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EXECUTIVE SUMMARY

From Reacting to Preventing Pandemics

Building Animal Health
and Wildlife Systems
for One Health in
East Asia and Pacific



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Executive Summary

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Foreword

The ongoing COVID-19 pandemic posed an unprecedented challenge to public health, food systems, and economic growth globally, leading to the loss of several millions of lives and tens of millions of people at risk of falling into extreme poverty threatening to reverse decades of development progress. The world is witnessing an increasing trend of public health threats such as emerging infectious diseases (EIDs) and zoonoses and antimicrobial resistance, many due to novel pathogens that spillover from wildlife to animals and humans with the potential to become pandemics. The East Asia and Pacific region is a global hot spot for disease emergence and is disproportionately vulnerable to economic losses due to pandemics. Furthermore, frequent occurrence of transboundary animal diseases (TADs) is confronting the agri-food systems, trade, and food security. This is emblematic of weaknesses in One Health systems to predict, prevent, and detect disease outbreaks before they reach regional or global proportions, which calls for a coordinated multi-sectoral response for transitioning *'from reacting to preventing pandemics'* at the source.

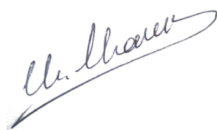
COVID-19 may not be the last pandemic. The reduction of pandemic risk by early actions to prevent EIDs is a global public good and risk management requires a whole-of-society preparedness to respond to the pandemics at the country, regional, and global levels. A team comprising experts from the World Bank and FAO and leading veterinary, wildlife, and One Health experts from around the world have worked together to analyze the drivers of zoonoses and EIDs and assessed the management of animal and wildlife systems, using risk-based approaches, for their ability to identify and respond to emerging threats and protect the health, agricultural production, and ecosystem services. The report brings together the latest global knowledge and evidence for providing a road map along with critical and actionable solutions, policy improvements, institutional strengthening, and investments.

Finally, this report complements the findings of a related report *'Reducing Pandemic Risks at Source - Wildlife, Environment and One Health Foundations in East and South Asia'*, jointly published by the World Bank and FAO around the same time. The second report analyzed the risks of EIDs of wildlife origin and proposes how to reduce emerging pandemic threats at their source and provided recommendations for strengthening systems to prevent, detect, and manage EID outbreaks caused by wildlife trade, wildlife farming, food systems, and habitat degradation. We hope these reports will foster policy dialogues among countries in East and South Asia and the Pacific, regional institutions, and the international community to strengthen the animal health and wildlife systems and the One Health operationalization. Our goal is to trigger investments in policy, institutions, and capacity building for the strengthening of One Health approaches in the region and globally.



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Abbreviations and acronyms

AMR	Antimicrobial resistance
ASF	African Swine Fever
EAP	East Asia and Pacific
EID	Emerging Infectious Disease
FETP	Field Epidemiology Training Program
FETPV	Field Epidemiology Training Program for Veterinarians
FMD	Foot-and-mouth disease
GDP	Gross domestic product
GHP	Good Hygiene Practices
HACCP	Hazard Analysis Critical Control Point
HPAI	Highly pathogenic avian influenza
JEE	Joint External Evaluation (of WHO)
LIMS	Laboratory Information System
MERS	Middle East Respiratory Syndrome
PPP	Public-private partnership
PPR	Peste des Petits Ruminants
PVS	Performance of Veterinary Services (of WOAHA)
SARS	Severe Acute Respiratory Syndrome
TAD	Transboundary Animal Disease
WHO	World Health Organization
WOAH	World Organisation for Animal Health, formerly Office International des Epizooties (OIE)

CHINA

Cattle breeding in Inner Mongolia, China

Photo credit: FAO/De Balogh





Executive summary

The reduction of pandemic risk is a quintessential global public good and risk management that requires whole-of-society to respond to the pandemics at the country, regional, and global levels. This joint World Bank-FAO report analyzes the drivers of zoonotic and emerging infectious diseases (EID) and offers strategic recommendations for preventing their spread in animals and humans using a cross-sectoral approach. Building on the latest global knowledge and evidence, practical guidance is provided for policy improvements, institutional strengthening, and investments in animal health and wildlife systems in East Asia and Pacific (EAP).¹ The report complements and deepens an associated report “Reducing Pandemic Risks at Source - Wildlife, Environment and One Health Foundations in East and South Asia” (World Bank and FAO 2022) that analyzes risks of EIDs from wildlife and the gaps in wildlife systems.

