In contrast, in Lao PDR, where there were more sporadic outbreaks of avian influenza, the World Bank Avian and Human Influenza (AHI) Facility successfully supported a compensation mechanism for avian influenza. Implementation of focal culling programs in Lao PDR, where compensation was available and the disease was not endemic, proved effective in containing sporadic outbreaks. However, culling was less effective in Indonesia, where the disease was endemic and there was inadequate compensation.

Different approaches are required where the disease is endemic compared to where the disease is considered sporadic and exotic. Getting the policy settings right for disease control measures in different contexts is an important contributor to success and equity. Vaccination is another disease control measure that requires clearer policies. While policy is a national sovereignty matter, there is still a lack of coherence in approach across the region, due partly to limited regional policy leadership in animal health.

The important question is: to what extent has this experience prepared the region for a new zoonotic emergency? The general weakness of veterinary public health policy and capacity remains a significant constraint to responsiveness and coordination. National legislative frameworks are generally still not flexible enough to deal with a new pathogen, resulting in delays in effective response. If livestock are involved in an epidemic of high public health impact, there will be pressure to use severe measures to control the disease in animals. The owners will bear the initial economic impact, and this must be considered in policy development.

A One Health policy foundation will be necessary to enable effective coordination between animal and human health sectors to ensure the measures are proportionate, supported by both sectors and well resourced. In this respect, there are still significant gaps in the governance mechanisms to deal with an emergency such as a new strain of avian influenza. Given the transboundary nature of emerging disease threats, there is an important role for regional coordination approaches supported by animal and human health sectors.

* The PDSR was an intensive avian influenza surveillance system supported by USAID and a World Bank AHI Facility grant in Indonesia, and Australia's bilateral animal health program in South Sulawesi Province in a modified form. PDSR is discussed further as part of community engagement in Chapter 5.

Image 2 Ducks during the Cambodia avian influenza crisis, Cambodia, 2005. Photo: Lorrie Graham (from DFAT photolibrary)

Linkages with private sector

We found few examples of linkages to the private sector (or commercial sector as opposed to smallholders) that would help to solidify the gains achieved by the investments to date—and where these have occurred they have tended to be at the operational level.* However, there are examples—such as Meat and Livestock Australia funding a joint cost–benefit analysis of maintaining Indonesia's FMD-free status.†

Australia's new investment in the Mekong countries (through USAID in the Food and Agriculture Organization of the United Nations (FAO) Livestock Production and Market Chain initiative) includes a private sector dialogue component. This will focus on animal–human interaction points along value chains to reduce economic losses and risk to public health. It is too early to form an assessment of the effectiveness of these efforts.

BUILDING SURVEILLANCE SYSTEMS IN ANIMAL HEALTH

The main challenge in strengthening animal disease surveillance is to establish and maintain links between animal owners and surveillance systems. The experience of the first phase of investment (2006–10)

* STANDZ developed links with veterinary groups to assist with rabies vaccination projects and SEACFMD engaged with farmers and traders on cross-border trade and in FMD vaccination pilot sites. In Indonesia, Australia's modification of the PDSR in South Sulawesi included engagement with small commercial producers, linking them to local government services as part of the surveillance network. The USAID-funded activities in Java and Sumatra have used a similar approach. This was an extension to the initial design of the PDSR initiative, which concentrated on village household producers and represented a significant step in private sector engagement at local level.

† Reported at the SEACFMD National Coordinators Meeting in Bangkok (17–19 August 2016).

demonstrated the challenges of maintaining farmer-clients' interest and motivation to participate in EID surveillance, when there are few incentives, and sometimes disincentives, to do so (see Box 6).

Box 6 Constraints to outbreak reporting

In most countries, programs included activities intended to raise the awareness of farmers and communities about H5N1 highly pathogenic avian influenza (H5N1 HPAI) and to encourage reporting to the village animal health worker (VAHW). This is important because the surveillance process in animals is usually triggered by the owner. The experience with H5N1 HPAI showed that if individuals or communities perceive that notification of a suspected EID outbreak will result in negative consequences for them (e.g. area-wide culling of poultry), or the mortality event is considered within the normal range (from endemic severe diseases such as Newcastle Disease or fowl cholera), then they are unlikely to report disease events. In addition, the VAHW is generally a private sector player and so there is little incentive to report disease, especially if there is a conflict of interest in relation to clients. And, as the level of concern about the disease lessens among communities and producers, so too does reporting. In the case of a zoonotic EID, unless there are significant livestock mortalities, the first signal of a problem will be human cases or deaths, as was noted for H5N1 HPAI infections in humans in Cambodia.

Although the reporting system starts with the farmer–livestock owner (or community), if the district offices do not respond to the VAHW then the grassroots volunteer reporters usually lose interest. As one respondent said, 'you can't blame the VAHWs for not reporting if the district offices do not support them and respond to information'. The morale and commitment of district-level veterinary services varies, and is influenced by lack of resources and low salaries.

There are also sometimes disincentives to moving information within the official system. Disease outbreaks within a country may lead to a country placing bans on interprovincial trade and so local animal health offices are encouraged to try to deal with a problem without making an official declaration of the presence of disease. In addition, there can be reaction from the political system if a district or province or department is seen as a source of bad news. Central government can also come under heavy criticism when outbreaks occur.

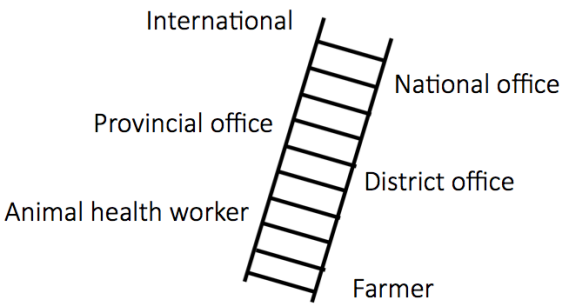
In general, after the interest in H5N1 HPAI subsided, governments have not maintained significant investment in animal health surveillance. A notable exception to this was Australia's bilateral investment in animal health in Indonesia, which took an innovative approach to this issue (see Box 7).

Establishing and maintaining the link between the animal owner and the surveillance system

During the emergency phase of H5N1 HPAI, the World Bank AHI Facility funded activities in Cambodia, Lao PDR and Vietnam to strengthen the bottom rung of the animal health 'surveillance ladder'. In Vietnam, the Vietnam UN Joint Program also supported this approach. Both the World Bank AHI Facility grant and

Australia's bilateral investments in Indonesia provided substantial funding for the establishment and maintenance of an avian influenza surveillance system in Indonesia: the Participatory Disease Surveillance and Response (PDSR) system.

Figure 7 Australia's investments in animal health surveillance focused on the bottom rung of the 'surveillance ladder'



All of these investments paid particular attention to the capacity of the bottom rungs of the surveillance ladder—the farmer and VAHW or equivalent. In most cases, the VAHW must volunteer to report to the next rung, usually the district office. Again, significant investments were made at this level to support the link.

During the height of concern about H5N1 HPAI, most of the investments in animal health surveillance led to increased disease reporting, outbreak investigation and faster response times in the field. However, eventually the incidence of human H5N1 HPAI cases subsided, along with the level of concern among stakeholders. As time went on, the disease was not a high priority for veterinary services, and investments were not maintained when donor support was reduced.

We identified the following lessons from these early investments in surveillance:

- The effective functioning of surveillance systems in animal health depends on a range of factors that need to be addressed. These factors include policy issues, implementation issues, impact on stakeholders and livelihoods, trust and perceptions. Animal health surveillance is not just a technical issue.
- Engagement with the concerns of the lower levels of government is critically important. The PDSR initiative in Indonesia showed that a focus on H5N1 HPAI alone was not sufficient to engage district and provincial offices when other endemic diseases, especially those involving large livestock, were a greater concern. There were also no simple feedback loops to return information to the farmers and provide analysis to field services.
- Surveillance systems built around single diseases have not been sustained without continued donor support. This was the case for some of the H5N1 HPAI surveillance systems, and for the PDSR. The PDSR was also considered by the Indonesian Government to be too expensive. Also, the PDSR was not fully supported by some provinces and districts because it was viewed by some as a parallel system to the established animal health structure.
- Some basic requirements need to be in place for investments to make a tangible difference. The key lesson from the work in Timor-Leste, and the Pacific countries, was that it is unrealistic to try to build a system from the ground up. Some essential scaffolding was lacking in some of these contexts (see Chapter 4).
- The early investments in animal health surveillance were akin to an insurance policy to keep the H5N1 HPAI virus at bay—not fully drawn down on, but would have demonstrated value if they had been. This is discussed further in Chapter 7.

Development of an information system for animal health surveillance

The iSIKHNAS information system in Indonesia (see Box 7) was funded and supported by the AIP EID animal health program (2010–15) and the current AIP EID program (2015–18). Unlike the investments in surveillance outlined above, the partner government co-invests heavily in iSIKHNAS. This multifaceted

information management system has enjoyed wide uptake in Indonesia. The system has improved the functioning of the animal health service at different levels of government. For example, one interviewee noted the change in attitude of senior central government staff to district animal health officers from 'condescending' to 'engaged' since the improved data flow. This is important, as disconnection between the levels of government was a serious constraint to more effective disease surveillance and response.

Box 7 Results snapshot—successful adoption of an innovative user-centred animal health reporting system in Indonesia*

The development of Sistem Informasi Kesehatan Hewan Nasional (integrated)—Indonesia's National Animal Health Information System (iSIKHNAS) in Indonesia, supported by the Australia Indonesia Partnership Emerging Infectious Diseases Animal Health Program (AIP EID animal health program) (2010–15) and the current AIP EID program (2015–18), was a key achievement. It is a platform for animal health surveillance that can be 'stepped up' at times of zoonotic EID concern. The development of the system started with a comprehensive review of Indonesia's animal health information needs and capabilities in 2012—including information needs across the veterinary services, the strengths and constraints of existing information systems, and the cultural and behavioural factors that motivate or discourage people from contributing and using information. Following this review, the design, development and pilot projects took place from 2013 to 2014, then the first phase of national extension was initiated in late 2014. From an initial focus on 44 districts, by May 2015 iSIKHNAS was being used by almost 5000 people in 382 districts across 33 provinces. In excess of 1000 SMS messages were received by the iSIKHNAS database each day and more than 300 people logged in to the iSIKHNAS website each day to view over 200 automatically generated reports, graphs and maps.†

iSIKHNAS supports both animal health and livestock production. It manages a large and rapidly growing number of information types—including disease notifications, laboratory test results, surveillance and vaccination programs, reproductive status, animal movements and identification—allowing users to contribute and extract information easily and in real time. Users have access to automatically generated reports, graphs and maps. Farmers and communities use data to make decisions related to production, and decision-makers use the data to plan and implement disease control programs, monitor the performance of staff, allocate resources more efficiently and advocate for the provision of animal health services. Information is more readily accessible and people are becoming more motivated to use it. By April 2017, the system contained over 380 000 reports of routine clinical disease cases and over 580 000 records of individual animal treatments (linked with the time, place, person attending, clinical signs, differential diagnosis, case history and case outcome). The

* Mainly summarised from *Strengthening Indonesia's veterinary services: Achievements of the AIP EID Animal Health Program 2011–2015*, and personal communication, Ausvet, April 2017.

† By April 2017, this number had increased to over 400 000 livestock owners registered on the system, as a result of the implementation of a new Indonesian Government program (SIWAB) to meet increased local demand for beef by promoting artificial insemination of cattle to increase domestic cattle numbers.

system has taken over the data management for the Bali rabies vaccination program, avian influenza reporting and all other priority and routine disease reporting in Indonesia.

To support effective use of data, the program developed a suite of training courses for veterinarians and paraveterinary staff. Each training 'package' includes comprehensive materials for facilitators and participants—all are freely accessible at wiki.iSIKHNAS.com. By May 2015, 277 people had received training in topics such as field epidemiology, surveillance, data analysis and geographic information systems. Several of these courses have already been replicated by the Indonesian Government at the central and subnational level, resulting in higher numbers of trained staff.

Future challenges for the initiative are strengthening links between data and policy, and between zoonotic disease data and the human health sector.

Whether iSIKHNAS proves to be a 'game changer' will depend on similar advances occurring in leadership and vision, governance and policy strengthening, effective use of the data for planning, and of course for zoonotic disease reporting. The Indonesian Komisi Nasional Pengendalian Zoonosis (KOMNAS Zoonosis) initiative was exploring potential connections between this system and the human health system, but details of what this might entail and the results were not available at the time of the evaluation.*

In considering potential for replication of the iSIKHNAS model, it is important to note that human resources in the animal health service in Indonesia, at least in the pilot area observed, extend down to trained and salaried paraveterinarians at the subdistrict level. This service has the most official penetration of any of the countries with H5N1 HPAI in ASEAN and so it was possible to build iSIKHNAS off that resource. Whether a similar animal health information system could be developed in countries with less penetration of the animal health service would need to be determined. The other factor is the high level of co-investment in iSIKHNAS by the Indonesian Government, which may not be feasible for more resource-limited countries.

* Since the evaluation team's visit to Jakarta in 2016, KOMNAS Zoonosis has been disbanded as part of a central government initiative to reduce the number of such commissions throughout government. The role of Komnas Zoonosis has been allocated to the Coordinating Ministry for Human Development and Cultural Affairs, which will now have a role in overseeing One Health approaches to zoonoses.

Increased transparency in reporting of FMD information

At the regional level, the SEACFMD program (which Australia is now supporting through STANDZ) provides a reporting platform where FMD surveillance data are mapped and shared, and the OIE Sub-Regional Representation for South-East Asia provides specialised technical support to investigate specific outbreaks or collaborate in risk-mapping studies. Member countries told us these were important contributions, and that disease information reporting at a regional level has become more transparent as a result. Through building cooperation between countries around FMD reporting and response—a high priority for countries because of trade implications—there is now a strong foundation for increasing transparency about other diseases, including zoonoses.

Main gaps—EID surveillance

Establishing animal health surveillance systems to protect human health is costly, and does not tend to have the support of governments. The models that use a cross-sectoral approach for EIDs are likely to be most effective, with some sort of cross-sectoral processing of information. However, as in the human health sector, the development of surveillance systems and generation of data is of limited value without capacity to use the data for planning and to respond in a timely and appropriate manner to outbreak threats. Capacity here is still under-developed.

Capacity for disease preparedness needs to be built at different levels of the system. However, it is not high on the agenda of some ministries of agriculture, or local administrations with vested authorities. Many respondents commented on the barrier between technical departments and the higher levels of government. There is also a need to link preparedness with the relevant priorities of national agriculture plans. For example, disease preparedness and control planning activities of the AIP EID animal health program (2010–15) focused on diseases of cattle (a priority livestock type) and those of national priority, and this aided acceptability. However, for H5N1 HPAI, there was no evidence that the affected countries had prepared for a possible upsurge in H5N1 HPAI activity associated with a pandemic strain. Where the event being planned for is a zoonotic EID, both human and animal health sectors need to be involved. However, typically coordination will only occur when there is a serious problem, but will cease after the crisis subsides. Generally, both sectors concentrate resources on what is in front of them, not what might hypothetically emerge.

ANIMAL HEALTH WORKFORCE

There is wide variation in the state of development of the animal health workforce in countries in the region and a shortage of qualified veterinarians throughout—for example, in 2015 PNG was reported as having only six public veterinarians while Fiji had one.* There are also variations in the qualifications of individuals

* (www.oie.int/wahis_2/public/wahid.php/Countryinformation/Veterinarians). In Solomon Islands, at the time of the evaluation field visit, the Chief Veterinary Officer was an international volunteer.

regarded as veterinarians or filling veterinary positions and functions. This was a major challenge in the response to the H5N1 HPAI crisis and it continues to be a challenge for other EIDs.*

Australia's investments have worked with peak bodies and government departments to strengthen animal health workforces by providing training for veterinarians and paraveterinarians. The EID investments did not address underlying issues of workforce development policy and strategy, or have a strong focus on strategies to improve performance of the animal health workforce.

Less clear system outcomes from workforce building

Building an animal health workforce through professional development of veterinary graduates is a long-term challenge. Australia's support contributed to the establishment of Veterinary Statutory Bodies in several countries, with OIE—through STANDZ—working to establish the roles of these bodies in setting educational, practice and ethical standards for veterinary professional registration. This initiative should contribute to a stronger workforce in the long term, but coverage and level of development is currently low. Also with a view to long-term outcomes, new veterinary schools have been established in Cambodia and Lao PDR in response to PVS findings about the lack of suitably qualified professionals in these countries. Through STANDZ, OIE has provided guidance to these schools in critical system strengthening respects, for example in curriculum development and establishing 'day one' competencies for veterinary school graduates.

The investments also went to building the skills of the existing workforce. We were impressed by the 'learning by doing' evident in the SEACFMD program, where the national FMD coordinators are required to take on leadership roles in the regional program and its technical networks. The SEACFMD program continues to support attendance at meetings, where a mix of external input and peer-to-peer learning takes place. The AIP EID animal health program supported the development of veterinary leadership targeting existing veterinary sector managers (see Box 8).

* The findings of an international OIE survey of veterinary services in 2011 were that the level of development of veterinary services is directly related to the level of economic development of countries. In developing countries, it remains very weak. This is reflected in the number of veterinarians. More than half of the 108 countries surveyed had fewer than 35 public sector and 100 private sector veterinarians per million inhabitants. Fewer veterinarians had an animal health mandate (median: 5.4 per million inhabitants), reflecting an overall weakness of surveillance systems in developing countries (P Bonnet, R Lancelot, H Seegers, D Martinez, Contribution of veterinary activities to global food security for food derived from terrestrial and aquatic animals, OIE World Assembly, 79th General Session, 79 SG/9).

Box 8 Results snapshot—Indonesia Veterinary Leadership course

Governance and leadership is critical to effective EID control—both in terms of program management and continuity, and during times of crisis. The Indonesia Veterinary Leadership (IVL) course is a collaboration between the University of Sydney and the lead Indonesian veterinary schools of Bogor Agricultural University and Gadjah Mada University. The IVL is a well-balanced postgraduate course that, by targeting veterinary sector managers, is helping to improve leadership, management and governance of veterinary services in Indonesia. This concept of equipping veterinarians with non-technical skills to increase their impact is based on the University of Sydney's Masters in Veterinary Public Health Management. The IVL aims to transform perspectives on leadership by showing what leadership can be at all levels. The course addresses the three core aspects of leadership—personal leadership, leading others and organisational leadership—and covers a range of topics including individual differences, ethics, career management, stress and time management, motivation, team building, communications, coaching and feedback, work design and change management. The delivery approach of the IVL course is highly innovative compared to the traditional rote learning approach generally used in Indonesian veterinary schools. Although the IVL still needs to find a local institutional home, Dr Krisnandana, Head of the Sub-Directorate Veterinary Institutions, states that the 'mental revolution' initiated by IVL will contribute to building the institutional culture needed to strengthen delivery of veterinary services in Indonesia. Opportunities to introduce gender concepts to the IVL should be explored.

Substantial inputs into training of the paraveterinarian workforce in the early investments

Several of Australia's earlier EID investments contributed to the training of the paraveterinarian workforce,* but this was not a feature of later investments.† For the most part, these training programs were linked with the official veterinary services, providing a stronger link between the official service and the grassroots. Where investments have strived for more grassroots engagement, the village veterinary worker or VAHW network has been an important component.‡ In Cambodia, a World Bank AHI Facility grant supported development of a standard manual for VAHW training on H5N1 HPAI and surveillance in general. Cambodia's Department of Animal Health and Production adopted this manual as the standard for all VAHW training in the country. This was an important outcome at the time, helping to ensure a common emphasis and quality of training delivered by different groups. It also increased the likelihood of linkages between veterinary services and the VAHWs trained by non-government organisations (NGOs). In the Pacific, the Pacific Regional Influenza Pandemic Preparedness Program (PRIPP) project supported the Secretariat of the Pacific Community (SPC) to compile a local training manual based on a FAO Manual for the Primary Animal Health

* Training for a paraveterinarian or VAHW can range from very basic training delivered by local trainers to certificate-type courses at vocational training centres. In resource-poor settings, most VAHWs are also farmers / livestock owners.
† The World Bank AHI Facility projects in Cambodia and Vietnam, the Vietnam UN Joint Program, the CARE pilot activities in Cambodia, Myanmar and Vietnam, and the PRIPP project in the Pacific all included inputs in this area.
‡ For the purposes of this discussion, the VAHW and village veterinary worker perform a paraveterinarian role.

Care Worker (circa 1994) and to deliver paraveterinarian training across the Pacific island countries and territories (PICTs) using this approach.

Quality of train-the-trainer and supervision models needs attention

Several issues relating to this early training arose in the evaluation. There is the question of the quality of train-the-trainer models, and the supervision of graduates. Documentation on the approach to training and the training manuals used was sometimes deficient, but it was clear there was a need for better use of effective adult learning processes. We observed that, while there were quite remarkable rollouts of training at the time, the results at grassroots level were not well monitored, and systems for supervision and support were not always in place.