The COVID-19 pandemic has caused an unprecedented setback in the worldwide effort to end extreme poverty and reduce inequality. Reversals in development caused by the COVID-19 pandemic threaten people’s lives, jobs, and livelihoods. By April 3, 2022, the number of infected had reached 492 million, with nearly 6.1 million deaths. Recent estimates by the World Bank indicate global gross domestic product (GDP) declining by 5 percent. In EAP, the COVID-19 shock is expected to have increased the number of people living in poverty by 32 million in 2021. The number of poor in developing EAP countries is, however, expected to decline to its 2019 level in 2022. The pandemic has triggered a two-track economic recovery, as low-income countries face high inflation, too few jobs, more food insecurity, and the high cost of adapting to climate change. This is worsening inequality; reversing gains in education, health, nutrition, and gender equality; fueling a debt crisis; and affecting all aspects of commercial activity and trade.

Infectious disease outbreaks are occurring more frequently in the EAP region, including those transmissible between humans and animals

Epidemic-prone infectious diseases have been occurring more frequently and are recognized as pandemic threats. These include diseases transmissible between animals and humans, such as Ebola, Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), and the COVID-19 in humans, and the epidemic of animal diseases such as highly pathogenic influenza viruses, African Swine Fever (ASF), and Peste des Petits Ruminants Virus (PPR). The examples of human infections have demonstrated that once either secondary epidemiological cycles are established or pathogens adapt fully to the human host, fast-spreading outbreaks occur and are incredibly difficult to manage and have a dramatic impact on human health and well-being.

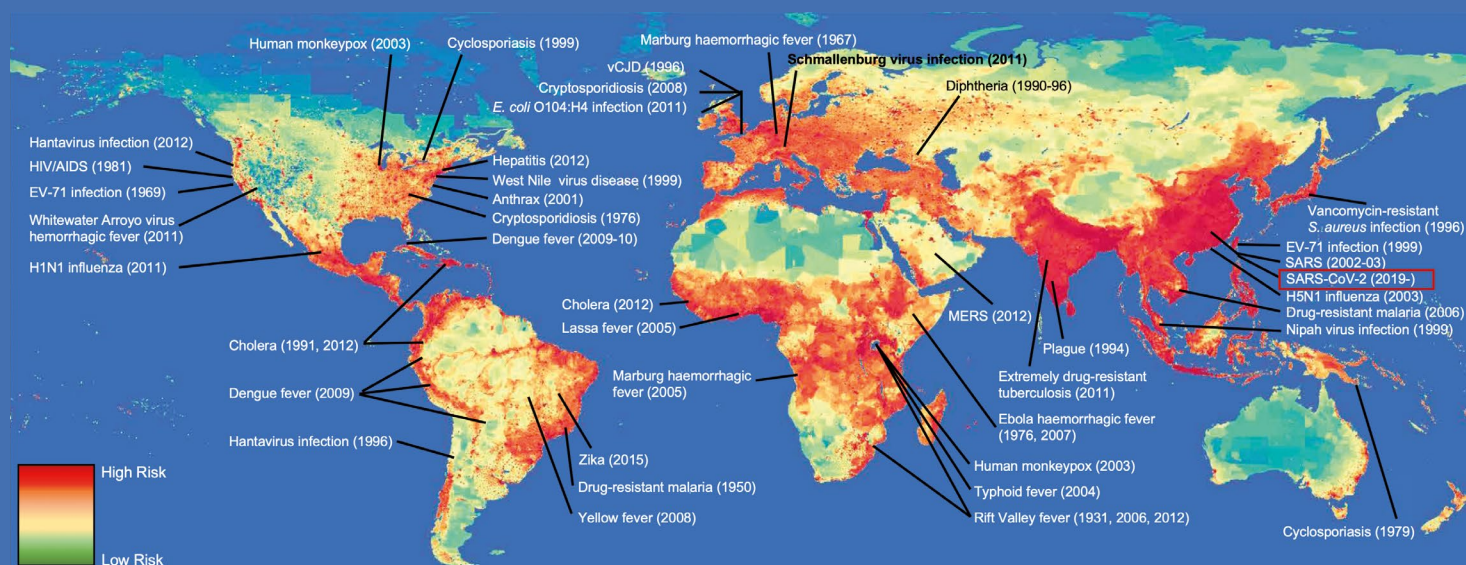


Figure E.1: Global hot spots for emerging zoonotic diseases Source: Authors, based on Lipkin 2013.