Longer term, we have concerns that inadequate supervision of paraveterinarians, coupled with the lack of regular incomes in the Mekong countries, is resulting in perverse incentives to overprescribe antibiotics and other medications for animals—potentially contributing to antimicrobial resistance. These issues related to VAHWs are of concern in their own right, and also leave veterinary services exposed to criticism by the human health sector when the two sectors have to work together in the field.

In the Pacific, governments showed little ongoing commitment to the paraveterinarians trained through the program. While some apparently have outbreak investigation roles, countries in this region lack the necessary operational supplies, supervisory capacity and other foundational elements of a system.

OTHER AREAS OF ACTIVITY IN ANIMAL HEALTH

Australia's EID investments in animal health also worked in a range of other areas. In Indonesia, valued support was provided for activities that are prerequisite for vaccine strain selection and to assist in validation and application of rapid diagnostic testing in the field. These tended to be technical inputs and did not have a strong systems strengthening intent. The program also provided limited support for applied research on vaccination of village poultry and an innovative environmental sampling strategy to detect the H5N1 virus in markets. The pilot vaccination approach led to some system strengthening due to organisational learning and development of practical field implementation experience. In a number of countries, activities were undertaken with communities to improve markets and market hygiene practices, and to improve biosecurity in poultry raising. This is discussed further as part of community engagement in Chapter 5.

Inputs around quarantine services and laboratory services had system strengthening components and the outcomes of these are discussed below. We discuss applied research and its outcomes in Chapter 7.

Laboratory strengthening efforts were well targeted and strengthened national vet services

We concluded that investments in laboratory services were generally well targeted and strengthened the services provided by national veterinary services. For the most part they contributed to stronger laboratory systems by making these systems function better longer term. Laboratory equipment to enable timely and

safe diagnosis of H5N1 HPAI was supplied through the World Bank AHI Facility projects in Cambodia and Vietnam. In Vietnam, supply of equipment was supplemented by strengthening interventions to improve the performance of the laboratory diagnostic system—for example, the development of quality control systems and proficiency testing. The CSIRO Australian Animal Health Laboratory was engaged to do this work in Vietnam and was also engaged under bilateral arrangements to strengthen laboratory systems in Indonesia.

The regional SEACFMD and STANDZ investments provided technical inputs to strengthen the OIE Regional Reference Laboratory for FMD in Thailand, which was a significant contribution to the regional FMD laboratory network.

There were exceptions to this where the underlying substrate of the system was too weak to support the investment's activities. Difficulties and lack of sustainability and institutionalisation were evident in situations of low capacity, including in Lao PDR, Timor-Leste and the Pacific. This is discussed further in Chapter 4.

Investment in quarantine services has not contributed to stronger systems

Several of Australia's EID initiatives invested directly or indirectly in strengthening quarantine services in different countries. There has been direct engagement with the quarantine services in Indonesia, investments through the World Bank AHI Facility project in Vietnam and indirect engagement through the SEACFMD and STANDZ regional projects. There was also work in this area through the PNG–Australia Quarantine Twinning Scheme and the Timor-Leste Biosecurity Strengthening Project.

Overall, we found that quarantine or border management services investments have limited long-term impact unless there is a high-value trade that needs the support. There are also institutional issues where quarantine services are not under the authority of the animal health administration. Institutional weaknesses were not well addressed by the initiatives, but were key constraints to effective system functioning. The range of investments in this area did not generate substantial system strengthening outcomes.

Box 9 Effectiveness of support for quarantine services

The review of the Indonesian Quarantine Strengthening Project identified concerns as to whether the inputs had effected institutional change and also about the application of the services to H5N1 highly pathogenic avian influenza (H5N1 HPAI) control. The investments were continued in the Australia Indonesia Partnership Emerging Infectious Diseases Animal Health Program (2010–15), which included joint activities between the two agencies with interests in biosecurity—the Directorate General of Livestock and Animal Health Services and the Indonesian Agricultural Quarantine Agency. However, the linkages do not appear to have been sustained.

The World Bank Avian and Human Influenza (AHI) Facility project in Vietnam invested in better control of poultry and other animal movement at border posts, especially at the border with China. However, investments in traditional quarantine border posts across the region have generally not been very effective, as the quarantine process cannot keep up with the vigorous trade. In addition, regulations covering cross-border movements are not well enforced. Sometimes facilities appear to make token gestures to international standards, with no substantive animal health impact.

In Timor-Leste, the Biosecurity project assisted a very under-resourced veterinary service to develop policy and raise awareness of the biosecurity needs at international borders, including introducing a ban on poultry from Indonesia. This may have been beneficial at the time, but there was no evidence of system strengthening outcomes.

In Papua New Guinea (PNG), the Australian Quarantine and Inspection Service (AQIS) implemented an Avian Influenza Enhanced Reporting and Surveillance Project with the goal of strengthening PNG's ability to detect and report incursions of H5N1 HPAI into the Indonesian border areas of Sandaun and Western Provinces.* While the project activities were implemented as intended, and may have helped mitigate the risk at the time, sustainable capacity in this area was not built in PNG. Also under the PNG–Australia Quarantine Twinning Scheme, AQIS assisted the PNG National Agriculture Quarantine and Inspection Authority (NAQIA) to build capacities, systems and protocols in quarantine. This work's focus on technical capabilities did not address the underlying strategic and managerial capabilities of NAQIA, which were found to be key constraints to a more effective system. The need for activities to address both technical and institutional aspects of system strengthening emerged as a common theme across animal and health systems.

Management of animal movements is necessary to control animal diseases. While quarantine services provide one entry point for this, approaches that are more fluid have shown some promise. For example, SEACFMD provided advice and conducted studies that helped disease control authorities understand and use risk-based approaches to respond to challenges arising from regional trade. From the regional perspective in South-East Asia, technical discussions and information sharing appear to be very effective in increasing government understanding of the constraints of the formal quarantine approaches, and to develop

* Under the PNG–Australia Quarantine Twinning Scheme (2006–10).

alternative solutions. More high-level regional attention to livestock trade facilitation and regulation is necessary, as program-level initiatives are insufficient.

CONCLUSION

The outcomes achieved from animal health investments differed between South-East Asia and the Pacific.

In the Pacific, there was little evidence of system strengthening gains. This is because the drivers for animal health system strengthening—livestock production and export of animal products—are generally not strong in the Pacific. Our assessment is that, given the greater risk for the Pacific is from imported animal diseases, future Australian assistance to animal health in the region should be limited to biosecurity and quarantine, taking into account lessons learned from previous investments in this area.

By contrast, the outcomes achieved in South-East Asia have created a modest platform for response to a future zoonotic disease emergency in a number of areas. First, the development of a regional disease control model for FMD has provided a foundation for control of zoonotic diseases including avian influenza and rabies. Second, there was some progress in improving animal health surveillance systems. The best result in this area was in Indonesia. Here, the surveillance model funded and supported by Australia, iSIKHNAS, achieved impressive engagement with farmers and strong ownership by all levels of the veterinary service in the pilot area, and by the Indonesian Government. Third, there were some good achievements in the development of animal health legislation in Cambodia and Vietnam, and stronger leadership and governance through the bilateral program in Indonesia. Finally, investments in animal health laboratories helped strengthen quality assurance mechanisms and laboratory networks, with the exception of Timor-Leste and a number of PICTs, where there was essentially nothing to build on.

Notwithstanding these gains, there are some significant challenges, including the acute shortage of qualified veterinarians in the region. The scale of this challenge meant there were no clear outcomes from donor efforts to address it, despite some remarkable rollouts of training in the response to avian influenza. This is because of the scale of the challenge, but also because of weak monitoring and supervision systems. Moving forward, care needs to be taken over the quality of train-the-trainer and supervision models of donor-supported programs because of the risk of introducing harm—for example through misuse of antibiotics.

Another gap is the weakness of policies for dealing with a serious new EID or zoonosis. Needing particular attention is the lack of effective policies on culling and compensation as part of disease control strategies—the unfinished agenda of H5N1 HPAI preparedness. With new avian influenza viruses circulating in poultry, the environment for a pandemic strain to emerge is still present.

It needs to be recognised that the impact of much of the work to build better animal health systems in protecting human health is indirect. That is, by improving the credibility and functioning of the veterinary system there is a stronger basis for engagement between governments and communities in detecting EIDs and responding to outbreaks. In the case of the iSIKHNAS system established in Indonesia, for example, there may be scope to use the system for surveillance of zoonoses, but this has yet to be tested.

Given the scale of the challenge of improving animal health systems, it is important that donor support is tightly focused and sustained. We recommend DFAT provide targeted support for surveillance in South-East

Asia, based on the epidemiological risk of new and existing zoonoses. This should build off existing capacity and systems, and avoid attempts to create new systems and capacity from the bottom up. Future investments in surveillance should include a focus on better use of data to improve planning and response, and sharing of data on priority zoonoses with the human health sector.

One clear entry point is FMD. FMD is the most serious biosecurity threat to Australia, and is a big constraint to livestock production and trade in the South-East Asia region. It is in Australia's national interest to provide ongoing support for FMD control in South-East Asia. The support provided to FMD control contributes to the Australian Government's target of at least 20 per cent of Australian aid being directed to aid-for-trade by 2020, strengthening the case for continued support in this area.

Another entry point is ASEAN. The ASEAN Secretariat is playing an increasingly important role in countering regional disease threats. It will be important for DFAT to consult with the Secretariat about future Australian regional health security initiatives and to monitor developments with the ASEAN Animal Health Trust Fund and the ASEAN Coordinating Centre for Animal Health and Zoonoses. It is also essential that DFAT continue to encourage other partners, including OIE, FAO and World Health Organization (WHO), to collaborate and coordinate with the Secretariat in relevant areas.

Finally, DFAT should consider the scope to incorporate strategies to address the misuse of antibiotics in animal production systems, which is a factor in the growing problem of antimicrobial resistance (AMR). Any investment in this area should be done using a One Health approach.

Recommendation 2

That DFAT make targeted investments in animal health with the following features:

i. Support FMD control in South-East Asia as a priority disease for economic development and trade, with benefits for systems for zoonoses control more broadly.

ii. Build on past experience and lessons for strengthening animal health surveillance in South-East Asia to support regional cooperation and transparency, better use of data to improve planning and response to disease, and sharing of data on priority zoonoses with the human health sector.

iii. Limit future Australian assistance for animal health in the Pacific to biosecurity and quarantine, taking into account lessons learned from past investments in these areas.

4. RELEVANCE AND SUSTAINABILITY

OVERVIEW

This chapter examines relevance and sustainability in terms of whether investments addressed key requirements for health system strengthening and in terms of the implementation approaches adopted. It also examines how the portfolio addressed the risks and drivers of disease transmission at the animal–human interface.

RELEVANCE TO HEALTH SYSTEM STRENGTHENING

As outlined in Chapter 1, there is no widely accepted standard about what health system strengthening is and how to measure it. We have used the four questions provided in DFAT's current *Health for Development Strategy 2015–2020* to help distinguish activities that strengthen health systems and build sustainable capacities from those that support the system, but do not change how it functions (Table 4).

A strength of emerging infectious disease (EID) investments was that they were usually tailored to country constraints and opportunities, with clear roles for country institutions. This is important because a common constraint in weak health systems is weak leadership and vision at multiple levels across the system. The initiatives made good use of and built on existing leadership capacity, including working with regionally owned institutions. In the early phase of investment, this was challenging as developing countries perceived much of the early response to avian influenza as addressing the health security concerns of developed economies, not their own priority concerns. The higher priority now given by partner governments to strengthening EID control systems is reflected in the 10th East Asia Summit leaders' *Statement on enhancing regional health security relating to infectious diseases with epidemic and pandemic potential* (November 2015).*

There were two main weaknesses in the EID portfolio. The first was the relative lack of attention to the underlying policy and organisational constraints to effective EID preparedness and response. This was particularly notable in the human health sector, where the focus was largely in narrow technical areas. The second was the lack of development of explicit strategies to strengthen broader systems through the EID investment.

* (www.asean.org/asean/external-relations/east-asia-summit-eas/)

Table 4 How well did the EID portfolio address the four 'is it health system strengthening?' questions?

Question*	Rating	Justification
Tailored roles for country institutions?	✓✓✓	Initiatives mostly reinforced the leadership roles of government health and veterinary service authorities, including by working with regionally owned institutions. In the animal health area, alignment of animal health activities with economic drivers was essential to getting political and leadership support to those activities and establishing meaningful roles. Most initiatives responded well to the country context and tried to target the constraints that would have maximum benefit across various health programs. The Pacific investments were less well-tailored to country context.
Addressed policy and organisational constraints?	✓	Mostly working at the technical level, the human health investments did not engage substantially in this area. There were some achievements in the animal health area, particularly the Indonesia AIP EID program.
Provided benefits to the broader system?	✓	Disease-specific activities generally did not have specific strategies to strengthen broader systems; however, AusAID/DFAT adjusted some activities for a greater focus on broader benefits, and synergies between different investments and activities helped some activities achieve wider system benefits. Good foundational elements of systems were strengthened in areas with relatively more capacity and with mutual reinforcement from other activities, but not where systems had low baseline capacity and where there was little reinforcement from other parts of the system.
Had systemic impacts beyond the project term?	✓✓	Activities funded under 'emergency' response mostly transitioned to more systemic approaches. Networks for professional development and EID surveillance data emerged as powerful means of generating momentum for change and sustaining system functions. They have led to systemic impacts, but need to be deliberately set up, maintained and have their function regularly reviewed. Co-investment by country governments was realised for the AIP EID animal and human health programs in Indonesia and holds promise for ongoing systemic impacts, while recognising that country priorities are changeable. There was little or no co-investment in the Pacific countries.

Rating provides an overall evaluative judgement against each criterion across the portfolio as a whole. Key: ✓✓✓=Strongly achieved; ✓✓=moderately achieved; ✓=slightly achieved†

As can be seen in Table 4, sustainability—whether investments are likely to achieve systemic impacts beyond the project term—is key to health systems strengthening. Across the portfolio, 9 of the 22 investments were rated by Australia's final Aid Quality Checks as less than adequate on sustainability. While this is an improvement—14 out of 15 investments were rated as inadequate on sustainability at the time of the *2009 Pandemics and Emerging Infectious Diseases (PEID) Framework* review—it is still significantly lower than for

* G Chee, N Pielemeier, A Lion & C Connor, Why differentiating between health system support and health system strengthening is needed, *International Journal of Health Planning and Management* 28(1):85–94, 2013—cited in DFAT's *Health for Development Strategy 2015–2020*, 9.
† To assign the rating we assessed each of the major initiatives against these questions and synthesised the findings against each of the questions for each region of fieldwork to form an overall evaluative judgement.

the Australian aid program as a whole. A major reason for this was that many of the investments in the early period were established in the context of an emergency, and were only designed to address immediate needs.

Some investments made during crisis periods extended for a substantial time beyond the period of the crisis.* Moving programs over to a post-crisis mode required flexibility and adaptation from AusAID/DFAT, implementing partners and country governments. Some investments were flexible in this way, and others were not, with no clear pattern that could help explain the differences. Several implementing partners expressed frustration that their deliverables and scope were too restrictive to adapt to changing circumstances. However, others valued the flexibility of Australia's funding, and considered it to be more useful and effective than funding from some other development partners as a result.

The strongest factor influencing sustainability was alignment with health or veterinary system functions. Capacity building of individuals can be readily achieved but the key requirement for sustainability of system strengthening is engagement of leaders and institutionalisation of capacity building. Some good alignment with formal system functions was seen in those activities in Indonesia that supported the EID work plans of the Ministry of Health, and with the first phase of the Australia Indonesia Partnership EID Animal Health Program (AIP EID animal health program). The outcomes achieved as a result have good prospects for sustainability. This is evidenced by different levels of the Indonesian Government investing in training and other aspects of implementation of Sistem Informasi Kesehatan Hewan Nasional (integrated)—Indonesia's National Animal Health Information System (iSIKHNAS), the field epidemiology training program (FETP), POSKO and the early warning and response system (EWARS). Country ownership of these activities and their funding was progressively taken over by the government. There was less alignment with health system structures and functions in the Pacific than in Indonesia and the Mekong.

The AQCs tended to rate the country-level investments higher on sustainability than the regional investments (two out of seven were rated inadequate). Our evaluation fieldwork assessment of sustainability generally concurred with these higher ratings. This likely reflects the difficulty regional programs face in getting good country engagement and alignment with human and animal health system functions. Regional programs need to be designed with country-level activities—where they were not, regional programs failed to gain traction, particularly in low-capacity countries. The model used by the Association of Southeast Asian Nations Plus Three EID Program (2006–10) (ASEAN+3 EID) initiative—with countries leading areas of work on behalf of the region—generated good ownership, and may be useful in other contexts or for other programs.

The issue of alignment with health system functions is also a key consideration when funding pilot activities. The experience of past EID investments shows that demonstrating proof of concept through pilot activities is not sufficient for the interventions to secure ongoing government support. This was illustrated by the CARE Australia Community-Based Avian Influenza Risk Reduction Program—Mekong Region (2006–10) (CARE program, outlined in Chapter 5), and may be the fate of the Stop Transboundary Animal Disease & Zoonoses

* Investments that commenced in the crisis period, but continued for some years, included the CARE program and World Bank AHI Facility (both continued to 2011), and the bilateral investment in Indonesia, which commenced in the 2005–10 investment phase with a focus on avian influenza and was extended to a second, overlapping, investment period that went to 2012.

(STANDZ) pilot vaccination activities addressing rabies (Cambodia) and foot and mouth disease (FMD) (Cambodia and Lao PDR). History suggests these pilots are very unlikely to attract the level of government resources needed to scale up, no matter how successful they are, unless they can be adopted at minimal cost.

There were a few laboratory strengthening activities funded through the various investments that with time proved unsustainable. The laboratory constructed in Timor-Leste, under the Biosecurity Strengthening Project (2006–10), had serious issues with budget constraints once international support finished. In Lao PDR, the biosecure level 3 laboratory constructed under the World Bank Avian and Human Influenza (AHI) Facility grant never became operational due to budget constraints. In the Pacific region, the Pacific Animal Health Laboratory Network established under the Pacific Regional Influenza Pandemic Preparedness Program (PRIPP) project has stalled. The main lesson was that it is unproductive to try to build a system where there is very little technical capacity and limited prospects of country commitment to long-term operational and maintenance costs.

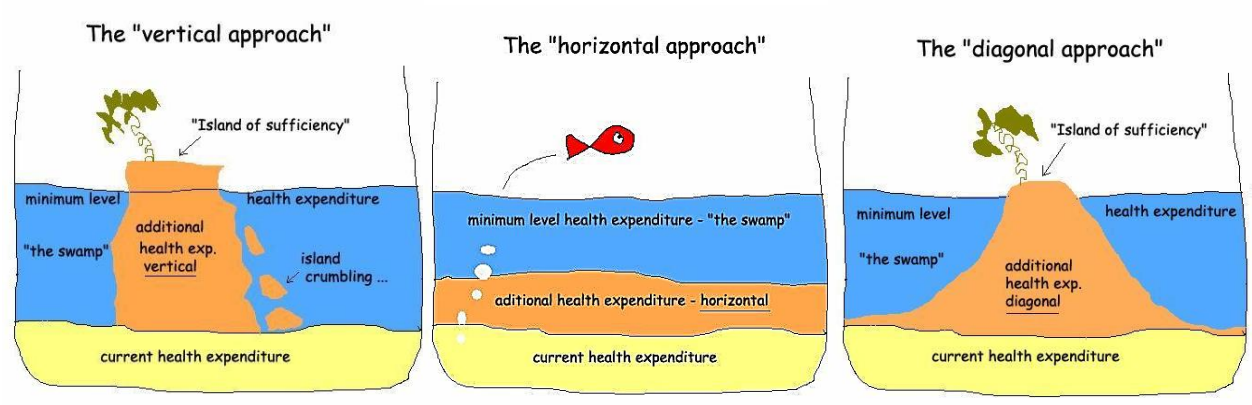
Overall, there were striking differences in how well the 'four key questions—was it health systems strengthening?' were met in the different regions. They were least well met by EID investments in the Pacific. In the two Pacific island countries and territories (PICTs) we visited, a key issue affecting system strengthening was the absence of an in-country Secretariat of the Pacific Community (SPC) health presence to work directly with ministries of health. For both the Pacific and South-East Asia, there were also particular challenges for making regional investments relevant to system strengthening at a country level. This was particularly apparent for the World Health Organization (WHO) Asia Pacific Strategy for Emerging Diseases (APSED), which was implemented across both regions.

RELEVANCE OF IMPLEMENTATION APPROACHES

EID activities can be seen as drawing from three typical implementation approaches—referred to as 'vertical', 'horizontal' and 'diagonal' (Box 10 and Figure 8). Each of these approaches contributes to system strengthening to varying extents, depending on the context.

Box 10 Diagonal, horizontal and vertical approaches to using additional health expenditure in health systems

A 'vertical' approach describes funding targeted at specific diseases, which does not contribute to the strength of the health system as a whole. Vertical approaches have a long history in global health. They have important roles in emergency situations, and where the underlying substrate is very weak. Used longer-term, vertical programs have been criticised as creating 'islands of sufficiency in a sea of incompetence' and are not considered good development practice. In contrast, 'horizontal' approaches are targeted at the health system as a whole, encompassing all activities whose primary purpose is to promote, restore or maintain health. Horizontal approaches have been criticised for 'spreading resources too thin', but again have their place if a basic foundation is lacking. The island image from Ooms and colleagues[20] reproduced below provides an illustration.



The key distinguishing feature of the 'diagonal' approach is a deliberate strategy to use explicit intervention priorities to drive improvements into health systems—dealing with generic issues such as human resource development, financing and quality assurance. In arguing for greater use of the diagonal approach in implementing disease control programs, the authors explain that *while the vertical approach results in fragile, isolated islands of sufficiency, and while the horizontal approach leads to generalised insufficiency, the diagonal approach aims to build islands with a broad and solid base, and to gradually connect those islands, by helping to fill in the swamp*.*

Many of Australia's EID investments did not have a clear intent to provide broader benefits to the human or animal health systems and can thus be characterised as vertical approaches (Box 10 and Figure 8). This was especially true during the period covered by the first *PEID Strategy 2006–10*, where the priority was to respond to H5N1 highly pathogenic avian influenza virus (H5N1 HPAI) and EID threats as fast as possible. In the human health sector, this was the main approach across the whole investment period.

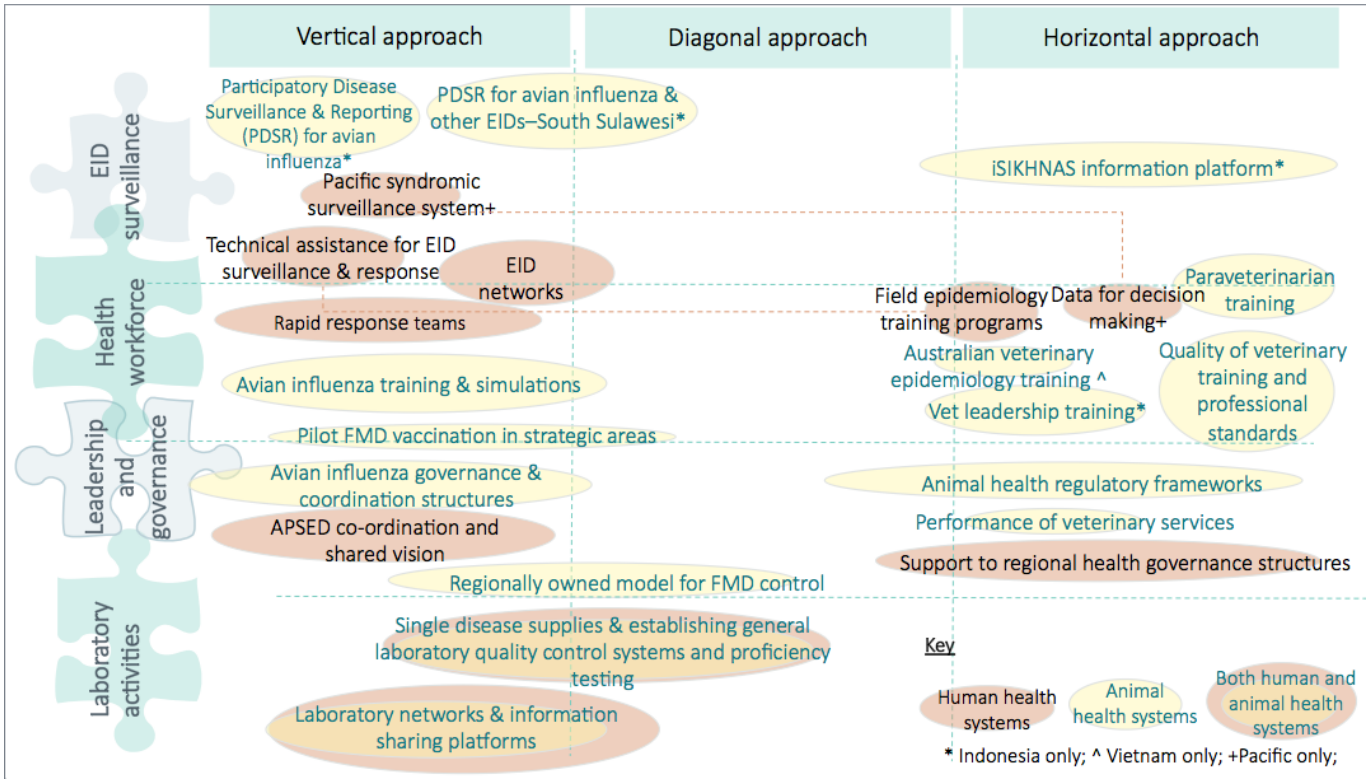
* G Ooms, W van Damme, BK Baker, P Zeitz & T Schrecker, The 'diagonal' approach to Global Fund financing: a cure for the broader malaise of health systems? *Globalization and Health* 4(1):6, 2008.

The evaluation concluded that the exclusive use of a vertical EID approach in the human health sector is no longer defensible. The activities supported by the EID investments do not take place in a vacuum. Despite technical support, EID plans, capacity assessments and so on, many countries continue to struggle to address basic EID capacity gaps and meet the IHR core capacity requirements. This is at least in part because of weaknesses in health systems, which many EID activities did not engage with and were not well equipped to address. While EID technical support in the higher capacity countries has become more embedded (often with funded staff positions, units with capable staff and career development potential), even in these settings, effectiveness is constrained by systemic weaknesses—such as lack of good human resource policies and procedures, workforce planning gaps and weak vertical integration in decentralised systems. In the Pacific, fledgling EID capacity has generally not yet found a place in health systems where it can grow and become influential in driving a public health agenda. Instead, it has little influence and inadequate budgets.

The horizontal approach was more common in animal than human health investments. This approach to strengthening systems was viable in high-capacity contexts but not in low-capacity contexts. The AIP animal health program in Indonesia was a good example in a relatively high-capacity country. Another key success factor was a whole-of-system focus—building on the outcomes of the Performance of Veterinary Services (PVS) evaluation and gap analysis—which helped to foster country ownership. The successful rollout of the iSIKHNAS information platform was on the back of work done to strengthen links between different levels of the veterinary system. The veterinary leadership development program reinforced district capacity in planning, budgeting, and use of data.

We concluded horizontal approaches to system strengthening were not viable in low-capacity settings. It is not feasible for donors to develop and maintain entire systems from the ground up.

Figure 8 Three approaches to implementation of activities funded by the EID investments



The diagonal approach—using intervention priorities to drive improvements in health systems by dealing with generic issues such as human resource development, financing, or quality assurance—was generally underemphasised in the EID portfolio. However, where this approach was used, there were some good system strengthening results. A good example was the model for disease control developed through the FMD investments, which became a blueprint for other diseases, and built credibility of veterinary services in South-East Asia (discussed in Chapter 3). Key to the success of this model was an initial focus on a single disease with clear economic benefits from disease control; country-led implementation that prioritised country ownership, supported by a responsive regional unit; and flexibility. The close relationship between AusAID/DFAT's ASEAN Mission Subregional Office and the World Organisation for Animal Health (OIE) Sub-Regional Representation Office in Bangkok was also an enabling factor.

Another example of the diagonal approach was investment in laboratories in response to specific disease threats, where some of the funds were used to establish quality control systems that strengthened countries' laboratory systems overall and therefore benefited the laboratory system for other diseases (see Chapter 3).

Links between activities (Figure 8—as shown by dotted lines) improved the relevance of both vertical and horizontal approaches. While synergies between activities and networking platforms between and within countries were not a panacea to siloed programs, they increased the value obtained from the activities in some tangible ways (Box 11).

Box 11 Results snapshot—integrated approach linking surveillance, training, emerging infections disease (EID) networks and in-country support—Pacific example

The Pacific Syndromic Surveillance System (PSSS), partly funded by Australia and launched in 2010, was a key advance in the collection of EID surveillance data in the Pacific. Prior to this, most Pacific island countries and territories (PICTs) did not have any means of systematically collecting EID surveillance data. The surveillance system collects syndrome data about patients presenting to 121 sentinel health facilities across 21 PICTs. Many of the ministry of health staff in the PICTs who have roles in data collection and analysis for their countries have participated in the Data for Decision Making training, also supported by Australia's EID investments. Since 2013, when the first course was conducted, more than 250 ministry of health officials from 17 PICTs have been trained in data analysis, surveillance and epidemiology. PICTs share information about outbreaks with others through PacNet, facilitated by the Secretariat of the Pacific Community (SPC) Public Health Division (also funded by Australia), thereby raising situational awareness and informing risk assessment activities. In recent years, the use and quality of reports posted to PacNet have improved substantially. Countries previously cautious about sharing information with an international audience now produce technically sound and informative event reports and situation updates. After a moderate level of initial investment, most PICTs—including some that are considered to have very low capacity—now implement the PSSS in their countries with little financial support. The World Health Organization provides technical assistance to address challenges to implementation and conducts analysis of the data at a regional level. Both functions are essential for the integrity of the system.

ADDRESSING THE ANIMAL–HUMAN HEALTH INTERFACE

Our evaluation did not reveal a significant body of work that could be regarded as One Health (see Box 12 for definition).* With the exception of PREVENT Emerging Disease Risk Reduction—Mekong (PREVENT), there was little focus on issues related to wildlife as a source of EIDs or the environmental interactions that may trigger emergence.† These matters were generally not part of investment designs.

Across the landscape of donor-funded activities in the Asia Pacific, there were activities related to wild bird surveillance, interactions with poultry populations and with various duck production systems. However, there was no significant focus on bigger picture issues related to the environment, drivers of disease emergence and One Health.

Box 12 Key terms—One Health

The One Health approach recognises that the health of humans, animals and the ecosystem are interconnected. It applies a coordinated, collaborative, cross-sectoral and multidisciplinary approach to address disease risks that originate at the animal–human–ecosystem interface. One Health is not a new concept, but it has become more important in recent years due to changes in the interactions between people, animals and the ecosystem. Key factors include expansion of human populations into new geographic areas, changes in climate and land use (e.g. deforestation, intensive farming) and increased travel and trade. These are leading to the emergence, re-emergence and spread of diseases, the majority of which are zoonoses.

The common theme in One Health approaches is collaboration across sectors to maximise benefits for public health. In practice, this involves thinking and working across institutional silos, and optimising resources and efforts while still respecting the autonomy of the various sectors. One of the more striking attempts to operationalise a One Health approach was the World Bank AHI Facility. A prerequisite for countries to receive grants under the Facility was that their avian influenza preparedness and response plans needed to be jointly developed between human and animal health authorities. This caused significant delays, with the disbursement of the grants ultimately too slow for an emergency response. In our fieldwork, we saw little evidence of this joint approach having left a legacy of joint activity between the sectors. Coordination structures set up to manage grants during implementation stages were largely dormant outside of major outbreaks. In our fieldwork countries, the bulk of funding was used for activities by animal health systems, with little ownership or leadership from the human health ministries.

* There are many obstacles to overcome in this area. While the One Health approach is evidence-based in theory, there is little agreement internationally about what this should look like in practice, particularly in resource-limited settings. A framework for aligning the IHR and the PVS has been produced by WHO, OIE and the World Bank Group, but it is cumbersome (*WHO–OIE operational framework for good governance at the human-animal interface: Bridging WHO and OIE tools for the assessment of national capacities*, 2014). There has been some resistance to having this adopted in South-East Asia.
† PREVENT conducted behavioural and social research on transmission of disease from wildlife to humans, contributing to a conceptual One Health model. PREVENT is discussed further in Chapter 8.

Across the investments, it was challenging to get joint animal and human health programs implemented. It was noted in interviews that where a joint initiative might have been tried, there were issues to overcome in interministerial collaboration and budget sharing, and caution over how the management arrangements would be organised. There were also entrenched views in some places as to the relative merits of animal and public health professionals. In one country, a recommendation to have veterinarians join field epidemiology training was rejected outright by the head of the Ministry of Health, who considered them unqualified to participate. The maturity of the various departments and their readiness to work collaboratively varies considerably between countries and there is no 'one size fits all' approach to building collaboration.

There was more success with One Health when efforts were focused on a particular disease (such as rabies), where there are shared objectives, shared responsibilities and actions are practical and result in demonstrable change. An example was the pilot activity 'practical intersectoral linking to improve the control and prevention of dog-mediated rabies' in the Philippines under STANDZ. The pilot established grassroots mechanisms to improve dog rabies case detection and reporting, reduce the number of human cases of rabies, and prompt interventions to reduce the disease at source. In addition, there was more exchange of information at higher levels in the animal and public health services and coordination of response. However, the approach has still not been embedded. For One Health approaches to be institutionalised and effective, the leadership of the individual technical departments and ministries would need to champion the approach.

CONCLUSION

There were strengths and weaknesses in the relevance of EID investments to system strengthening.

The strengths were that EID investments:

- were usually tailored to country constraints and opportunities, with clear roles for country institutions
- made good use of and built on existing leadership capacity, including working with regionally owned institutions
- generally supported national plans, reinforcing country leadership.

There were two main weaknesses. The first was a lack of attention to policy and organisational constraints to effective EID preparedness and response, especially in human health, where donors focused largely on narrow technical areas. The second was the lack of development of explicit strategies to strengthen broader systems through the EID investment.

An important test of the relevance of investments to system strengthening outcomes is sustainability—whether they achieve systemic impacts beyond the project term. Project completion ratings of the sustainability of EID investments were significantly lower than for the Australian aid program as a whole. This reflects the fact that many of the EID investments were established in the context of an emergency. While sustainability ratings have improved over time, this occurred from a low base and needs continued attention.

While the question of sustainability is closely linked to financing priorities in lower income countries, this chapter highlights two key lessons for achieving sustainable system impacts. First, that institutional change

takes time. Investments showing the best prospects for sustainability were those that had stayed the course (working in the same areas with the same or similar partners for 10 or more years). Second, that the implementation approach has a strong influence on sustainability.

To improve the sustainability of outcomes, the reliance on vertical approaches to implementation—where there is no clear intent to provide broader benefits to the human or animal health systems—needs to be reduced. Instead, diagonal approaches, where intervention priorities are used to drive improvements in health systems (such as human resource development, financing and quality assurance), should be used more widely and purposively.

Horizontal approaches—more holistic attempts at systems development—should be avoided in low-capacity settings. For example, in places where animal health systems are virtually non-existent, there is a serious risk of investing in areas where there is no prospect of countries continuing activities after funding stops. This underlines that the choices around what resources countries are prepared to commit to their health systems are linked to political economy drivers, over which donors have very little influence.

The case for a One Health approach to tackle the animal–human–ecosystem interface of disease transmission and control is sound. However, it is harder to operationalise. The best prospects for One Health approaches will likely be in areas of common ground that threaten public health—such as avian influenza, rabies and antimicrobial resistance (AMR). AMR was not addressed in DFAT's past PEID strategies but is a growing problem involving both human and animal health sectors. It should receive greater attention in future DFAT health security investments than it has received in the past—for example through assistance for regulation of antibiotic use.

5. COMMUNITY ENGAGEMENT

OVERVIEW

Communities have a vital role in prevention, early detection and response to disease. A lesson from the 2014–15 Ebola response was that aid agencies focused too much on the clinical response and not enough on the social and cultural factors that led to the spread of Ebola within communities—strongly reinforcing the need for community engagement in tackling emerging infectious diseases (EIDs). With a disease of zoonotic origin such as H5N1 highly pathogenic avian influenza virus (H5N1 HPAI), communities have an essential role in surveillance, minimising exposure to potentially diseased animals and disease control measures.

Australia's approach to community engagement has evolved over the last decade (Box 13). The evaluation examined the following approaches to community engagement through the EID investments over the review period:

- **Pilot projects** through an NGO to identify effective approaches to building community- and district-level institutional capacity for prevention and risk reduction (CARE Australia Community-Based Avian Influenza Risk Reduction Program—Mekong region 2006–10) and piloting of family case studies to assess impacts of disease and disease control activities on livelihoods (Myanmar Joint FAO / WHO Avian Influenza Project 2009–12).
- **Support for subnational activities with community engagement components in Vietnam and Indonesia** (Indonesia Pandemic Influenza & EID Prevention & Preparedness Program 2006–12, Australia Indonesia Partnership EID Animal and Human Health Programs 2010–15, Joint UN/Government of Vietnam UN Avian Influenza Program Phase II 2006–10). These programs supported three activities in the Indonesian province of South Sulawesi: the Food and Agriculture Organization of the United Nations (FAO) Participatory Disease Surveillance and Response (PDSR) initiative, the Healthy Traditional Market Project and the Village-based Education and Communication initiative.
- **Public communication approaches aimed at behaviour change** (Vietnam UN Joint Program, South-East Asia and China Foot and Mouth Disease (SEACFMD) program, PREVENT Emerging Disease Risk Reduction—Mekong 2011–15 (PREVENT), CARE program, Timor-Leste Biosecurity Strengthening Project, Pacific Regional Influenza Pandemic Preparedness Program 2006–10).

Box 13 Evolution of Australian approaches to community engagement, 2006–15

AusAID/DFAT's policy approach to emerging infectious disease (EID) preparedness and response over the last decade showed increasing recognition of the need to work with communities on risk reduction. The *Pandemics and Emerging Infectious Diseases (PEID) Strategy 2006–2010* noted that citizens need to know how to protect themselves and how to contribute to disease reporting mechanisms. However, it was scant on details beyond noting investments would include support for community awareness programs implemented by CARE, an international NGO. In 2006, engaging communities in the response to EIDs was largely uncharted territory and the choice of implementing partners was limited. AusAID's decision to use a piloting approach through an NGO with an established presence in the Mekong countries was made in this context. NGOs are acknowledged as having a comparative advantage in supporting community-level initiatives.

The subsequent *PEID Framework 2010–2015* identified that 'action at the district and community level, and around prevention compared to outbreaks, was somewhat neglected in the last few years of the emergency approach to pandemics and EIDs'.[21] Strengthening systems for prevention, detection and control of EIDs at district and community level was made a specific objective of the new framework.

APPROACHES TO COMMUNITY ENGAGEMENT

Pilot projects

The CARE Australia Community-Based Avian Influenza Risk Reduction Program—Mekong Region (2006–10) was a grassroots emergency intervention that piloted 12 models of avian influenza risk reduction in rural communities engaged in small-scale poultry farming in pilot sites across Cambodia, Lao PDR, Vietnam and Myanmar. Results included mobilisation and capacity building of village surveillance teams (bringing animal and human health sectors together), strengthened reporting systems from village to district levels, adoption of biosecure techniques at demonstration farms, improved hygiene and biosafety in wet markets and slaughterhouses, and training of government staff and extension workers in avian influenza communications.

The midterm review (2008) identified that the program design gave insufficient attention to dissemination and replication of pilot activities and gender issues. CARE re-focused the program to enable more rigorous piloting and assessment of models,* and a more strategic approach to adoption and replication through engagement with national-level ministries and technical agencies. Greater attention was also given to promoting women's participation in activities. Towards the end of the program, dissemination workshops were conducted at country and regional levels. *A regional synthesis of models for the Mekong region* (2010)

* A quasi-experimental approach was used with change in pilot sites measured by baseline and follow-up knowledge, attitudes and practice studies and through external evaluation to capture lessons and factors influencing success or failure. There was limited use of intervention and control sites in evaluation of models in Vietnam (*CARE in Vietnam: evaluation of three pilot models: Community-based Avian Influenza Risk Reduction Program Mekong Region, Vietnam*, March 2010).

was produced, which remains a resource for design of future programs on community-based EID risk reduction.[22]

The independent completion report (2010) assessed 9 of the 12 models piloted as successful, based on evidence of positive results and stated intentions by governments to adopt. We were unable to investigate what has happened in the case of each of these models. However, in Cambodia we found the CARE program was remembered by interviewees* as contributing to increased community awareness and strengthening collaboration between the animal and human health sectors on surveillance at village level during the emergency response. Evidence of sustained behaviour change in Cambodia is that people now burn or bury chickens that die of unknown causes, whereas in the past people would often boil and eat them. They are also more likely to report animal diseases to authorities.

A limitation of the piloting approach was that pilots were better resourced than local contexts could afford on an ongoing basis. While the CARE models demonstrated that it was in farmers' economic interests to use biosecure methods,† in both Cambodia and Myanmar farmers with small flocks could not attempt the confined model without financial assistance for inputs such as fencing and feed. A risk to community-based surveillance activities was the absence of compensation for farmers if flocks needed to be culled, resulting in financial losses. CARE found that EID investments also need to be responsive to people's other concerns, including livelihoods and access to affordable treatment for people and animals.‡ This concern was also raised by interviewees in connection with the Indonesia animal health program and Solomon Islands regional EID investments.

The Myanmar Joint FAO / World Health Organization (WHO) Avian Influenza Project (2009–12) piloted the use of family case studies as a way of assessing the impact of disease and disease control activities on livelihoods. This was an innovative approach, which aimed to highlight the stories of families raising livestock. The independent completion report found that as a result of these and other project activities, there was improved understanding within the Livestock Breeding and Veterinary Department of the Myanmar Ministry of Livestock and Fisheries of the tools available to develop evidence-based policy. The project supported changed policy in outbreak control procedures. This recognised that without compensation, strict adherence to large-scale culling could encourage spread of the disease if farmers sold their poultry as soon as they heard of a nearby outbreak. We have not been able to verify if this policy change was implemented.