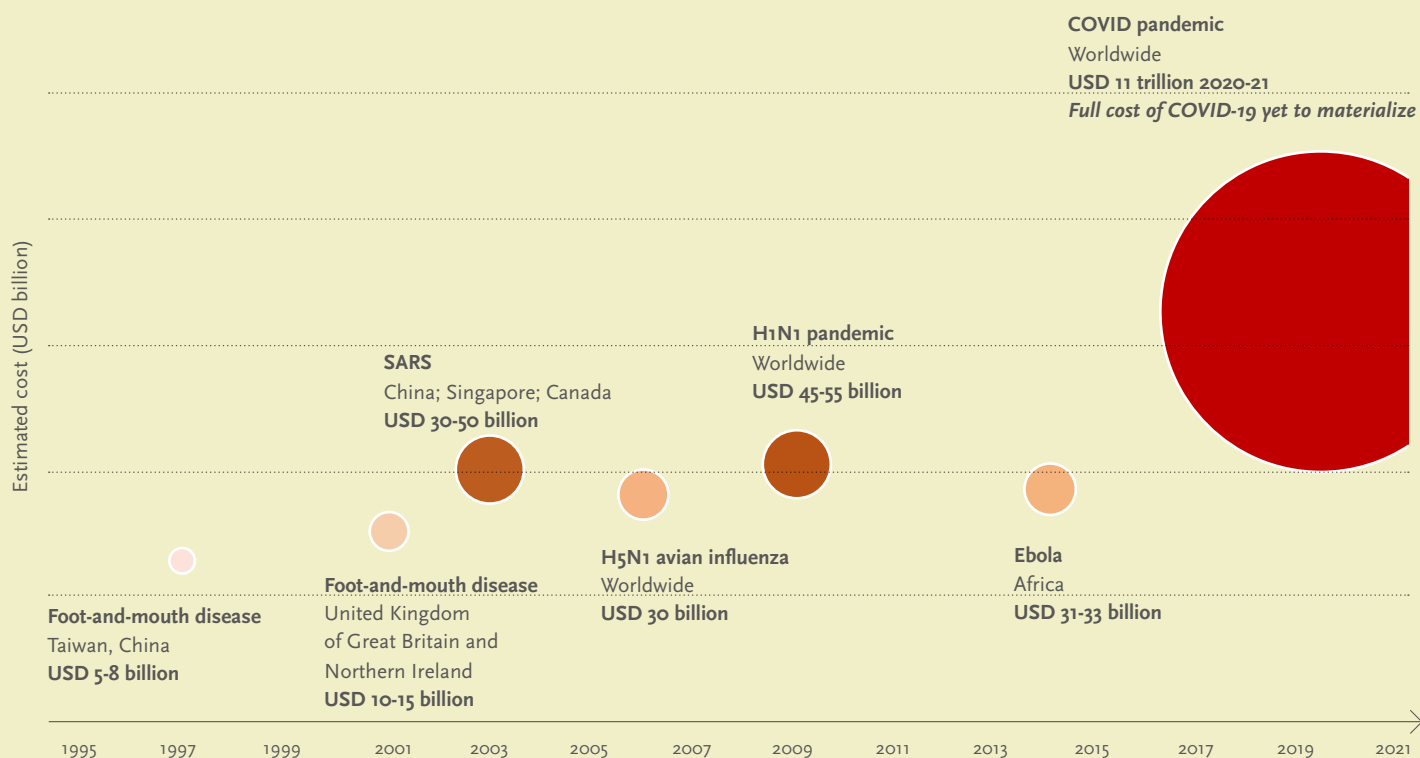


Figure E.2: The rising global costs of animal disease and human health epidemics 1995-2021 Source: Bio-era, adapted by the authors.