Subnational programs

AusAID investments in Indonesia and Vietnam used subnational systems as the vehicle for community engagement. In Indonesia, the Participatory Disease Surveillance and Response (PDSR) initiative was a system of avian influenza surveillance and response that provided field workers with training in technical aspects of disease control, communication strategies and community engagement. Implemented by FAO

* Department of Animal Health and Production, Ministry of Health, FAO, USAID.
† For example, in Myanmar, research conducted by the CARE program demonstrated that fencing of chickens resulted in increased laying and hatching and a reduced mortality rate compared to free range practice—providing incentive for farmers to adopt the practice.
‡ 'A key concern of participating villagers was better access to affordable treatment for both animal and human conditions, as well as vaccines for animals', Burnet Institute, *Community event based surveillance: A qualitative evaluation of four pilot sites* (Laos), 2009, 5.

with AusAID funding in South Sulawesi, achievements included improved community awareness resulting in an increase of confirmed case findings and improvements in biosecurity farming practices in the commercial poultry sector.

PDSR was considered effective as a surveillance system but less effective for disease control. This was because government services did not consistently provide field operations with the support required for response, including the provision of compensation to affected farmers. Further, PDSR was essentially a parallel system to government that depended on external donor support for payment of allowances to field workers; this meant it was too expensive to be sustained. However, our fieldwork in South Sulawesi found some legacies—for example, staff in the animal health system have maintained skills in participatory practices for community engagement and outbreak investigations. The subsequent Australia Indonesia Partnership EID Animal Health Program (2010–15) adapted the PDSR approach to address a wider range of animal diseases.

We also observed that elements of the South Sulawesi Healthy Traditional Market Project (completed in 2012) were maintained in the one market visited. Traders wore gloves when handling poultry and used the water facilities set up at the market. More generally, we were told that the level of community awareness about disease prevention and control has risen and there is increased awareness of the need to trade healthy chickens. Interviewees reported that this has benefited the market traders economically as their incomes have increased. The market was renovated as part of the investment but, longer term, there would need to be commitment from authorities to maintain the facilities. This underlines the fact that it is unrealistic to expect awareness and behaviour change to be sustained long term without continuing or repeat efforts. This concern was raised by a number of interviewees.

Image 3 Market at Panakkukang, South Sulawesi, Indonesia, 2016. Photo: Justanti Salilo

Public communications

Public risk communications is a key element in disease surveillance and response. Several of Australia's investments reported improvements in awareness and behaviour in target communities as a result of communications activities. Features of more effective approaches are that they:

- drew on context-specific audience research
- tailored messages to target groups
- monitored results through surveys (CARE program, Vietnam UN Joint Program, SEACFMD, PREVENT, STANDZ)
- chose the right local partners for behaviour change interventions.

For example, the CARE program worked through local women's groups and farmers' groups in some areas, and PREVENT Emerging Disease Risk Reduction—Mekong (2011–15) (PREVENT) worked with the Cambodian Red Cross. There was a successful shift from less effective general awareness raising to an explicit behaviour change communication approach in the Vietnam UN Joint Program.* The approach was evidence-based, participatory and worked through community organisations. An evaluation (2009–10) of the Vietnam UN Joint Program's approach found the impacts among farmers in project communes were positive, with most farmers adopting the recommended biosecure poultry-raising methods to reduce the risk of spread of avian influenza at that time.

* The Vietnam UN Joint Program commissioned a meta-evaluation of available information on avian influenza for the period 2003–06 in order to strengthen its communications strategy. As part of implementation, it reviewed campaign effectiveness in respect to reported behaviour change among target groups and campaign recognition and satisfaction among target audiences.

Image 4 Super Chicken. Icon developed by the Academy for Education (AED), a partner in the PREVENT program, for use in behaviour change communications to fight avian influenza in South-East Asia (AED has now been acquired by Family Health International 360).

Several programs used knowledge, attitudes and practices surveys to inform their message development and monitor results. A general finding was that community awareness levels declined once disease outbreaks were contained.* This reinforces the need for ongoing efforts between outbreaks to maintain community awareness of the symptoms of animal and human diseases and modes of transmission, and knowledge of preventive practices at household, market and slaughterhouse levels.

Public communications on animal health are less developed than in human health. The World Organisation for Animal Health (OIE) through SEACFMD addressed a need for community engagement to address FMD. Based on audience research, communication activities were designed for specific target groups including farmers, the travelling public, consumers, commercial raisers and policy makers.

Through the Pacific Regional Influenza Pandemic Preparedness Program (2006–10) (PRIPP), the Secretariat of the Pacific Community (SPC) collaborated with WHO and the United Nations Children's Fund (UNICEF) to produce standardised risk communication messages and materials and to strengthen interagency networking for the avian influenza response. However, the independent completion report (2010) found that these advocacy and standardised communication strategies and activities had yet to be evaluated for their effectiveness in changing behaviours.†[23] The current evaluation found no evidence that this work has been evaluated.

* For example, *CARE summary report of KAP trends 2006–09 (Lao PDR): impact assessment*.

† The PRIPP independent completion report noted that a New Zealand aid-funded *SPC country consultations report* (2009) on the 2009 swine flu response in the Pacific had identified a number of gaps in the area of community engagement and risk communications: difficulties in enforcing cancellation of mass gatherings; difficulties in operationalising outbreak communication plans; lack of appropriate information, education and communication materials in local languages; and relatively little attention to working with schools, churches and other civil society organisations.

CONCLUSION

We identified a number of promising approaches to community engagement. These include:

- successful models of avian influenza risk reduction in rural communities engaged in small-scale poultry farming
- work to improve hygiene and biosafety practices in markets
- targeting behaviour change through public risk communications.

However, EID investments generally struggled to get community engagement institutionalised. Weak veterinary services and culling policies with inadequate compensation further constrained the effectiveness of these initiatives.

Evaluation visits to South Sulawesi (Indonesia) and Cambodia found some positive legacies of community engagement activities from past EID investments. However, sustaining behaviour change and community interest, and their linkages with veterinary services, in the periods between outbreaks is difficult. Further work is needed to understand optimal and affordable intervention approaches at different epidemic stages and in situations where disease is endemic. The question is—what can work at scale and be implemented—if not through existing government services, then with their strong support? This requires models that are responsive to government and community needs and concerns such as affordable health care, livelihoods and food security. Some combination of lower cost broad-coverage public communications on disease prevention, coupled with more resource-intensive community-level interventions when required, is likely to produce positive results.

Image 5 Don’t touch chickens! Cambodia, Khmer display banner. Source: one of the communication tools developed by UNICEF and supported by AusAID for translation into local languages in affected countries

6. GENDER

OVERVIEW

Health systems can contribute to gender equality and equity* in a range of ways, including through service delivery, the workforce, information systems, medical supplies, financing and leadership. Gender-disaggregated reporting of health data is particularly important to provide evidence on the different health status of women and men. This is necessary to support the case for changes, such as the need for health budgets and services to address the specific needs of women. Public health risk communications also need to address the different roles and responsibilities of women and men.†

Women play key roles in small-scale animal production and food preparation, which increases their risk of exposure to emerging infectious diseases (EIDs) from raw animal products. They also play a lead role in protecting the health of their families. Gender is thus a significant contributor to EID vulnerability. Further, interventions in the poultry sector to improve disease surveillance, culling without adequate compensation and the introduction of biosecure farming techniques have the potential to disadvantage women. Biosecure poultry production is becoming increasingly commercialised and the domain of men. A study of the gender aspects of the avian influenza crisis in South-East Asia found that this could result in loss of livelihoods, independence and food security for poor rural women.[24]

* Gender equality means the absence of discrimination on the basis of a person's sex in opportunities, allocation of resources or benefits, and access to services. Gender equity means fairness and justice in the distribution of benefits, power, resources and responsibility between women and men. The concept recognises that women and men have different needs, power and access to resources, and that these differences should be identified and addressed in a manner that rectifies the imbalance between the sexes (WHO Regional Office for Europe, *Mainstreaming gender equity in health: the need to move forward*, 2002).

† Gender refers to the socially constructed roles, behaviours, activities and attributes that a given society considers appropriate for males and females. 'Gender differences include both socio-cultural factors as well as male-female differences in access and control over resources … Differences in activity patterns of males and females cause them to have different patterns of exposure to infectious pathogens (WHO Western Pacific Region, *Taking sex and gender into account in EID programmes: an analytical framework*, 2011, 2).

Image 6 Women selling poultry, Hanoi, Vietnam, 2005. Photo: Lorrie Graham (from DFAT photolibrary)

Our findings on how gender has been addressed in Australia's EID investments over the last decade are presented below.

INCREASING ATTENTION TO GENDER BUT FROM A LOW BASE

Attention to gender issues in Australia's pandemics and emerging infectious diseases (PEID) response has increased over the last decade, but from a low base. Gender was omitted from the *PEID Strategy 2006–2010*, even though gender was an overarching priority for the aid program at the time. This was a significant omission; however, much of the international response to EIDs in the early post-SARS period was gender blind. This reflected a view that infectious agents do not distinguish between women and men and that emergency responses should focus on technical aspects of disease control and treatment.[25] The animal health sector was behind the human health sector in its awareness of the importance of gender in disease control. The spread of avian influenza in Asia and risk of a global pandemic led to an increased focus on the social context of poultry production, including gender roles.* We identified examples of gender analysis and

* The study of the gender aspects of the avian influenza crisis in South-East Asia commissioned by the European Commission in 2008 found that women's dual roles in small-scale poultry production and health care provision for their families was known, but there had been no systematic examination of what

research undertaken through Australia-supported initiatives (CARE Australia Community-Based Avian Influenza Risk Reduction Program—Mekong Region [CARE program] and ASEAN+3) over this period, some of which was described as 'pioneering'* given the lack of attention to the links between gender and disease prevention and control at the time.

Australia's *PEID Framework 2010–2015* acknowledged that gender had been neglected in the previous strategy and committed to addressing gender in program design and implementation.† This greater attention to gender can be seen in improvements in AusAID/DFAT quality ratings. In 2014, 50 per cent of investments were rated as satisfactory on gender, compared to just 33 per cent in 2010. However, annual quality ratings on gender for EID investments overall were lower than for other health initiatives (56 per cent of EID investments over the period 2009–15 were rated unsatisfactory on gender compared to 16 per cent of investments in other areas of health over the same period). Reasons for the weaker performance on gender by EID initiatives include the emergency nature of investments under the first *PEID Strategy 2006–2010* (stamping out avian influenza) and that the EID subsector has had a narrower, more technical focus than other areas of health. Lack of capacity and commitment by some implementing partners and partner government staff have also contributed to this weaker performance on gender in EID initiatives.

APPROACHES TO ADDRESS GENDER AND EMERGING OUTCOMES

We identified a number of approaches to addressing issues of gender in Australia's EID investments. Most of these are formative with emerging outcomes. There is only limited evidence of higher level outcomes and results. Thus, there are still significant gaps in the evidence base on the most effective ways to incorporate gender considerations through EID investments.

this meant for the avian influenza response (p.2). The study was commissioned to help fill this gap and was referenced in AusAID's *PEID Framework 2010–2015* (European Commission, *Study on the gender aspects of the avian influenza crisis in Southeast Asia*, 2008).

* Gender analysis and operational research undertaken through the ASEAN+3 initiative on gender and social perspectives on avian influenza and dengue, and training of women's groups in Indonesia on the early detection and response to avian influenza at the community level, were described as 'pioneering and contributing to raising the regional profile of gender in EIDs' (AusAID, ASEAN+3 Quality at Implementation Report, 2009). However, the independent completion report (ICR) rated the initiative as less than adequate on gender as the program did not address gender equity in a systematic and tangible way. The ICR concluded there remained a need to assist ASEAN member states to develop clearer perspectives on gender related to EIDs, and to build the capacities of the member states on gender mainstreaming into EID prevention and control initiatives (P Crawford, *ASEAN Plus Three EID Program Phase II—rapid assessment report*, 2009).

† *AusAID PEID Framework 2010–2015*, 14.

Box 13 Main approaches to gender in Australia's emerging infectious disease (EID) investments

- **Gender analysis to inform program designs and implementation or training**—used to identify gender targets, outcomes and monitoring indicators (good practice example in STANDZ with valuable lessons also from CARE program) or to provide recommendations for training (Myanmar Joint FAO/WHO Avian Influenza Project).
- **Gender analytical tools, operational research and policy briefs**—including addressing gender in audience research for behaviour change communications, but overall mixed evidence of application and results (APSED, ASEAN+3, Vietnam UN Joint Program, PREVENT, STANDZ).
- **Advocacy and capacity building**—DFAT program managers advocating for institutionalisation of gender within implementing partner approaches and requiring them to collect and report gender outcomes and data, with variable success (OIE, FAO, WHO, SPC, partner governments).
- **Working with women's groups**—CARE program worked with women's unions and associations in Vietnam, Lao PDR and Myanmar on planning, implementing and monitoring avian influenza risk reduction activities including training and public risk communications aimed at behaviour change.
- **Making gender explicit in broader community development approaches**—promoting participation of women in community-level surveillance and response and encouraging them to become demonstration farmers using biosecure techniques (CARE, PREVENT, AIP EID programs in Indonesia).
- **Training**—promoting participation of women in field epidemiology training (APSED, AIP EID programs in Indonesia, PRIPP in the Pacific).

We identified the following outcomes from the above approaches to addressing gender in EID work.

Women were well represented in field epidemiology training in Indonesia and the Pacific.

We found that women were well represented in field epidemiology training programs (FETPs) in some countries but not others. The example of Indonesia is positive. There were 311 graduates of the FETP in Indonesia between 2006 and 2015, 48 per cent of whom were women. As indicated in Chapter 2, this representation of women is particularly relevant to gender equality as FETP is a potentially important contributor to strengthening leadership and governance in this country, with some graduates going on to leadership positions.

In contrast, the FETP in Cambodia is an abridged course (six months rather than the usual two years), with 25 graduates to date, of whom only three are women. We heard that the Ministry of Health and development partners were aware of the lower representation of women in the course and were looking for ways to increase their participation. Some interviewees suggested that the structure of the course, requiring substantial time away from home, may be a barrier to course participation, particularly for women with young children, but we were unable to verify this. At a more fundamental level, the participation rates for women in FETP training in Indonesia and Cambodia reflect differences in enrolment rates for girls in

secondary schools in these countries. This underscores the importance of basic education for girls as a foundation for their participation in higher education and the health workforce.*

The Pacific adaptation, the Data for Decision Making course, is shorter, with a broader reach at the low to mid levels of the health system in these smaller countries. Women are strongly represented in the course (68 per cent), reflecting their greater representation in this 'lower' tier of the health workforce in the Pacific island countries and territories (PICTs). Strategies to increase the involvement of Pacific men in public health (often seen as a 'poor cousin' to clinical medicine) are needed.

Women poultry farmers participated in community-based surveillance, biosecure farming and safe market activities, resulting in increased incomes and decision-making opportunities over the life of investments.

Australia's investment in the CARE program in the Mekong countries promoted the participation of women in village surveillance teams, biosecure demonstration farms and safe market activities—the independent completion report found that this resulted in increased incomes and decision-making opportunities for women at the time.[26] In Indonesia, Australia's support for the Participatory Disease Surveillance and Response (PDSR) system in South Sulawesi included training of PDSR field officers, 34 per cent (87/257) were women. Also in South Sulawesi, the Village-based Education and Communication initiative gave specific attention to gender-balanced participation. Female participation in all meetings conducted in villages in the target areas was above 50 per cent.

The Food and Agriculture Organization of the United Nations (FAO) made a significant effort to address gender and build capacity on gender in the animal health component of the Myanmar Joint FAO / World Health Organization (WHO) Avian Influenza Project (2009–12). The project supported a study of gender roles in the poultry sector and training needs in the Livestock Breeding and Veterinary Department of the Myanmar Ministry of Livestock and Fisheries. Findings of the study were used to train departmental staff, who were then able to gather data using a gender-based approach in household survey studies in poultry production zones.[27]

A significant outcome of AusAID/DFAT advocacy and program management is the World Organisation for Animal Health (OIE) Sub-Regional Office for South-East Asia's gender policy. This subregional policy has the potential to contribute to institutionalisation of gender approaches within OIE's international headquarters.

The development of a gender policy by the OIE Sub-Regional Representation office for South-East Asia was a result of DFAT's investment in Stop Transboundary Animal Disease & Zoonoses (2011–16) (STANDZ), and

* In Indonesia, the enrolment ratio of females as a percentage of males in secondary schools from 2008–12 was 99.8 per cent (www.unicef.org/infobycountry/indonesia_statistics.html). Over the same period in Cambodia, the enrolment ratio of females as a percentage of males in secondary schools was 84.7 per cent (www.unicef.org/infobycountry/cambodia_statistics.html). This is also reflected in participation rates in the Australian Government's scholarships program, Australia Awards. In 2014–15, 53 per cent of Indonesia's Australia Awards went to women, whereas, in Cambodia, 46 per cent of Australia Awards went to women, an increase from 26 per cent in 2012 (DFAT, Indonesia and Cambodia annual program performance reports 2015–16). The increase in female participation in the Cambodia Australia Awards program was due to a range of strategies, including targeted English-language training and giving priority to women during shortlisting (DFAT, *Cambodia annual program performance report 2014–15*).

represented a substantial achievement. The strategy *acknowledges that improvement in animal health, veterinary public health and animal welfare worldwide will benefit from the active involvement of both women and men in the management, implementation, communication and training aspects of the veterinary services*.[28] STANDZ advocacy contributed to the development of a gender mainstreaming plan by the Cambodian Ministry of Agriculture, Forestry and Fisheries.* Other positive gender results from STANDZ are the completion of a gender assessment of veterinary services in South-East Asia† and the conduct of socioeconomic impact studies of foot and mouth disease (FMD) control, which have informed the targeting of FMD vaccination pilots. The socioeconomic studies have increased veterinarians' understanding of the non-technical issues of FMD control.[29] Knowledge, attitudes and practice studies collected sex-disaggregated baseline data to improve intervention targeting and communication approaches.‡

Sistem Informasi Kesehatan Hewan Nasional (integrated)—Indonesia's National Animal Health Information System (iSIKHNAS) is contributing to the promotion of gender equality through gender-balanced training of iSIKHNAS coordinators at provincial and district levels.

A recent iSIKHNAS internal evaluation (2017)[30] reported good representation of women among coordinators, with 53 per cent (59/112) and 48 per cent (297/620) of the provincial and district iSIKHNAS coordinators being female. Although the program has no control over the selection of coordinators, it provided guidance and selection criteria that gave equal opportunity for women and men to be selected and to undergo the associated training. Coordinators register, provide training and grant access to users. They also monitor and provide troubleshooting services. Interviews conducted as part of the internal evaluation suggested that female coordinators have benefited from the opportunities provided to them through the program's training and these leadership opportunities.

'iSIKHNAS has contributed to enhancing my self-confidence to lead others as I have been provided with a range of skills which enabled me to lead and work with others and to provide technical support to the users. Being skilled in data analysis has given me chances to be involved in evidence-based planning and decision-making in my organisation by providing data from iSIKHNAS' —*ISIKHNAS provincial coordinator (female)*

'I am very proud to be part of iSIKHNAS as the system is very good and it has improved my technical knowledge on animal health as well as in delivery of training to the field staff' —*ISIKHNAS district coordinator (female)*

* Personal communication, Richard Lee, DFAT's ASEAN Mission Sub-Regional Office, Australian Embassy, Bangkok.
† The gender assessment of veterinary services in South-East Asia found positive gender balance of female veterinary students in all countries except Lao PDR, but that female veterinarians face discrimination and challenges that limit abilities to carry out veterinary functions (household and reproductive roles, security issues and traditional perceptions of women's roles). Anecdotal evidence suggests that many female students intend to pursue small animal medicine after graduation (DFAT Aid Quality Check, 2016).
‡ A Lao knowledge, attitudes and practice (KAP) study surveyed 845 farmers and traders of whom 43 per cent were women. Of the farmers surveyed in this group, 60 per cent were women. Gender findings highlighted that men and women share equal responsibility in animal husbandry. When outbreaks occur, men's responsibilities increased, while women's dropped. The KAP report noted this was influenced by education and the perception that men's knowledge of treating diseases was better than that of women.

CHALLENGES TO IMPROVING GENDER OUTCOMES FROM EID INVESTMENTS

Major challenges to improving gender outcomes from EID programs include the variable capacity and commitment of implementing partners and country governments, and weak links between gender analysis or research and practical implementation. This suggests that more needs to be done to promote political commitment and ownership of gender approaches to EIDs, and to build the capacity of implementing partners and partner government health and agriculture ministries.*

Interviews conducted during our fieldwork revealed that efforts to address or mainstream gender in EID programming did not have widespread commitment at country level. Some perceived these efforts to be driven by donors, particularly Australia. In some instances, reasons for this lack of commitment included a failure to adequately communicate the rationale for addressing gender and failure to identify practical measures and actions to address gender through EID programs. Country and implementing partners' readiness for change is also a factor. In cases where investments were implemented by national governments, achievement of gender outcomes was dependent on the maturity of the government's gender policies and the commitment of the relevant ministries. This was an issue for OIE in its efforts to address gender through STANDZ, with national counterparts showing variable commitment to the gender policy.

More also needs to be done to strengthen the links between gender analysis and implementation. Findings from the gender analysis and operational research conducted under the Asia Pacific Strategy for Emerging Diseases (APSED) and the Association of Southeast Asian Nations Plus Three EID Program (ASEAN+3 EID) investments have not been applied to any discernible extent. The 2009 review of AusAID's *PEID Strategy 2006–2010* cited as an achievement that, under APSED Phase I, with funding from AusAID and Canada, WHO developed a framework for analysis of sex and gender in EID programs,[31] with the intention that this be applied at country and regional levels. The framework was a tool for identifying how sex and gender differences affect the different vulnerabilities of women and men in their exposure to zoonotic diseases (due to their different activities and roles with domestic or wild animals). The 2009 review observed that the framework did not provide a clear link to implementation. Our evaluation has confirmed that the APSED gender framework has still not been widely disseminated or operationalised, and was perceived by a number of stakeholders as donor driven. However, the framework will be a useful resource for DFAT's future investments in regional health security.

The generally poor performance on gender evident in the EID programs also reflects the commitment to gender of some implementing partners. In the Pacific, the performance of the Secretariat of the Pacific Community (SPC) in relation to gender in the Pacific Regional Influenza Pandemic Preparedness Program

* A WHO policy brief on addressing gender equity through health systems in Europe identified the following necessary conditions for gender approaches to be implemented effectively: availability and use of gender-disaggregated data, political commitment and ownership, financial and human resources, training for those involved, evaluation of interventions and strategies used, involvement of key stakeholders at all levels, commitment from decision-makers, and effective stewardship by the government ministry responsible for health (S Payne, *How can gender equity be addressed through health systems?*, WHO, 2009 on behalf of the European Observatory on Health Systems and Policies, 2009).

(PRIPP) was poor. The midterm review (2008) recommended PRIPP fund research to explore the roles of men, women and children in the prevention and control of EIDs in the Pacific context, and that these findings be used in training workshops on gender.[32] The independent completion report (2010) found that the research project was dropped for lack of funding, indicating that it was not considered a priority.* A recent ODE evaluation of the SPC–Government of Australia Partnership (2016) found that, despite substantial dialogue on the need for SPC to better integrate and resource gender into its programs, progress on gender across SPC is still inconsistent.[33] The evaluation recommended the Partnership look to additional forms of support for gender integration, such as technical assistance and tagged divisional-level funding. Our findings support this recommendation.

Following OIE's poor performance on gender in the South-East Asia and China FMD (SEACFMD) program (2006–11), AusAID successfully advocated for OIE to develop a gender policy and tools for the successor program, STANDZ. OIE's Sub-Regional Representation for South-East Asia was therefore required to undertake gender analysis and identify specific gender outcomes and monitoring indicators for STANDZ. Tranche payments in the STANDZ grant arrangement were linked to program performance, including on gender, and provision was made in the budget for a gender specialist. However, the independent midterm review (2014) found the focus on gender in the STANDZ design to be overly theoretical and took a disproportionate amount of resources, at least initially. As a result, there was some moderation of DFAT's expectations, but with the agreement that STANDZ would continue to deliver and report against five specific areas on gender.† Gender has therefore been addressed in all STANDZ socioeconomic studies on FMD control, in its work to strengthen veterinary services and in OIE's Sub-Regional Representation for South-East Asia workplace. It is a good practice example for other EID investments.

The evaluation noted the lack of gender outcomes in the design and results framework for the current Australia Indonesia Partnership EID Program (2015–18). The program documentation indicates that differences in gender roles in livestock production will be considered in design of community-level interventions, to ensure that benefits are equitably distributed, but there is no indication of how this will be monitored. Notwithstanding the program's achievement of gender equity in provincial and district iSIKHNAS coordinator roles, it could learn from the STANDZ approach to gender.

Women have a key role in infection prevention and control in their family and their professional roles in the health workforce. Infection control was underemphasised in DFAT's EID investments in the past, perhaps in part because it requires getting into the business of generic health systems improvement, which was not a strong focus of the investments. It should receive greater attention moving forward.

* The PRIPP independent completion report (ICR) noted the lack of traction for gender equality considerations within SPC and that there was no systematic means of ensuring gender equality was integrated in SPC's work. The ICR further observed that the design for PRIPP should have included a gender equality strategy concerning the role of men, women, boys and girls, with outputs, targets and qualitative indicators. Alternatively, it should have provided for the early development of such a strategy by the SPC (B Broughton, M Patel & D Kennedy, *PRIPP independent completion report*, 2010, 34).

† Following the midterm review, DFAT and OIE agreed that STANDZ would continue to (i) collect and report gender-disaggregated data relevant to those participating in key STANDZ events; (ii) promote equality of access and opportunity for secondments, meetings and training; (iii) ensure that gender issues were specifically addressed in terms of reference for relevant studies and small grants (e.g. socioeconomic studies on FMD control, strengthening of veterinary services) and disseminate gender-related findings; (iv) ensure gender and socioeconomic issues were appropriately addressed in scopes of work and grant-funding arrangements for larger interventions (e.g. communication strategies, M&E priorities); and (v) promote gender equity within the Sub-Regional Representation workplace (DFAT management response to STANDZ midterm review).

CONCLUSION

It is now better understood that gender is an important factor in EID exposure and vulnerability, but the link between this conceptual understanding to program implementation and outcomes still needs to be strengthened. We found good examples of gender analysis and research, but limited evidence of gender impact and results. Regional programs face particular challenges in embedding gender at country level, with variable capacity and commitment within partner government ministries. More thought is needed about how best to support countries to develop clearer perspectives on gender and social issues related to EIDs and other infectious diseases, and to mainstream gender into EID prevention and control initiatives.[34] There would be benefit in developing and documenting some targeted examples of better practice in this area, including from the international literature, to illustrate the translation of theory to practice for various types of investments, and to demonstrate impact on development outcomes.

It is essential that DFAT's future investments in regional health security take a rigorous approach to addressing gender differences and impacts. Gender analysis in the design of new investments should include an assessment of capacity gaps and identify incentives for relevant institutions and target groups to better identify and address the gender dimensions of EIDs. The design of new investments should include gender outcomes and monitoring indicators in M&E frameworks.

Recommendation 3

That the design of new DFAT regional health security investments include gender outcomes and monitoring indicators in monitoring and evaluation frameworks, and implementers proactively monitor progress in addressing gender equality.

7. EFFICIENCY

OVERVIEW

This chapter assesses the efficiency of emerging infectious disease (EID) investments from the perspective of value for money. The first section assesses whether the investments overall were implemented efficiently and the implementation characteristics that contributed to efficiency. The second section addresses the value for money of the different implementing partners, with more detail on partner modalities provided in Annex 4.

VALUE FOR MONEY AND EFFICIENCY IN EXECUTION

Overall, the evaluation found that the activities and outputs for most initiatives were delivered on time and in a cost-effective manner. Across the portfolio, 20 of the 22 investments were rated by Australia's final Aid Quality Checks (AQCs) as adequate or better on efficiency. Several initiatives were slower to start up than had been anticipated, with partner government capacity constraints a common factor. Where there were delays, both Australia and partners documented the reasons and made efforts to address them. Factors that contributed to delays were issues with government approval in getting documents signed, and establishing coordination mechanisms where there were a number of partners involved. Most programs were regarded as efficient by the Australian Government Department of Foreign Affairs and Trade's (DFAT) internal quality assessments by the time they were completed.

For the most part, predicted budgets compared well to actual expenditure and planned timeframes were sufficient to achieve intended outcomes. There were no issues with programs being seriously underspent, with the exception of the World Bank Avian and Human Influenza (AHI) Facility (2006–11) project grant in Indonesia, where agreement was not reached between the World Bank and the Indonesian Government and the grant was terminated. There were also some delays and difficulties spending funds allocated to the human health sector under the World Bank AHI Facility project grant in Cambodia, with these funds eventually being absorbed into a sector pool. There was a lack of demand by countries for funds made available by the Asia Pacific Economic Cooperation (APEC) investment ($7.8 million intended for capacity building of APEC member states in areas of health security) and limited documentation about this investment. Several of the other initiatives required more time for start-up and implementation than had been anticipated, and AusAID/DFAT generally granted no-cost extensions to enable completion of the projects.

Program management arrangements by AusAID/DFAT depended on the source of funding—whether from global, regional or country program budget allocations—and the location of health specialist staff. Regional Pacific and South-East Asia programs were managed out of the Suva post and the Association of Southeast

Asian Nations (ASEAN) Mission Sub-Regional Office at Bangkok post respectively, and the Indonesia bilateral country program initiatives were managed out of Jakarta post. However, the Asia Pacific Strategy for Emerging Diseases (APSED) was managed by Health Policy Section in Canberra, which also managed the aid program's core budget contributions to the World Health Organization (WHO). Where initiatives were managed from Canberra, it was more difficult to ensure implementation efficiency. For programs managed from Canberra, such as APSED, DFAT staff at country posts found it challenging to engage meaningfully about the program with their country counterparts and other in-country development partners. This was compounded by the reduction in bilateral health programs in South-East Asia, and the corresponding depletion of in-house health expertise in the aid program since 2013. DFAT needs to consider the skills needed by staff to effectively conduct policy dialogue on regional health security and health systems issues, recognising that countries with no bilateral health programs may only have generalist staff.

The modalities differed in the program management resources needed from AusAID/DFAT, with the Joint United Nations / Government of Vietnam Avian Influenza Program Phase II (2006–10) considered fairly 'low maintenance'.

Implementation arrangements were generally well harmonised with other donors. AusAID/DFAT generally participated in donor coordination efforts. Interviewees generally saw Australia as a strong contributor to coordination of EID investments between different donor groups (particularly evident in Indonesia) and as a strong advocate for aid effectiveness (particularly evident in the Mekong and the Pacific). Australia's presence in-country or in-region (in the case of Bangkok) was critical to this.

Implementation arrangements were aligned with partner government systems. Both human and animal health EID investments followed national plans. Partial failures to align with the system were evident in two activities. The Participatory Disease Surveillance and Response (PDSR) approach in Indonesia set up parallel processes within the government system and the PREVENT Emerging Disease Risk Reduction (PREVENT) program in Mekong consulted with government but was not implemented in alignment with government systems. Neither of these initiatives were discouraged by the central governments as they gave government some penetration at community level.

Recognising that prevention, and early rapid detection and management to avert a pandemic, are more cost-effective than mounting a response once a pandemic is under way, the *Pandemics and Emerging Infectious Diseases (PEID) Framework 2010–2015* had a stronger focus on prevention. In the long term, this is an efficient approach, akin to an insurance policy. It is interesting to speculate what the value for money of the investments would have been if H5N1 highly pathogenic avian influenza virus (H5N1 HPAI) had resulted in the emergence of a human-to-human transmissible strain of influenza with a low or moderate case fatality rate. Such a scenario would certainly have maintained the attention of governments on the issue, and would likely have sustained the activities and results of the early investments. As it was, when the human incidence of avian influenza cases subsided, so too did the level of donor support.

Design and implementation characteristics contributing to efficiency

We identified the following implementation characteristics and aspects of context that contributed to efficiency at program level.

Aligning with longer-running programs or larger systems

The source of funds for the initial World Organisation for Animal Health (OIE) Performance of Veterinary Services (PVS) evaluations in South-East Asia was OIE's South-East Asia and China Foot and Mouth Disease (SEACFMD) program and Project to Strengthen Veterinary Services, to which Australia contributed.[35] Thus Australia's investment in OIE was efficient for building stronger systems in key areas of regional programs—noting that the STANDZ success comes after decades of Australian support to SEACFMD. The Australia Indonesia Partnership EID Human Health Program in Indonesia invested in small niche components of larger Indonesian Government activities, *punching above its weight*, according to the 2013 midterm review. Use of the NGO CARE, and its large, established networks in-country, was also an efficient way to get into the field quickly. There were also clear efficiencies where there was (fairly) seamless funding of the same organisations to work in similar areas.

Linking regional programs and country-level support activities

There were clear efficiencies in regional programs that had well-structured and resourced implementation support at the country level. This support provided a platform for contextualising regional program approaches to specific settings. This also provided opportunities to build relationships and monitor and troubleshoot problems. In settings where permanent in-country regional program support was not feasible, efficiencies were found created by linking regional programs with Australia's bilateral activities or with activities of other development partners.

Using local, regional or Australian expertise

Cost-effective delivery of training activities was supported by use of local resource persons from ASEAN countries and use of ASEAN networks to help organise logistics for regional events. In addition, drawing on local or regional expertise for delivery of technical assistance, where available, appeared to contribute to efficiency through harnessing the technical advisers' understanding of contextual and cultural factors that would influence program implementation. The use of Australian or other international expertise did not emerge as a strong factor influencing effectiveness—the way that technical assistance was delivered was more important. The international NGO CARE is regarded as generally efficient in its area of work, owing to its established experience in community work in the region. However, notwithstanding CARE's efforts in this

direction, closer links with the expertise of technical agencies and of the government systems would have improved efficiency and effectiveness.*

Applying systems approaches to developing capacity

In some cases, individual activities were implemented efficiently, but efficiency was undermined by a lack of sustainable outcomes. For example, substantial numbers of people were trained at relatively low cost through some investments, but the people trained were not supported to use their new knowledge and skills in their work. Long-term outcomes from training were often not known or seemed unlikely. Another example was the short-term, fly-in fly-out model of technical assistance provided in the Pacific, where in some cases, following departure of the consultant, countries were left with lists of capacity gaps that they had no means of filling, or lists of recommendations but no way of implementing them. On the other hand, where WHO country offices had positive long-term relationships with ministries of health (which was the case in the countries we visited), and the short-term work was provided as part of a systematic program of support, the inputs were highly valued.

There were no examples identified of good linkages between EID investment and Australia's health systems strengthening programs, and this detracted from efficiency in delivering against a health systems strengthening agenda.

A twinning modality was used to deliver two investments in animal health systems—the Australia Indonesia Partnership Animal Health program (2010–15) and the Australian Quarantine and Inspection Service (AQIS) programs under Australia's Papua New Guinea (PNG) PEID Program (2006–10). There were two lessons from the use of this modality in the EID portfolio. First, that this modality requires substantial program management by the aid program, particularly at the start, and this should not be underestimated. Second, there needs to be a deliberate effort from all sides to ensure institutional, not just technical, capacity development. There is a risk that technical experts without development insight and experience will not be equipped to tailor their assistance to suit the absorptive capacity of countries, and that the underlying institutional or governance issues will remain unaddressed. This was the case with the PNG AQIS partnership.

Investing in coordination mechanisms of partner government systems

The strength of government coordination, unsurprisingly, had a strong influence on how efficiently initiatives could be implemented. This is largely outside the influence of the donor but impacts on efficiency, and especially the efficiency of coordination of different inputs. This is linked to the capacity of animal and human health systems more generally. Long-term system inputs that contribute to improved coordination should have a positive influence on efficiency of program investments over time.

* The independent completion report for the CARE program recommended that future community-based programs consider formal partnerships with technical agencies such as FAO and WHO in order to enhance the technical content of activity designs and increase opportunities for influence in national-level policy and planning processes (R Bowen, *CARE Australia Community-based Avian Influenza Risk Reduction Program Phase II—end of program evaluation*, 2010, viii).

PARTNER MODALITIES

The evaluation found that the aid program has generally used 'the right partners for the right things'. Strengths of the portfolio in terms of efficiency were the diversity of modalities used, and the role of Australia in coordinating EID investments by other development partners. Australia's coordination role was most notable in Bangkok, where most regional partners working in health security in South-East Asia are located, and where the need for donor coordination was most acute.

The different funding modalities and implementing partners fulfilled different purposes at different times and so it is not appropriate to make a definitive statement about their relative value for money. However, there were some lessons, identified below.

Both the World Bank AHI Facility and WHO's APSED had clear advantages in terms of donor coordination and harmonisation of implementation arrangements. This was particularly important in the complex donor environments of South-East Asia.

The risk of inefficiencies was realised where regional/global initiatives were not well matched to country context, and where Australia's influence on implementation was limited. The documentation for some (APEC, the World Bank AHI Facility, APSED Phase I) presents a picture of Australia advocating for more context-appropriate and efficient execution of investments, but not meeting with much success.

In some cases, the grant agreements may have benefited from higher level M&E expertise—in reaching agreement on more robust performance assessment frameworks, for example. However, in other cases there seemed to be a 'like us or leave us' situation that Australia has had to weigh up. Overall, the World Bank AHI Facility was not an efficient modality for an emergency response as funds could not be accessed fast enough. This was in part due to the requirement that national avian influenza plans be jointly developed between the human and animal health sectors. Further, where governments did not yet have mechanisms in place to deal with the complexities of managing a World Bank finance agreement, there were difficulties aligning the government administration processes with the requirements of the World Bank, or with the project design. This contributed to inefficiencies and delays.*

Australia's support to the APEC EID initiative illustrates the inefficiency of investing in initiatives that have little or no country-level ownership. Our evaluation found no evidence of any outcomes of this initiative, and the small one-off meetings and workshops supported do not seem to have been well linked with other regional (ASEAN) and global organisations who have EID technical and political legitimacy in this area, nor with country priorities.

There were clear efficiencies for regional programs in using partners with established country offices and relationships with country governments. However, in such cases it was difficult to distinguish between the activities of the regional EID investments and other activities funded by a range of donors and implemented

* The final AusAID quality report (2011) notes that at the end of the fourth implementation year (75 per cent of overall implementation time), overall World Bank AHI Facility disbursement was 50.8 per cent. This was an improvement from the time of the midterm review (2009) when disbursement was just 29 per cent. Given the earlier period coincided with the emergency period, this was very low.

by the development partner's country offices. In several instances, Australia was supporting both through different channels.

The OIE model appeared to have some cost efficiencies relative to contractor models (5 per cent overhead for managing Stop Transboundary Animal Disease & Zoonoses (2011–16) (STANDZ) funds, compared with approximately 20 per cent). ODE's qualitative assessment is that the OIE Sub-Regional Representation Office in Bangkok has managed to achieve a lot with a small budget and modest staffing, punching above its weight.

At the time Australia commenced EID support to the regional institutions of the Secretariat of the Pacific Community (SPC), ASEAN and APEC, neither ASEAN nor APEC had strong leadership roles or capacities in EID preparedness and response, and SPC had some capacity. The efficiency of the support needs to be understood from this basis—that is, through taking a long-term view and recognising that it takes time to build organisational capacities and reputational capital. Investments made through regional member-driven associations provided a platform to strengthen self-determination and country leadership in the EID response.

There was wide variation in the size of the investments (see Annex 1), and the EID activities of implementing partners were supported through different mechanisms (Figure 5). Further, in many cases Australia was one of a number of contributors to the implementing partners' EID programs, and the total resource envelope available at country level was not known to ODE. It was therefore not possible to draw clear conclusions about relative efficiencies or value for money, except in a negative sense. There was one case—APEC—where an investment of substantial size did not appear to deliver, or at least we could not identify sustainable outcomes.

CONCLUSION

Overall, the evaluation found that activities and outputs were delivered on time and in a cost-effective manner for most programs. No type of investment or activity stood out as being better value for money. Rather, the evaluation found that value for money was achieved where activities were well suited to context, not overly ambitious, and were implemented in a way that complemented other activities. Factors contributing to the efficiency of EID investments were alignment with longer-running programs, using implementing partners who had permanent in-country offices, using local expertise, and investing in coordination structures of partner governments.

There were clear efficiencies in regional programs that had well-structured and resourced implementation support at the country level. In some cases, individual activities were executed efficiently (e.g. many people trained), but overall efficiency was undermined by lack of attention to systems issues (e.g. lack of supervision or resources to apply skills gained). There were no examples identified of good linkages between EID investment and Australia's health systems strengthening programs, and this detracted from efficiency in delivering against a health systems strengthening agenda.

With a few exceptions, Australia has generally used 'the right partners for the right things', with different funding modalities and partners fulfilling different roles.*

Program management by AusAID/DFAT contributed to efficient execution of the initiatives, although where programs were managed more distally (such as from Canberra), it was more challenging for AusAID/DFAT to ensure complementarity with other initiatives, and contribute to efficiency. This challenge will increase given the significantly reduced bilateral engagement with health sectors in South-East Asia and shift of emphasis from bilateral programming to multilateral support and working through other partners. To address this, DFAT will need to consider ways of overcoming the lack of dedicated health staff on the ground so that it can continue to be informed and influential. This will be necessary to ensure that regional health security initiatives are managed efficiently and contribute in tangible ways to the goals of the aid program. With a smaller pool of internal health expertise to draw from, it will likely be harder for DFAT to maintain a credible leadership role on health security in the region and with whole-of-government partners.