The EAP region is one of the global hotspots for emerging infectious zoonotic diseases (Figure E.1). The region is considered one of the most vulnerable to disease emergence, incursions, and spread. SARS, COVID-19, Nipah disease, and highly pathogenic avian influenza (HPAI) H5N1 and H7N9 viruses all emerged from East Asia and Southeast Asia, and research predicts that the next global pandemic is likely to arise again in this region. Multiple risk factors in the region include the large and concentrated human and livestock populations, high levels of urbanization, environmental degradation, poor livestock biosecurity and food hygiene practices, increased consumption of wildlife, extensive trade in animals (both domestic and wild), and the often close contact between animals and humans. Vector-borne diseases such as Zika, Lumpy Skin Disease, and so on have also been increasing in the region in part driven by climate change and changing vector patterns. The Pacific Island countries appear to have been free of emerging infectious diseases and major transboundary diseases, likely due to isolation and the low densities of people and animals, but they face other One Health threats such as food safety similar to other parts of the region.

Various factors have made the region a zoonotic disease hot spot: large human/animal populations, urbanization, environmental degradation, poor livestock biosecurity and inadequate hygiene

Beyond direct human health impacts, emerging infectious zoonoses (i.e., animal diseases including those with zoonotic potential that are transmissible to humans) have caused significant costs to the livestock and public health sectors, threatening economic development and resilience to disasters and ecosystem sustainability and integrity. The impact and cost of major disease outbreaks and zoonoses have increased dramatically in recent years (Figure E.2). Recent International Monetary Fund (IMF) estimates show that prolonged impact of COVID-19 into the medium term could reduce the global GDP by a cumulative of USD 5.3 trillion over the next five years, further to the estimated loss in output relative to the pre-pandemic projected path of USD 11 trillion during 2020-21. McKinsey estimates that by 2025, COVID-19 will have cost the world between USD 16 trillion and USD 35 trillion. EAP has seen the highest economic losses from epidemics of any region in the world and the costs of disease outbreaks have increased dramatically over the past decades. Moreover, the inability to effectively manage diseases such as food-borne zoonoses, emerging vector diseases, and antimicrobial resistance (AMR) due to the improper use of antibiotics in animal husbandry and poor compliance with appropriate food safety standards also have significant human and economic impacts.

The origins of epidemic-prone infectious diseases of both humans and animals need urgent attention by global health authorities using a One Health approach that is cross-sectoral coordination among the human, animal (domesticated and wild), and the environmental sectors. The current system of assessing the epidemiology and risk of epidemic-prone infectious diseases is limited by a lack of cohesion across the sectors, that is, a lack of applying a One Health approach. Collaboration and coordination are limited by mixed terminologies for emergence, and the analyses cover a wide variety of diseases (including novel pathogens from evolution or host switching, re-emerging pathogens, changing geographies of pathogens or affected communities, and variants on old or known microorganisms such as antimicrobial-resistant organisms). These result in any generalizations on emerging infectious disease and their origins being uncertain and at worst misleading.

Increasing Risks of Spillover of Emerging Pathogens

The ‘spillover’ of microorganisms between species can lead to the emergence of novel human and animal pathogens and disease syndromes. Figure E.3 shows the relative sources of spillover and zoonoses. This occurs at the interface between species, and for human diseases, it is particularly common where there are animal species (domesticated or wild) which are adapted to human domains and is now hugely amplified through large-scale animal production and trade for human use. Direct naturally transmitted infection (zoonosis) from wildlife to humans in nature is extremely rare but biodiversity plays a key role in the evolution of microorganisms and ultimately novel pathogens. Prediction of emergence is a very inexact science and precautionary principles on reducing emergence pathways to prevent spillover are urgently needed.

As a result of its rapid development and increased consumption of animal products the EAP region is at high risk of EIDs

The EAP region is at high risk of EIDs, rooted in the rapid economic development and dramatic increases in consumption of animal products. Livestock production has increased to meet rising consumer demand, and this has resulted in unprecedented ecological and socio-cultural changes, with increased damage to natural ecosystems and biodiversity. Notably, FAOSTAT¹ shows that the livestock population of cattle, horses, sheep, and goats in EAP increased from 356 million in 2010 to 420 million in 2019. Similarly, poultry also increased from 15.5 billion in 2010 to 22.2 billion in 2019. However, the pig population declined from 819 million to 712 million during the same period. There was a sharp decline of nearly 156 million pigs in 2019 alone because of the ASF outbreak. Though animal husbandry and farm biosecurity measures have improved, barriers to disease entry remain highly variable. This has led to increased opportunities for pathogens to spillover from wild animals to humans and domestic animals and has resulted in a series of epidemics of transboundary animal diseases (TADs), such as the HPAI.