Recommendation 4

That DFAT identify the level of representation and skills needed to contribute to effective policy dialogue with implementing partners and partner governments in relation to health security and health systems strengthening, taking into account that not all DFAT country programs have dedicated health staff.

* It was challenging, however, to ensure efficient execution of those projects implemented through the World Bank AHI Fund and APEC. These investments may not have been good value for money for outcomes achieved.

8. MONITORING, EVALUATION AND RESEARCH

OVERVIEW

The first section of this chapter addresses monitoring and evaluation (M&E) of the emerging infectious disease (EID) investments. The second section addresses related research activities and the extent to which the EID investments have contributed to the evidence base for preparedness and response.

MONITORING AND EVALUATION OF EID INVESTMENTS

Across the period, the most recent Australian Aid Quality Check (AQC) ratings assessed 29 per cent of EID investments as inadequate (unsatisfactory) on M&E, 52 per cent as adequate (satisfactory), and 24 per cent as high performing (Figure 9).

For $28.8 million (14.6 per cent of total expenditure of $196.5 million), there was no DFAT quality reporting. In most cases, this was because initiatives were exempt from quality reporting their funding was less than the reporting threshold of $3 million, or were classified as humanitarian assistance, which was also exempt until 2014.*

Improvements in M&E over time

M&E quality improved over the period covered by the evaluation. The median† end-of-investment rating for M&E in the period 2006–10 was less than adequate (unsatisfactory) (3.7) and this increased to adequate (satisfactory) (4.5) for 2011–15.‡

The lower quality of M&E in the earlier period may reflect the emergency nature of the earlier investments, many of which were designed in response to an immediate pandemic threat and had less time for development of robust M&E approaches, compared to the later investments. The 2009 desk review of the *Pandemics and Emerging Infectious Diseases (PEID) Strategy 2006–2010* found that reporting against

* Introduced in 2014, an Aid Quality Check (AQC) is DFAT's annual quality assessment of the performance of investments funded from bilateral, regional and global program funds using seven criteria: relevance, effectiveness, efficiency, M&E, sustainability, gender, and risk management and safeguards. Also in 2014, a tailored humanitarian AQC (HAQC) was introduced to assess performance of investments funded from humanitarian and emergency program funds. Sustainability is not assessed for humanitarian and emergency investments as the aim is to alleviate hardship caused by disasters and other humanitarian emergencies in the shorter term. Prior to 2014, this annual quality assessment was known as a Quality at Implementation (QAI) assessment, which used the same quality criteria and comparable ratings scale as the AQC. However, QAIs were not required for humanitarian and emergency investments, which relied on reporting received from implementing partners, supplemented by periodic AusAID/DFAT assessments of key implementing partner performance (see http://dfat.gov.au/about-us/publications/Pages/australian-multilateral-assessment-ama-full-report.aspx).

† These assessments are performed annually, and may change over the course of the investment. We use the most recently available ratings in this report, unless otherwise stated.

‡ A six-point rating scale is used for AQCs and HAQCs: 6=very good, 5=good, 4=adequate, 3=less than adequate, 2=poor, and 1=very poor.

outcomes was inadequate. We agree with this finding for the early investments and found that while outcome reporting had improved for some investments, it was still inadequate for the later investments. More work is needed to develop theories of change and monitor progress towards outcomes—examples are provided below.

M&E of regional investments

Regional programs faced particular challenges in gathering data on outcomes of activities implemented at country level. At the end of the investment period, more than one third of regional investments were assessed as inadequate on M&E, compared to just over one fifth of the bilateral country investments (Figure 9).

Figure 9 Country investments tended to have better ratings for M&E than did regional and global investments

Several large regional investments under both the *PEID Strategy 2006–2010* and *PEID Framework 2010–2015* stand out as being particularly weak on M&E.

The Asia Pacific Economic Cooperation (APEC) initiative did not provide any reporting on individual activities nor did it report against its overarching action plan. This was despite Australia's early efforts to develop an M&E framework for APEC and to establish a panel to assess projects funded under the initiative. The final AQC notes that *if funding regional organisations for EID-related work in the future, ensure activities are in line with their mandate and that they complement the work of other organisations*.[36] AusAID exempted the initiative from an independent completion report on the basis of a complete lack of reporting from the implementing partner. The second APEC investment—APEC EID Capacity Building through APEC Private Sector Linkages program ($2.6 million)—was exempt from quality reporting because it was less than the reporting threshold of $3 million. Thus, a total investment of $7.8 million was made through APEC with very limited activity reporting and no reporting on outcomes. While this investment was made at the height of international concerns about avian influenza, this does not justify the lack of reporting. The main regional project in the Pacific, the Pacific Regional Influenza Pandemic Preparedness Program (PRIPP), did not include an M&E framework for supporting country needs. The PRIPP independent completion report concluded that this gap, and the lack of country action plans, was a serious constraint to effectiveness and indicated some lack of strategic oversight of the initiative.[37]

The Association of Southeast Asian Nations Plus Three EID Program (2006–10) (ASEAN+3 EID) investment was rated poorly on M&E. It did not have a clearly articulated 'theory of change' and there was some mismatch in expectations between what AusAID expected as outcomes at community level and what a regional investment could deliver. AusAID also rated the South-East Asia and China Foot and Mouth Disease

initiative (SEACFMD) poorly in M&E in the early phase, but the World Organisation for Animal Health (OIE) Sub-Regional Representation Office was responsive to requests, and ratings improved.

AusAID/DFAT's ratings for the World Health Organization (WHO) Asia Pacific Strategy for Emerging Diseases (APSED) on M&E were low in the first phase (2005–10) and improved in the second (2011–15). This was Australia's largest investment in a single EID initiative ($28.8 million). Following advocacy by Australia, an M&E component and supplementary monitoring indicators were included in the design of Phase II, along with recruitment of an M&E specialist. However, there were delays in filling this role and M&E remained problematic. International Health Regulations (IHR) compliance depends on functioning and adequately funded health systems, which is largely the responsibility of national governments. Countries report annually on their progress towards meeting IHR core capacity requirements, and APSED's M&E approach used IHR data as a key indicator of its success. To assess APSED's contribution to this, good documentation of program logic and evidence for contribution at each step is needed, but was lacking.

The key mechanism for monitoring APSED was through annual meetings of a technical advisory group to review progress, in which Australia participated.* Apart from reports to this group, WHO reported on work plan milestones (checklists of actions taken) and APSED performance indicators. However, WHO has been unable to provide consolidated data about capacity building activities delivered using APSED funds. The 2010 independent evaluation of APSED Phase I recommended that monitoring in the second phase include a systematic list of capacity building support provided to countries. This recommendation does not appear to have been implemented. If it had, the draft APSED evaluation report (2015)[38] would have included these data, and they would have been provided to us when we requested them. This limitation has made it impossible for this evaluation to meaningfully assess the contribution of APSED technical assistance to outcomes achieved in IHR compliance.

Both APSED and the ASEAN+3 EID initiative included a strong focus on establishing and maintaining EID networks, but did not evaluate the functioning of the networks. Like all approaches, networks stand to benefit from reflection on performance. They need to be evaluated from two perspectives: the effectiveness of the network (doing the right thing) and the efficiency of the network (doing things right). The evaluation did not find any evidence that this was done. In addition, for APSED, there was little differentiation in reporting of results achieved between the Pacific and South-East Asian countries.

M&E and health systems strengthening

Both PEID strategies had health systems strengthening objectives, so it is not unreasonable to expect that individual investments should be able to demonstrate how they contribute to these objectives. Overall, this was lacking. At program level, the theory of change, where this had been developed, did not generally clearly link activities to the end goal of health systems strengthening. Establishing a clearer line of sight between the inputs and activities and this overall goal at the design stage would have helped to identify where the EID

* The technical advisory group comprised representatives from member states, technical agencies, donors, WHO and individual experts.

investments could link more strongly with other health systems strengthening efforts and work more efficiently and synergistically with them.

None of the independent completion reports or midterm reviews included in our document review looked at effectiveness for health systems strengthening, although various health system building blocks were implicit in some of the indicators (e.g. related surveillance, laboratories, epidemiology, risk communications). The 2009 review of the *PEID Strategy 2006–2010* was a desk-based exercise, and did not consider health systems strengthening contributions. There was no review of the *PEID Framework 2010–2015* and no performance assessment framework at portfolio level.

The *PEID Framework 2010–2015* stated that a companion performance assessment framework would be developed.* Reporting requirements would be aligned with those of other donors, partner government frameworks and international standards (such as the IHRs), and AusAID would work with regional and multilateral partners to improve the quality of their M&E systems. AusAID further undertook to conduct independent reviews of the framework and its activities in 2012 and 2015 to assess lessons learned, outcomes achieved and any need for a shift in policy direction or priorities. While a performance assessment framework was drafted, it was not finalised due to other priorities at the time, and the reviews did not take place. This ODE evaluation helps to fill this gap.

M&E and collaboration between human and animal health systems

There were no good examples identified from the past EID investments of M&E of collaboration between human and animal health systems or the application of One Health principles. The design of the new Australia Indonesia Partnership EID Program in Indonesia includes outcomes that are shared between animal and human health, and implementation is through parallel human and animal health components that have their own outcomes. However, implementation is still at an early stage and it is premature to form an assessment of the robustness and usefulness of these reporting arrangements.

Using national-level assessment tools in M&E

The main lesson from using national-level assessment tools in M&E is that indicator selection needs to focus on what is within the sphere of influence of the investments, and include outcomes along the intended impact pathway. Use of available data is a key element of effective M&E systems, as outlined above. Beyond this, more judicious use of national assessments, and more robust means of reporting how the funds are used, is required. In the animal health area, the M&E adopted for Stop Transboundary Animal Disease & Zoonoses (STANDZ) reports countries' progress in uptake of the Performance of Veterinary Services (PVS) assessment process. It also reports use of the PVS gap analyses to inform country planning, which is plausibly within the sphere of influence of the project.

*AusAID, *Pandemics and Emerging Infectious Diseases Framework 2010–2015*, 16.

BUILDING THE EVIDENCE BASE

The *PEID Framework 2010–2015* included an objective to build the evidence base for the response to EIDs. This section provides a brief assessment of EID research from the perspective of M&E—that is, whether the information generated informed decision-making, learning and accountability. We focus on the research funded through the EID investments or where there were direct links identified to the investment activities.

Research linked to intervention activities

Some research was directly linked to animal health intervention activities. Most, but not all, of this research produced practical information used for program improvement. For example, several research activities in Indonesia investigated which interventions were most likely to be effective and efficient, and helped to inform their selection and delivery. The World Bank Avian and Human Influenza (AHI) Facility in Indonesia contributed to a significant research exercise that helped to clarify the feasibility of delivering effective H5N1 highly pathogenic avian influenza virus (H5N1 HPAI) vaccination of village poultry in Indonesia. This large controlled study demonstrated that while intensive vaccination appeared to have an impact on H5N1 HPAI incidence, it was difficult to achieve effective population-level vaccine coverage, so this would not be an effective disease control strategy. Since that time, there has been no systematic attempt to control H5N1 HPAI by widespread vaccination of village poultry in Indonesia.

Building on the community vaccinators and cold chain facilities[*] established during this research, a community-based vaccination effort (driven by the Indonesian Government and supported by World Bank AHI Facility funding) delivered a more targeted intervention to introduce H5N1 HPAI vaccination of small-scale commercial poultry farms and commercial native chicken farms. Further, Australia's support for epidemiologists within the Department of Animal Health in Indonesia introduced a rapid diagnostic test for H5N1 HPAI that is still used as the first-line diagnostic test to confirm suspected cases in the field. In addition, useful applied research by AusAID-funded staff in the Food and Agriculture Organization of the United Nations (FAO) and in WHO resulted in a practical approach to measure the environmental load of H5N1 HPAI virus in markets and other points along market chains.

The SEACFMD and STANDZ investments drew on applied research, much of this conducted by the Australian Centre for International Agricultural Research (ACIAR)—a statutory authority within the Foreign Affairs portfolio and Australia's specialist international agricultural research for development agency. While ACIAR funded most of this research from its core budget, there were some good linkages with the EID investments. For example, SEACFMD drew on information from ACIAR projects about the drivers of animal movements. This led to action to mitigate risks of imported animals that did not follow existing, regular movement pathways.

ACIAR has deliberate strategies to promote research uptake, and this approach contributed to the positive way the findings have been used. ACIAR's animal health research program in the region (2007–12) required

[*] A cold chain is a system for storing vaccines that is designed to keep them within WHO-recommended temperature ranges from the point of manufacture to the point of administration.

that use of research findings be considered at design stage, including the institutional pathways for adoption of research results by smallholder farmers. A 2015 ODE evaluation of research use in DFAT programs found that uptake of ACIAR research in partner countries was strong.[39]

Image 7 Ducks being sampled for testing for avian influenza, Indonesia, 2009. Photo: Adi Rahmatullah, ACIAR

ACIAR also shows commitment to research uptake through commissioning external research impact assessments and studies to assess economic returns on research investment. These are used to inform ACIAR's own accountability and learning.

The overall story here was that the research was 'demand driven'—that is, required by the programs and institutions, with a clear pathway for research use—and this aided uptake. This finding is consistent with the findings of the ODE evaluation (2015) of research use in DFAT programs more generally.[40]

Our evaluation did not identify any clear health systems research on the human health side that was directly linked with specific interventions. This is a gap.

Research not linked to intervention activities

Other research, while applied, was not designed to link to any particular intervention activities of the EID portfolio. This included research by PREVENT Emerging Disease Risk Reduction—Mekong (2011–15) (PREVENT) into the social and behavioural factors that affect the risk of emerging pandemic threats, and testing strategies for prevention. It also included WHO/APSED's work to produce a gender analytic framework for EIDs, a systematic review of the effectiveness of community-based interventions for emerging zoonotic diseases in South-East Asia,[*41] and some of ACIAR's animal health research program. Some of this research made important conceptual contributions, and appears to have been of reasonable quality. However, apart from ACIAR's research, it is uncertain whether any significant amount of the research was used to benefit the aid program—for example, through informing design and thinking.

PREVENT was a component of the USAID Emerging Pandemics Threat Program (2009–14) implemented by FHI360 (an international NGO), and funded by DFAT under a delegated cooperation agreement between DFAT and USAID.[†] PREVENT conducted extensive formative research. Its research findings were published in international peer-reviewed journals and reported in conference presentations and technical briefs. However, while the intent was to develop interventions based on the research, this did not happen because the program was closed early. The design of USAID's successor program draws on PREVENT's work, but there was little evidence of PREVENT's findings being used by DFAT. According to the investment design, Australia invested in this area in order to inform the decision-making of Australia's investments in EIDs in the region, and that of partner governments. The fact that Australia and the partner governments were removed from those implementing the research may have made it difficult to achieve this outcome.

Under APSED, with support from Australia and other partners, WHO's Western Pacific Regional Office developed a research-based analytical framework for analysis of gender in EID programs.[42] The framework was a tool for identifying how sex and gender differences affect people's exposure to zoonotic diseases, but links to practical implementation were not developed.[‡] Interviewees in our fieldwork countries had not heard of this framework. Some gender analysis and operational research was also undertaken through the

* In 2010, AusAID joined with the International Initiative for Impact Evaluation and the UK Department for International Development to make a joint call for systematic reviews under the Australia Development Research Awards scheme, including in the area of EIDs.

† The USAID Emerging Pandemics Threat Program (2009–14) comprised PREDICT (detection/surveillance), RESPOND (rapid response), PREVENT (risk reduction), IDENTIFY (laboratory diagnosis) and PREPARE (preparedness planning). The program's purpose was to build regional, national and local capacity for early disease detection, diagnosis, response and containment, and risk reduction of dangerous pathogens in animals before they became threats to human health. In this context PREVENT's purpose was to apply a social and behavioural change approach to developing and introducing interventions for improved disease prevention practices.

‡ The framework identified that interventions involving surveillance to detect disease outbreaks in poultry and livestock, culling, compensation practices and changing production and marketing practices to increase biosecurity all have gender implications including potential loss of income, independence and food security for poor women (WHO Western Pacific Regional Office, *Taking sex and gender into account in emerging infectious disease programmes: an analytical framework*, WHO, 2011, 36–38).

ASEAN+3 EID program, but with little uptake and application of the resulting policy recommendations. For both of these research efforts, there seemed to be weaknesses on both the 'demand' and 'supply' side that likely contributed to limited research uptake. The WHO analytic gender framework appears to have been donor driven, with little evidence of implementation.

The systematic review funded by Australia into community-based interventions for emerging zoonotic disease in South-East Asia addressed a priority issue. However, while the review was of high technical quality, it did not yield findings that were useful to policy and practice. This was largely because the research synthesis method only included studies that compared an intervention and a non-intervention setting and reported quantitative data. The study found that behavioural and contextual factors had a major influence on an individual's response to risk reduction messages, and that these would be better understood through qualitative data.*

Developing capacities to conduct and use applied research

The quality of research and its application to local context is often enhanced by involvement of local in-country research partners. The EID research has demonstrated some positive examples of this research involvement building regional and Australian capacity.

Australia contributed to a Canadian International Development Research Centre program in the area of EcoHealth.† Australia's contribution was earmarked for a capacity building initiative in EcoHealth research and practice in South-East Asia, and a research project on EID prevention and mitigation among vulnerable communities in South-East Asia. The International Development Research Centre EcoHealth initiative, which performed well, had good policy uptake of research findings. The project supported the training of more than 52 postgraduate students and directly influenced the creation of new graduate programs in Indonesia, Thailand and Vietnam. It led to the design and piloting of an innovative disease surveillance system endorsed by government agencies in Bali. Research also informed policies for poultry production in Vietnam‡ and Thailand.§

Several lessons from the EcoHealth external evaluation are relevant to DFAT's future research investments in regional health security. The initiative goes beyond emerging infectious diseases, including a strong focus on what are usually designated 'neglected tropical diseases'—which include neglected zoonoses. This is innovative and relevant since these agendas are often funded and addressed separately from one another. The drivers and recommended intervention approaches in EIDs and neglected tropical diseases are often very similar or overlapping. Therefore, it makes sense to provide scope for institutions and research initiatives to have a broad infectious disease remit, rather than one focused on EIDs only.

* This was a classical systematic review which followed protocols derived from experimental methods, including the calculation of relative effect sizes using statistical methods. The synthesis provided a critical review of English language published evidence between 1980 and 2011. After screening, only 57 out of 5131 potentially relevant studies identified in the initial search were included, the quality of which were assessed as poor to medium (K Halton, M Sarna, A Barnett, L Leonardo & N Graves, *A systematic review of community-based interventions for emerging zoonotic diseases in Southeast Asia*. Funded and published by AusAID, 2013).

† EcoHealth is a transdisciplinary research field that aims to improve the health of people, animals and ecosystems to address complex challenges facing our planet. EcoHealth emphasises holistic understanding of social and ecological systems and drivers of social determinants of health and ecosystem changes.

‡ IDRC research informed development of the Strategy for Agriculture and Rural Development in Vietnam.

§ IDRC research informed the poultry development policy in the province of Nong Khai through the Provincial Livestock Development.

CONCLUSION

M&E by DFAT and its partners was adequate for the majority of Australia's EID investments, although there is a clear need to improve the capacity of systems to assess outcomes. The documentation and M&E generally failed to provide a clear picture of how the investments contributed to health systems strengthening, and there was no operational guidance from DFAT in this area. M&E frameworks developed for future investments need to include logical links between activities and outputs and the end goal of system strengthening.

Regional programs tended not to perform well in M&E. More than one third of these investments were deemed at the end of the investment period to have been inadequate on M&E compared to just over one fifth of the country investments.

While collaboration between animal and human health sectors (the One Health approach) was a guiding principle in the *PEID Framework 2010–2015*, we looked, but did not find, any examples of such collaboration being included in M&E frameworks and indicators.

There were some good examples of practical research that contributed to evidence-based programming, but also examples where there was little evidence of research use. To obtain more consistent outcomes from research, DFAT should ensure that the research purpose is clear; that there is ongoing dialogue and engagement between researchers and the intended users of the research, including national authorities; and that there is flexibility to adapt to changing needs of programs. Research institutions need specific strategies to promote research uptake and demonstrate commitment to improving uptake. ACIAR's approach to animal health research is a good model.

Recommendation 5

That DFAT's strategy for future EID research:

i. Include a focus on health systems research on the human health side.

ii. Provide scope for researchers to have a broad infectious disease / health security remit, rather than one focused on emerging infectious diseases only.

iii. Require consideration of research governance arrangements and strategies for maximising research uptake.

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[41] K Halton, M Sarna, A Barnett, L Leonardo & N Graves, *A systematic review of community-based interventions for emerging zoonotic diseases in Southeast Asia.* Funded and published by AusAID, 2013 (www.dfat.gov.au/about-us/publications/Documents/interventions-for-emerging-zoonotic-diseases.pdf).
[42] World Health Organization Western Pacific Region, *Taking sex and gender into account in emerging infectious disease programmes: an analytical framework.*

ANNEX 1: INVESTMENT PROFILES

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
Regional programs					
	1. Asia Pacific Strategy for Emerging Diseases (APSED) Phase I	World Health Organization (WHO) Western Pacific and South-East Asia Regional Offices	2007–10	$12,000,000	Australia's funding supported the first (2005–10) and second phases (2011–15) of APSED which was a WHO bi-regional strategy. APSED aimed to build the capacity of WHO member states in Asia and the Pacific to work collectively towards regional health security through building national and regional systems and capacities for preparedness planning, prevention, early detection and rapid response to emerging diseases and other public health emergencies in accordance with the International Health Regulations (2005).
	2. APSED Phase II		2011–14	$12,000,000 Subtotal $24,000,000*	
 	3. Stop Transboundary Animal Disease & Zoonoses (STANDZ)	World Organisation for Animal Health (OIE)	2011–16	$12,795,855	STANDZ supports the work of the OIE to improve the performance of veterinary services in South-East Asia in the prevention, control and eradication of emerging infectious diseases (EIDs) and transboundary animal diseases, including foot and mouth disease (FMD) and rabies. Program goal is to mitigate the high health, trade, economic and livelihood impacts of these diseases.
 	4. World Bank Avian and Human Influenza (AHI) Facility (regional and global† focus)	World Bank	2006–09 (but Facility ran to 2011)	$10,500,000	Australia contributed funds to a World Bank Multidonor Avian Influenza Trust Fund which was the modality to fund the World Bank AHI Facility. The Facility provided grants to assist countries meet financing gaps in their avian influenza country action plans. Eligible grant activities included support for elaboration and improvement of integrated (human and animal health) country action plans; activities consistent with Food and Agriculture Organization of the United Nations (FAO), OIE and WHO protocols, including public communications; surveillance and early warning systems, including support for laboratories and diagnostic capacity; and rapid outbreak containment plans and operations including (i) animal vaccination, culling and compensation schemes and (ii) field investigations of human disease cases and clusters; and evaluation and strengthening of the veterinary system and services to deal with animal health outbreaks. Australia's support was notionally earmarked for Asia Pacific ($5

* Total funding for WHO–APSED was $28.88 million when the additional $4.88 million provided as emergency assistance through APSED for the 2009 H1N1 (swine flu) outbreak is counted (see below).
† Denotes that some funds may have been used outside of the Asia Pacific region, e.g. in Africa.

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
					million), Laos ($3 million) and Africa ($2.5 million), although contributions to the trust fund were pooled.
	5. Pacific Regional Influenza Pandemic Preparedness Program (PRIPP)	Secretariat of the Pacific Community (SPC); Pacific ministries of health and agriculture	2006–10	$9,101,455	Program implemented by SPC across 22 Pacific island countries and territories (PICTs). Focused on strengthening capacity of PICTs to manage an outbreak of H5N1 highly pathogenic avian influenza virus (H5N1 HPAI) and pandemic influenza, but was broadened to address H1N1 'swine flu', dengue fever, acute respiratory infection, typhoid, cholera, brucellosis, poultry disease and EIDs generally. Total value of PRIPP was $13.1 million, including New Zealand's contribution.
	6. CARE Australia Community-Based Avian Influenza Risk Reduction Program—Mekong Region (CARE program)	CARE Australia and CARE country offices in Cambodia, Lao PDR, Myanmar and Vietnam	2006–10	$6,923,536	Program piloted models of community-based risk reduction through introducing biosecure measures among small-scale poultry farmers, improving hygiene in the poultry trade chain in wet markets and slaughterhouses, establishing cross-sectoral village surveillance teams, and raising community awareness on avian influenza through behaviour change activities.
	7. South-East Asia Foot and Mouth Disease/South-East Asia and China Foot and Mouth Disease initiative (SEAFMD/SEACFMD)	OIE; national agriculture and livestock ministries	1997–2011	$3,844,424 $10,934 $2,412,092 Subtotal $6,267,450	Australia supported SEAFMD since its inception in 1997: Phase 1: 1997–2001, Phase II: 2001–06 and Phase III: 2006–10 (split into two parts). Phase III: (i) consolidation of national FMD control and eradication programs and further harmonisation of FMD control legislation in member countries; and (ii) from 2009–11, improving institutional capacities of South-East Asian livestock ministries in national and cross-border FMD prevention, control and eradication. In 2010, China, Brunei Darussalam and Singapore joined, resulting in an expanded program and name change to SEACFMD.
	8. Public Health Division Strategic Plan	SPC	2014–17	$6,000,000 ($2 million per annum)	Support for implementation of SPC Public Health Division Strategic Plan; includes national/regional surveillance systems for the Pacific Public Health Surveillance Network (PPHSN) target diseases, EIDs and public health emergencies; and national level one laboratories strengthened with Laboratory Quality Management System to test PPHSN target diseases.
	9. PREVENT Emerging Disease Risk Reduction—Mekong (PREVENT)	US Agency for International Development (USAID); Family Health International (FHI) 360	2011–15	$5,892,443	Under a delegated cooperation agreement with USAID, Australia's funding supported expansion of PREVENT activities in Cambodia, Lao PDR and Vietnam under a delegated cooperation agreement with USAID. PREVENT was part of USAID's broader Emerging Pandemics Threat Program (2009–14). PREVENT's objectives were to (i) further understanding of social and behavioural factors that heighten the risk of people being infected by an emerging pandemic disease from livestock and wildlife; (ii) develop, implement and validate effective behaviour change communication activities among high-risk populations; (iii) develop effective evidence-based strategies for improving national, regional and community-level pandemic preparedness and response; and (iv) build local

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
	10. FAO Live Animal Marketing and Production Program (LAMP)	Food and Agricultural Organization (FAO) Regional Office for Asia and Emergency Centre for Transboundary Animal Disease (ECTAD)	2016–19	Unspent funds from PREVENT used to fund LAMP	capacities on EID prevention. PREVENT was closed down in 2015, therefore its end-of-program objectives were only partially achieved. Under the same delegated cooperation agreement with USAID, funding for LAMP will support activities focused on animal–human interaction points along value chains to improve biosecurity, reduce economic losses and risks to public health. LAMP will build capacity of veterinary services to regularly update and interpret Asia-specific data along value chains in support of critical control points. Risk-based surveillance at country and cross-border levels will be used to identify critical points where virus transmission occurs. Value chain data will improve epidemiological information sharing through networks at the national/regional levels. Includes a private sector dialogue component. Community-based social, cultural and economic dimensions including gender will be considered in implementation.
	11. Asia Pacific Economic Cooperation (APEC) PEID initiative	APEC Secretariat	2006–10	$5,123,175	Funding intended for capacity building of APEC member states in the area of health security, but spent mostly on meetings and workshops. Some support for APEC preparedness, communications and response simulation exercises. No information available on outcomes in AusAID quality reports due to lack of reporting from APEC Secretariat. Initiative was exempted from independent completion report (ICR).
	12. APEC EID Capacity Building through APEC Private Sector Linkages program	APEC Secretariat	2006–11	$2,698,479 Subtotal $7,821,654	Funds were spent on activities such as enhanced biosecurity for APEC countries, focusing on Indonesia and avian influenza; building preparedness and response capacity of the Pasteur Institute; vaccine development; and management strategies. Funds were underspent. Exempted from quality reporting as investment was less than $3 million.
	13. Association of Southeast Asian Nations Plus Three Emerging Infectious Diseases Program (ASEAN+3 EID program)	ASEAN Secretariat; national ministries of health	2006–10	$4,559,835	Program aimed to enhance the ASEAN Secretariat's and ASEAN member states' regional preparedness and capacity in EID prevention, surveillance and timely response. Program outputs included establishment of regional communications and laboratory networks, multi-country protocols, political commitment, and collaborative frameworks between human health and animal health. Ministries of health of the 10 ASEAN member states implemented projects with strategic program oversight provided by the ASEAN Experts Group on Communicable Diseases. The '+3' countries (China, Japan, Republic of Korea) and international agencies such as WHO, FAO and OIE provided technical implementation support. AusAID provided funding of $98,069 separately for a Study on Strengthening ASEAN Regional Coordination on Animal Health and Zoonoses. This is included in the funding amount for ASEAN+3.
	14. Post-sanitary & Phytosanitary Capacity Building Program (SPS program)	Australian Department of Agriculture,	2002–09	$4,311,613	Program was designed to build capability of ASEAN focal countries to describe and manage animal and plant health and implement SPS measures consistent with international standards and the expectations of trading partners. It aimed

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
		Fisheries and Forestry (DAFF)			to facilitate international trade in agricultural commodities by helping ASEAN countries meet international World Trade Organization standards.
	15. OIE Project for Strengthening Veterinary Services (PSVS)	OIE	2007–10	$2,058,540	PSVS focused on strengthening country veterinary services, laboratory capacity and regional laboratory networking in South-East Asia to effectively detect and respond to EIDs. Although the investment was under $3 million, OIE project reports and documentation resulted in AusAID quality reporting.
	16. WHO H1N1 Influenza 2009 response (regional and global)	WHO	2009–11	$7,381,600	Investment followed WHO's declaration of a pandemic for H1N1 (swine flu) in 2009. It comprised (i) an additional $4.88 million for APSED including $2.2 million for procurement of Tamiflu antiviral medications and personal protective equipment for health care workers in Papua New Guinea (PNG) and the Pacific, and technical assistance in epidemiology, quarantine, influenza surveillance and communication; (ii) $1 million for H1N1 vaccine procurement for PNG, the Pacific and Timor-Leste; and (iii) $1.5 million for WHO's H1N1 Global Response Plan. Exempted from quality reporting as emergency assistance.*
	17. Humanitarian and Emergency (HES) EID Avian Influenza activities (global)	World Food Programme (WFP)	2006–10	$2,540,082	Funds used to build WFP's capacity to respond to sudden onset emergencies with a focus on continuity of WFP's operations and its role in provision of humanitarian common services support, and use of food aid to mitigate pandemic effects on populations. Exempted from quality reporting as emergency assistance.
	18. Australian Epidemiology Regional Assistance Program	Australian Department of Health and Ageing	2006–10	$2,086,555	Short-term placements of epidemiologists in WHO offices in China, Indonesia, Vietnam, Timor-Leste and Lao PDR to assist countries build national capacity to respond to the threat of pandemic influenza and other EIDs. Exempted from quality reporting as investment was less than $3 million.
	19. Capacity Building in EcoHealth Research on EIDs	International Development Research Centre	2009–14	$1,700,000	Support for capacity building for EcoHealth research on EIDs at the research–policy interface in South-East Asia with a focus on research capacity building and a research project on EID prevention and mitigation within vulnerable communities in South-East Asia. EcoHealth research seeks an integrated understanding of the social, economic, biophysical and ecological determinants of health while improving environmental sustainability. Exempted from quality reporting as investment was less than $3 million.

* Prior to 2014, initiatives funded from AusAID humanitarian and emergency programs relied on reporting received from implementing partners, supplemented by periodic AusAID/DFAT assessments of implementing partner performance (see http://dfat.gov.au/about-us/publications/Pages/australian-multilateral-assessment-ama-full-report.aspx). In 2014, a tailored humanitarian Aid Quality Check was introduced to assess performance of investments funded from humanitarian and emergency program funds over the threshold of $3 million, which applies to all aid program investments.

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
	20. IFRC Appeal for Avian Influenza Preparedness, Mitigation & Response (global)	International Federation of the Red Cross (IFRC)	2006	$1,000,000	The IFRC Appeal supported capacity building of Red Cross National Societies in avian influenza response; medical and non-medical materials for protection, dissemination and health education, communications; pandemic preparedness work, contingency planning in coordination with UN, government and interagency plans. Exempted from quality reports as emergency assistance.
	21. WFP Avian and Human Influenza Preparedness (global)	World Food Programme (WFP)	2006–09	$1,000,000	Investment supported two projects to strengthen the capacity of WFP and UN Humanitarian Response Depot Network in avian influenza response. The Network supports the emergency response efforts of UN (including WFP), international, government and non-government organisations. Exempted from quality reports as emergency assistance.
	Other smaller activities:				
	22. AusReady—Asia Pacific EID Facility	ANU Enterprises Samoa Red Cross	2007–09	$691,598	A facility model. Example of activities was restocking of Samoa Red Cross containers with medical supplies. Exempted from quality reporting as less than $3 million.
	23. Regional Asia Pacific Pandemic Influenza Contingency Team	UN Office of Coordination of Humanitarian Affairs (OCHA)	2008–09	$400,000 Subtotal $1,091,598	Support for OCHA team to contribute to workshops with governments and organisations on Regional Asia Pacific Pandemic Influenza Contingency Plan. Exempted from quality reports as emergency assistance.
Country programs—Indonesia					
	24. Communicable Diseases Program	WHO; Indonesian Ministries of Health and Agriculture; FAO; DAFF and Australian Quarantine and Inspection Service (AQIS); Indonesian Agricultural Quarantine Agency (IAQA); CSIRO—Australian Animal Health Laboratory (AAHL)	2005–10	$10,010,796	Aim was to strengthen health systems to enable Indonesia to manage avian influenza in targeted areas by developing capacity of Indonesian partners. Support was provided through WHO/Ministry of Health; FAO/Ministry of Agriculture for Participatory Disease Surveillance and Response (PDSR); AQIS Quarantine Strengthening Project; CSIRO Veterinary Laboratories Capacity Building Project; and design of the Healthy Traditional Market Project in South Sulawesi. There was significant overlap with the PEID Prevention & Preparedness Program (see point 25.).

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
	25. Pandemics and emerging infectious diseases (PEID) Prevention & Preparedness Program	WHO; Indonesian Ministries of Health and Agriculture; FAO; DAFF and AQIS; IAQA; CSIRO—AAHL; Cooperative Housing Foundation (CHF) International; Australian Centre for International Agricultural Research (ACIAR)	2006–12	$19,258,373	Support to Indonesian Government to prevent and control H5N1 HPAI through human and animal health programs; rabies control in Bali. Animal health response ($16 million)—consolidation and expansion of PDSR to South Sulawesi; strengthening of zoonotic disease diagnosis and surveillance through development of a high-quality regional veterinary laboratory network within Indonesia, with the national veterinary research laboratory in Bogor (Balitvet) at the centre; strengthening Indonesia's internal quarantine services to contain H5N1 HPAI virus to as few provinces as possible and prevent the re-introduction of disease to provinces once control measures begin to take effect; Healthy Traditional Market Project, Village-based Biosecurity, Education and Communication Project and ACIAR biosecurity research activity in South Sulawesi; rabies control in Bali including vaccine procurement and vaccination campaign. Human health response ($3.3 million)—support to establishment of rapid response and surveillance teams at national and subnational levels; strengthening hospital, health centre and community-based surveillance; international technical assistance; established avian influenza command (coordination) post (POSKO) within Ministry of Health; purchase of Tamiflu; support for development of National Pandemic Preparedness Plan; and revitalisation of Field Epidemiology Training Program (FETP).
	26. Australia Indonesia Partnership (AIP) EID Animal Health Program	DAFF; Indonesian Directorate General of Livestock and Animal Health Services	2010–15	$21,987,487	Building on the PEID Prevention & Preparedness Program, the AIP EID Animal Health Program supported strengthening of Indonesia's veterinary services to prevent, detect and control emerging and priority infectious diseases of animals.
	27. AIP EID Human Health Program	WHO; Indonesia's Ministry of Health	2011–15	$4,810,661	Also building on the PEID Prevention & Preparedness Program, the AIP EID Human Health Program continued technical direction, oversight and management support to Indonesia's Ministry of Health in Disease Surveillance and Outbreak. Worked through Directorate General of Disease Control & Environmental Health / Surveillance & Outbreak Response Sub-Directorate / Zoonosis Sub-Directorate.

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
	28. AIP EID program	Australian Department of Agriculture and Water Resources (DAWR); Ministry of Agriculture; WHO; Ministry of Health	2015–18	$3,275,095*	Described as a One Health approach through the animal and human health components sharing the following high-level outcomes: strengthened Indonesian government systems for integrated preparedness and rapid response to animal health and public health emergencies; strengthened Indonesian government animal health information system and public health surveillance systems; and the effective use of information and enhanced institutional and individual performance in leadership, management and evidence-based decision-making. However, implementation of human and animal health components is separate.
Country programs—other					
	29. Timor-Leste Biosecurity Strengthening Project	FAO	2006–10	$5,910,339	Project goal was to contribute to rural development and livestock health and production in Timor-Leste in coordination with international efforts to prevent and control H5N1 HPAI and EIDs. Objectives included improving livestock disease surveillance and response, establishing a veterinary laboratory and drafting animal health legislation. It also aimed to improve poultry and pig health and husbandry at the household level.
	30. Timor-Leste Village Poultry Health and Biosecurity Program	DAWR; Timor-Leste Ministry of Agriculture and Fisheries; University of Sydney Veterinary School	2014–16	$1,800,000 Subtotal $7,710,339	Objective was to demonstrate effective poultry management strategies in a small number of pilot villages in Timor-Leste, with a focus on Newcastle disease. Useful techniques are communicated to other villages using a targeted extension program. Program intended to demonstrate benefits of better biosecurity on poultry production and food supply and to support more effective disease surveillance systems. No DFAT quality reporting as DAWR project and investment was less than $3 million.
	31. Joint UN / Government of Vietnam Avian Influenza Program Phase II	UNICEF; UNDP WHO; FAO; Government of Vietnam Ministries of Health and Agriculture	2006–10	$3,942,049	Provided a platform for coordination of Vietnamese and international agencies supporting implementation of Vietnam's Integrated Operational Program for Avian and Human Influenza 2006–10. Activities supported control of H5N1 HPAI in domestic poultry and enhanced overall national and local capacity to detect and respond to outbreaks of zoonotic and other diseases in animals; strengthened national and local capacity to prepare for, respond to and recover from public health emergencies caused by infectious diseases such as H5N1 HPAI; and increased public awareness generally and within specific population groups on critical H5N1 HPAI–related risk factors.
	32. PNG EID Program:	PNG National Department of Health (NDoH);	2006–10	$2,609,531	Avian Influenza Enhanced Reporting & Surveillance Project—aimed to strengthen the ability of PNG to detect and report on an incursion of H5N1 HPAI into the Indonesian border areas of Sandaun and Western Provinces.

* Total funding commitment for the current AIP EID program is $9.9 million to 30/6/2018, with expenditure to end of 2015 shown above.

Human and/or animal health	Investment name	Implementing partner(s)	Funding period (for Australia)	Total AUD funding	Program description
 	• PNG Avian Influenza Enhanced Reporting & Surveillance Project • PNG–Australia Quarantine Twinning Scheme	AQIS; PNG National Agriculture & Quarantine Authority (NAQIA)			PNG–Australia Quarantine Twinning Scheme—assisted PNG to improve quarantine standards, and to build capacity for the prevention of incursions and the early detection and control of exotic pests and diseases, by strengthening the technical, managerial, strategic and procedural capabilities of NAQIA and strengthen strategic technical cooperation between NAQIA and AQIS. Independent completion report found improvements on the technical side more than institutional. Quality reporting was done, despite the investment being less than $3 million.
	33. WHO Technical Support Health Sector in PNG	WHO; PNG NDoH	2006–09	$901,267 Subtotal $3,510,798	Technical assistance to PNG NDoH to develop disease surveillance and outbreak response capacity. Total funding for initiative was $3.6 million with one quarter estimated for EID surveillance and response.
 	34. Prevention & Control of Avian and Human Pandemic Influenza in Myanmar Joint FAO/WHO Avian Influenza Project Phase 2	FAO; WHO	2009–12	$2,000,000	Support to WHO and FAO for the prevention and control of avian and human pandemic influenza in Myanmar. Australia's contribution supported planning, surveillance, outbreak investigation, rapid response and containment; diagnostic and operational support; case management and infection control within the Myanmar health system; functional strategy analysis; and project management.
				$193,787,823*	Total funding excludes funding provided for research with exception of the $1.7 million EcoHealth research capacity building investment.

* Total includes $250,000 for Facilitating Regional Advancement of the Global Health Security Agenda (2015–17) funded through the Australian Department of Health and implemented with the APEC Health Working Group. The United States and Vietnam are co-sponsors of the project, which is being implemented in Vietnam.

ANNEX 2: DATA COLLECTION METHODS AND CATEGORIES OF STAKEHOLDERS INTERVIEWED

Data collection method	Stakeholders/data consulted
Scoping interviews	ODE Independent Evaluation Committee; DFAT (Health Policy Branch / Development Policy Division; Pacific Division)
Canberra—interviews	DFAT (Health Policy Branch; World Bank Group, Banks & Finance Branch; Health & Education Funds Section; Gender Equity Branch; Pacific Division); DAWR; Department of Health; ACIAR, independent M&E consultant to WHO
Fieldwork—Fiji	Australian High Commission; Mataika House / Pacific Laboratory Network; US CDC (by phone); Fiji School of Medicine; SPC; National Pharmaceutical and Bio-Warehouse; WHO
Fieldwork—Solomon Islands	Australian High Commission; Ministry of Health & Medical Services (Surveillance, Epidemiology & Response Unit; National Director of Nursing; National Vector-Borne Disease Control Program; Health Promotion Unit); National Referral Hospital; Mataniko Central Zone Clinic; Good Samaritan Hospital; Ministry of Agriculture & Livestock
Telephone interviews	Previous AusAID/DFAT health advisers for Indonesia and Mekong; previous FHI360 staff; WHO Western Pacific Regional Office; WHO South-East Asia Regional Office
Other interviews	WHO Representative, PNG; Senior Health Specialist, Health Nutrition & Population, World Bank Sydney Office
Fieldwork—Bangkok	Australia's ASEAN Mission Sub-Regional Office / Australian Embassy; World Bank Regional Office; OIE Sub-Regional Representation Office; FMD National Coordinators for Lao PDR, Indonesia, Myanmar, Thailand, Vietnam, Malaysia attending SEACFMD National Coordinators Meeting; FAO Regional Office; UNICEF East Asia & Pacific Regional Office; WHO; Ministry of Health; Health Systems Research Institute; SEAMEO Tropical Medicine Network; USAID Regional Office; US CDC
Fieldwork—Cambodia	Australian Embassy; Ministry of Health (Department of Disease Control); Ministry of Agriculture, Forestry & Fisheries (Department of Animal Health and Production; National Veterinary Research Institute); OIE Sub-Regional Representation staff; Faculty of Veterinary Medicine / Royal University of Agriculture; FHI360; CARE Cambodia; USAID; FAO; European Union; Pasteur Institute; US CDC; World Bank; WHO Cambodia office; farmers and animal health workers in Steung village, O'Saray commune, Tramkok district, Takeo province
Fieldwork—Indonesia	**Animal health** Australian Embassy; ACIAR; Ministry of Agriculture (Directorate of Animal Health; Biosecurity Sub-Directorate; Zoonoses Sub-Directorate; AIP EID team); DAWR; Provincial Livestock & Animal Health Office, Makassar; Disease Investigation Centre, Maros, South Sulawesi; Australian Consul General, Makassar; Dinas Kabupaten / Sinjai District Livestock Office, South Sulawesi; farmers in Palae Village, North Sinjai Subdistrict; Indonesian Agricultural Quarantine Agency; Faculty of Veterinary Medicine, Bogor Agricultural University; former CHF International staff; FAO Emergency Centre for Transboundary Animal Diseases; NGO CIVAS **Human health** Ministry of Health (Surveillance & Health Quarantine; Transmitted Diseases Control; Acute Respiratory Infection Sub-Division; Vector-Borne Disease Control); National Reference Laboratory; FETP Secretariat; WHO; ASEAN; USAID; US CDC; Provincial Health Office, Yogyakarta; Boyolali District Health Office, Yogyakarta; Public Health Laboratory, Yogyakarta; University Gadjah Mada; Infectious Disease Hospital, Sulianti Suroso, North Jakarta; Army Hospital, Central Jakarta; Jakarta Provincial Health Office

Data collection method	Stakeholders/data consulted
Secondary data	All QAIs/AQCs, progress reviews, independent completion reports, select design documents Other: Other donor reviews (models in existence, research and evaluation studies undertaken), independent research on health systems strengthening

ANNEX 3: FINAL OR MOST RECENT AID QUALITY CHECK (AQC) RATINGS*

Short title		Relevance	Effectiveness	Efficiency	Monitoring and evaluation	Sustain-ability	Gender equality
Country investments							
Asia							
ING131	Communicable Disease Program—Indonesia		5	5	5	3	
INH024	PEID Preparedness Program—Indonesia	5	5	5	4	4	4
INJ509	AIP EID Program Animal Health	6	5	5	6	5	3
INJ895	AIP EID Program Human Health	5	5	5	4	5	3
INL808	AIP EID Joint Program	5	4	5	5	5	3
INH054	Timor-Leste Biosecurity Strengthening Project	4	4	3	3	4	2
ING949	Vietnam UN Joint Program	4	5	4	4	3	3
		Median = 5 (range 4–6)	**Median = 5 (range 4–5)**	**Median = 5 (range 3–5)**	**Median = 4 (range 3–6)**	**Median = 4 (range 3–5)**	**Median = 3 (range 2–4)**
Pacific							
ING684	WHO PNG Technical support		4	5	5	4	
ING837	PNG EID program		3	5	3	3	
			Median = 3.5 (range 3–4)	**Median = 5**	**Median = 4 (range 3–5)**	**Median = 3.5 (range 3–4)**	
Regional investments							
Asia							
INC991	SEAFMD		5	4	2	3	
INI500	SEACFMD	4	5	5	4	3	2
INF526	SPS program		4	4	4	4	
ING364	CARE Program	5	4	4	5	3	5
ING786	ASEAN+3 EID Program	2	2	3	2	1	3
ING877	APEC EID Program	3	1	2	2	2	2
INJ703	STANDZ	4	5	4	4	4	5
INJ704	PREVENT	4	3	4	4	3	4
		Median = 4 (range 2–5)	**Median = 4 (range 1–5)**	**Median = 4 (range 2–5)**	**Median = 4 (range 2–5)**	**Median = 3 (range 1–4)**	**Median = 3.5 (range 2–5)**

* Final AQCs for completed initiatives and most recent AQCs for ongoing initiatives.

Short title		Relevance	Effectiveness	Efficiency	Monitoring and evaluation	Sustain-ability	Gender equality
Pacific							
ING365	PRIPP	5	4	4	4	4	2
Asia and Pacific							
INH191	APSED Phase 1	6	5	4	3	4	3
INJ680	APSED Phase 2	6	4	4	4	4	4
		Median = 6	**Median = 4.5 (range 4–5)**	**Median = 4**	**Median = 3.5 (range 3–4)**	**Median = 4**	**Median = 3.5 (range 3–4)**
Global investments							
ING579	World Bank AHI Trust Fund	5	4	4	4	4	3
ING878	HES EID activity		5	5	4	5	
		Median = 5	**Median = 4.5 (range 4–5)**	**Median = 4.5 (range 4–5)**	**Median = 4**	**Median = 4.5 (range 4–5)**	**Median = 3**

Rating key: 6 = Very good; satisfies criteria in all or almost all areas; 5 = Good; satisfies criteria in most areas; 4 = Adequate; on balance, satisfies criteria; does not fail in any major area; 3 = Less than adequate; on balance, does not satisfy criteri a but does not fail in any major area; 2 = Poor; does not satisfy criteria in major areas; 1 = Very poor; does not satisfy criteria in many major areas.

Note: The tool used for the internal monitoring of Australian aid quality was amended in 2014. The new tool, the Aid Quality Checks (AQC), differed from the previous Quality at Implementation (QAI) reporting in that (i) the rating scale terminology was slightly amended and (ii) relevance and gender equity were added. Rating scores presented in this table are those reported in the most recent AQC/QAI.

			Key	**high (5,6)**	**adequate (4)**	**low (1,2,3)**	

ANNEX 4: PARTNER MODALITIES—EFFICIENCY IN RESPECT OF IMPLEMENTATION FOR STRONGER SYSTEMS

Modality	Main lessons for efficiency	Key issues and evidence
Trust funds and facilities	Harmonisation of implementation arrangements with other partner systems takes time to get right Essential to develop early understanding about differences in administrative procedures	**Joint United Nations/Government of Vietnam Avian Influenza Program*** • Initial low efficiency rating due to early delays in project implementation, issues with government approval, and UN procedures related to national execution and the work plans having to be approved a second time. Efficiency rating improved later although long delays in approval of work plans remained. • Use of Vietnam health system's existing operational mechanisms and human resources highly efficient as it did not require significant additional resources. • Low maintenance project for AusAID, possibly indicative of 'efficiency' in terms of management time.
	World Bank Trust Fund for Avian Influenza and Avian and Human Influenza (AHI) Facility showed concrete evidence of donor coordination at international level However, it is not a good modality for an emergency response as funds could not be accessed fast enough	**World Bank Multi-Donor Trust Fund (modality for funding the AHI Facility)** • Challenging to determine efficiency of World Bank Trust Fund overall—the independent completion reports (ICRs) for projects funded through AHI grants look at efficiency of individual projects but not the modality as a whole. • From the individual ICRs for implementation of projects funded by grants under the AHI Facility, it appeared that the World Bank projects presented variable complexities for governments or ministries to put in place. For some projects, there was little difficulty because the government already had mechanisms in place to deal with the complexities of managing a World Bank finance agreement, while others had a lot of difficulty in being able to align the government administration processes with the requirements of the World Bank, or with the project design. • Unclear whether the financing agreements were a combination of loan and grant, and this structure made it difficult for governments to agree to, because more than one ministry needed to sign off approvals. • For some of the projects, technical work conducted under the grant was to be delivered by a third party such as the Food and Agriculture Organization of the United Nations (FAO). Arranging such a subcontract was time consuming, again because of the constraints in aligning the administrative processes, in particular the financial reporting. In fact, the FAO was not able to receive funds directly from the World Bank for project implementation because of an unresolved incompatibility in financial reporting systems and norms. The midterm review (2009) of the Facility found the World Bank was not an effective partner for an emergency situation as it could not respond quickly or flexibly enough—the ICR for the Indonesia grant (2011) concurs. The final AusAID quality report (2011) notes that at the end of the fourth implementation year (75 per cent of overall implementation time), overall AHI Facility disbursement was 50.8 per cent. This was an improvement from the time of the midterm review (2009) when disbursement was just 29 per cent. Given the earlier period coincided with the emergency period, this was very low. Further, by March 2010, 18 projects closed—reasons for closure included lack of partner government commitment, delays in parliamentary approval of co-financed grants and delays in recruitment of project staff.

* In Vietnam, in the early part of the emergency response, there was good coordination in the UN system and a number of donor countries agreed to finance a UN trust fund that was used to establish the Joint United Nations/Government of Vietnam Avian Influenza Program with the Vietnamese Government. The second phase of this program commenced in October 2006, to which Australia contributed $3.9 million.

Technical agencies	Both FAO and the World Health Organization (WHO) were considered good partners for capacity development in technical areas, but questions were raised about relative advantage in broader systems development World Organisation for Animal Health (OIE) was regarded as efficient for building stronger systems in key areas of regional programs—noting that the Stop Transboundary Animal Disease & Zoonoses (STANDZ) success comes after decades of support to South-East Asia Foot and Mouth Disease initiative (SEAFMD), later SEACFMD (with the addition of China) To address system constraints, there may be a need for close partnerships between the technical agencies and agencies with other capacities (e.g. logistics, management, budgeting) and with in-depth knowledge of country systems Technical agencies tend to wear 'multiple hats' in EID work—standard setters, standard monitors, direct implementing partners, and sometimes being funded for specific capacity development work, or specific technical positions. It can be difficult to disentangle the efficiency and effectiveness of these different roles—they are closely linked to the overall capacity, functioning and efficiency of the organisation	**FAO** • Primary mandate of FAO is as a technical agency. • In-country offices and established relationships were an asset to efficiency and country capacity building. • Has an established positive reputation for capacity building in technical areas—e.g. in Indonesia, on some of the vertical inputs related to H5N1 highly pathogenic avian influenza virus (HPAI) or emerging infectious diseases (EID) surveillance, FAO performed well. • Was contractor/subcontractor to various World Bank projects; for these evaluations noted lengthy processes in finalising agreements with governments. • In Indonesia, Australia funded some positions on the ground through FAO and Commonwealth Scientific and Industrial Research Organisation (CSIRO) and this seems to have been an effective modality at a time when technical inputs were required. • Further investigation of the role of FAO as an implementing agency for DFAT might be in order—it was not possible for this evaluation to drill down to the level required. Optimal role of post in supervision of investments implemented by technical agencies may need clarification. **OIE** • Overhead rates indicate cost efficiency relative to contractor models (5 per cent overhead for managing STANDZ funds, compared with ~20 per cent); Aid Quality Checks (AQCs) rated adequate or good efficiency for all three OIE investments. • SEACFMD project and STANDZ foot and mouth disease (FMD) component regarded as good value for money; Strengthening Veterinary Services project overly ambitious and later not considered sustainable. • ODE qualitative assessment was that the OIE Sub-Regional Representation Office in Bangkok managed to achieve a lot with a small budget and modest staffing, punching above its weight on international stage. **WHO** • Indonesia bilateral: the model adopted by the Australia Indonesia Partnership (AIP) EID human health program in Indonesia—in which WHO, as Australia's subcontracted partner, was in effect a broker, seeking and channelling funds to support Indonesian Government work plans—was generally considered efficient. This was because WHO was also engaged by other development partners to work in the same general area and had strong technical expertise and a longstanding presence and close relationships in Indonesia. • Element of inefficiency in the model was that senior technical people were distracted by the need to source donor funds (identified in the 2013 midterm review). • Technical positions: The earlier funding of a WHO epidemiologist long term in Indonesia was a key position, helping support revitalisation of the Field Epidemiology Training Program (FETP). Funding an epidemiologist position in Papua New Guinea's (PNG) National Department of Health was also considered useful at the time. • Asia Pacific Strategy for Emerging Diseases (APSED): APSED was a good way to harmonise development partner support for WHO's EID work. It linked a conceptual framework for EID capacity building with an assessment of capacity gaps, and then had funding to help WHO work with countries to address those gaps. This provided for greater efficiency in delivery of technical assistance. WHO's technical expertise in EID is an advantage in terms of efficient execution of technical support.

		• Efficiency of APSED-supported activities at country level (harmonisation of implementation) may have been challenged by the siloed nature of WHO—e.g. in the Pacific, WHO is the only health agency with a presence in most countries and is generally co-located with ministries of health, although EID support is primarily delivered from Suva. In Indonesia, there are few areas of connection between the WHO support to health systems and WHO's role in EID. • APSED as a bi-regional strategy may have been overly ambitious—not much uptake in WHO's South-East Asian Region or in the Pacific island countries and territories (PICTs); some PICTs felt APSED focused too much on expensive meetings, and not enough on country support. • There is a risk that having APSED, International Health Regulations and now Global Health Security Agenda approaches to EID capacity building in the mix will place heavy administrative burden on ministries, particularly those from the smaller states, and detract attention from other high priority but more routine functions.
Non-government organisations (NGOs)	NGOs may be partner of choice for community engagement in animal health area, but need to be well linked in with government systems at all levels to ensure relevance to longer-term system strengthening	Two NGOs were engaged directly by AusAID—CARE Australia for the Community-Based Avian Influenza Risk Reduction Program in the Mekong region and the Cooperative Housing Foundation International to undertake poultry market restructuring activities in Makassar, South Sulawesi. Both were considered adequate in terms of efficiency, particularly in the community engagement aspect of their mandate—efficiency rating in the final AQC for CARE was 4. Regional management structure was seen to compromise efficiency earlier in the project. The CARE program operated more as a multi-country program than a regional program. Both NGOs were active on the ground in-country and so were able to quickly swing in to action. Isolation of NGOs from the government system resulted in relevance and uptake of pilots not being assured.
Delegated cooperation agreement with USAID—NGO implementer	Strength is partner harmonisation Modality introduces an additional 'step of removal' between the research group and Australian policy makers—this likely was a barrier to achieving intended outcome of better use of evidence in Australia's pandemics and emerging infectious diseases (PEID) response Similarly relative 'distance' between research group and country governments may have constrained uptake/buy-in at country level in some countries	**USAID** • The design document considered the delegated cooperation agreement with USAID to represent good value for money—few start-up costs as Australian funds were used to expand existing activities to broader geographic reach. • A disadvantage of this modality (from the implementers' perspective) was the relative lack of flexibility to adapt their research to respond to changing context and priorities of partner governments (and so be more likely to be taken up). They had hoped that Australia's funding would bring more flexibility, but this was not the result. • Lack of visibility of Australia's investment.* • Application of findings to policy and practice unclear—seemed a bit disconnected from informing Australia's PEID investment, and without ongoing dialogue between Australia and the research it is difficult to see how this could be achieved.

* Few interviewees realised that Australia had made this contribution, and a scan of the publications produced using Australian money found very limited evidence of acknowledgement of Australia's support.

Regionally led institutions	Investments made through regional member-driven associations provided a platform to support self-determination and strengthen country leadership in issues pertinent to the settings. Such alignment affects efficiency through strengthened regional significance, country ownership and governance. However, senior government buy-in, clear and meaningful program objectives, strong program management, robust internal and external reporting, and flexible implementation models are required	**Secretariat of the Pacific Community (SPC)** • In terms of efficiency, the performance of the Pacific Regional Influenza Pandemic Preparedness Program (PRIPP) was seen as inadequate by mid- and end-of-project independent reviewers. Lack of leadership and strategic direction, limited internal reporting and weak program decision-making and management confounded by operating in a difficult implementation environment were cited as reasons for this. An emphasis on expensive and somewhat sporadic travel to PICTs for training and workshops was seen as not cost-effective and is at odds with a system strengthening agenda. • Despite this, PRIPP had some lasting impacts, including the foundation for national PEID preparedness plans in most PICTs, the groundwork for the currently 'reinvigorated' Data for Decision Making course and ongoing animal health paraveterinary training. **Association of Southeast Asian Nations (ASEAN)** Taking a longer-term view, the ASEAN Plus Three EID Program (ASEAN+3 EID) was highly efficient in that it established foundational elements of a regional system for EID preparedness and response that has continued to be built on, following cessation of Australia's support. The approach used fostered country ownership. While ASEAN+3 EID failed to link projects into a coherent regional mechanism, this was perhaps unrealistic in the three years (plus no-cost extension) of support, and the low starting point. Some of the individual projects supported by ASEAN+3 EID, which have continued to be used, can be regarded as highly efficient as they were developed by lead countries, for wider use in the region—spreading the benefits. **Asia Pacific Economic Cooperation (APEC)** Australia's investment in the APEC Health Security sub-fund, while relevant in terms of the fund's alignment with broad Australia PEID and related regional economic security strengthening initiatives, was inefficiently implemented. Funds were used to support a large number of unlinked, small, one-off meetings and workshops, a number of which appear to duplicate the work of the ASEAN Secretariat and to a lesser extent WHO. There did not seem to be much demand from countries who were supposed to be supported, which may relate to a general lack of ownership by these countries and the existence of multiple other sources of funding for support at the time—some of which was perhaps better tied in to the respective line ministries and/or easier to access. With the caveat that documentation about this initiative is very poor, there is no evidence that APEC attempted to collaborate with ASEAN or WHO in the delivery of the meetings or workshops.
Australian research and technical collaborations	Research collaboration was an efficient way to bring Australian expertise to bear on issues affecting animal health in a near neighbour—flexibility was key Development work may be a new experience for some research and technical organisations, and teething problems should be expected	**Australian Centre for International Agricultural Research (ACIAR)** • The project Veterinary Services in a Decentralised Indonesia was found to be efficient as a capacity building contribution to animal health services. • Efficiency was enhanced by the flexibility of the modality—e.g. the project was used effectively as a conduit to deliver emergency rabies vaccine to assist the control program in Bali Province. **CSIRO—Australian Animal Health Laboratory (AAHL)** • Technically sound program to strengthen the laboratory service in Indonesia, where the inputs were well regarded. • AAHL was motivated to engage because of the opportunity to work at the coalface of a disease problem and benefited through honed skills as well as learning about the diagnostic capability of a near neighbour and establishing linkages. • In the early days of the CSIRO AAHL involvement, there was criticism of the project management, the timeliness of input, and of reporting. This seemed to relate to a lack of capacity at the laboratory to manage the inputs properly, and perhaps overcommitment of the staff working on the project. Working in a development modality is not the core business of the national research organisation. • Efficient way to bring Australian technical expertise to strengthen the laboratory service in the EID arena.

Australian government partnerships	Slow start-up can be expected—efficiency increases over time Partnership has provided good opportunities for use of Australian expertise	**Department of Agriculture, Fisheries and Forestry (DAFF) including Australian Quarantine and Inspection Service (AQIS)** • Under the Indonesia PEID Prevention and Preparedness Program (2006–12), the former DAFF (now the Department of Agriculture and Water Resources [DAWR]) implemented a Quarantine Strengthening Project through AQIS as part of the early H5N1 HPAI project portfolio. A third-party contractor delivered the project in-country and this assisted implementation considerably. It seemed be delivered on time although there were questions about the likelihood of uptake of the technical content of the program and the contribution it would make to H5N1 HPAI control.* • DAFF/DAWR—initial implementation of the first phase of AIP EID animal health program (2010–15) implemented by DAFF/DAWR was not very efficient, but once established it proceeded very efficiently and was well linked to the national system. It is well branded as an Australian project and it provides opportunities to use Australian technical and management expertise. • The early stage of the DAWR management of the current AIP EID program (2015–18) indicated some issues with the whole-of-government approach and the degree of understanding that the government partner had of DFAT's implementation and monitoring requirements. There was a question about the alignment of management procedures of DAWR with those required to implement an international project. However, it must also be noted that the arrangement did allow for some flexibility and it was possible to adjust direction or focus in response to need, which enhanced efficiency. By all accounts, once the DAWR management adapted to the situation the approach worked well. • AQIS also delivered projects in PNG under the PNG EID–PEID Program (2006–10). Technical outcomes were achieved, but the independent completion report concluded that organisational issues were key constraints to better effectiveness of the service, and AQIS may not have been the best partner for capacity development in this area.

* Very limited information is available on this project.