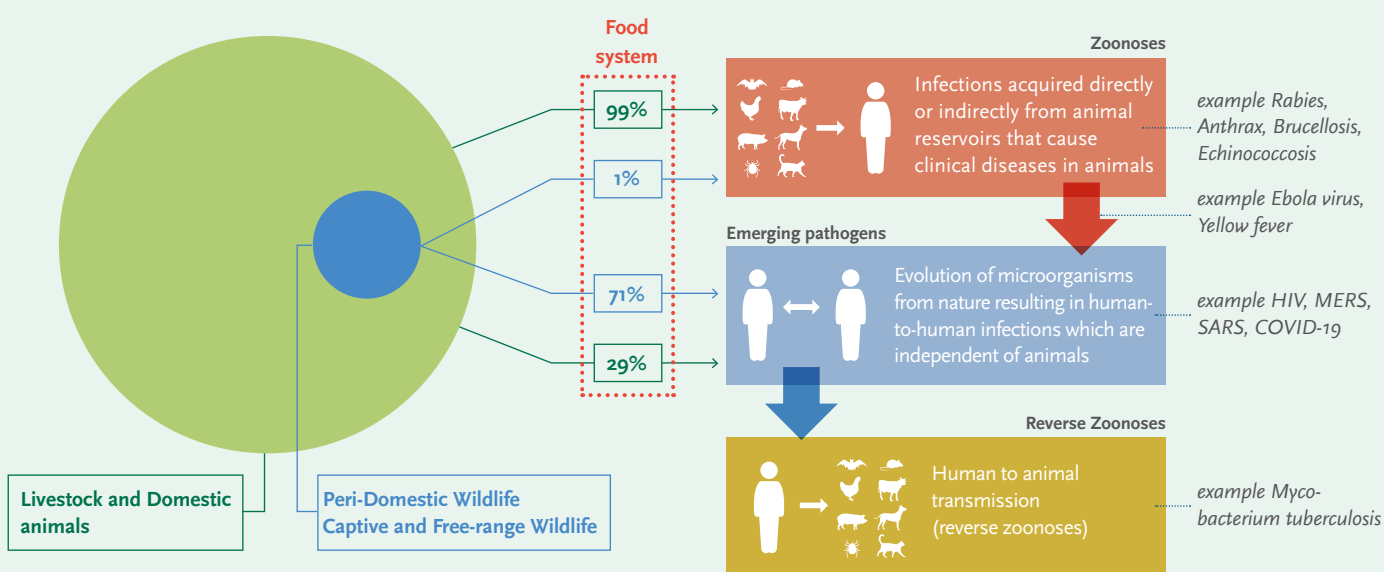


Figure E.3: Diagram showing relative sources of spillover and zoonoses Source: Haider et al. 2020, adapted by the authors.

¹ FAOSTAT provides a reference to farmgate prices but information is not always updated by countries and it provides only a single fixed price per species across the country, thus ignoring the variability by animal breed, type, sex and age, season, and locality in the country.

In addition, human health continues to be compromised by the relatively high frequency of food-borne zoonoses (e.g., salmonellosis, campylobacteriosis, listeriosis), endemic zoonotic diseases (e.g., rabies, brucellosis), and increased AMR in meat value chains, particularly in low- to middle-income countries in the region. The demand for wildlife products has also been increasing for many years resulting in increased local wildlife hunting and farming and growing global trade in the region for exotic animals/wildlife and products. Captive wildlife farming has developed into a significant industry in some countries, but with very limited if any supervision by government veterinary or wildlife authorities. Wildlife farming has become a significant industry in some countries. For example, it is estimated to be a USD 20 billion industry in China, employing 15 million people. A survey in one region of Viet Nam found that there were over 4,000 wildlife farms, farming 182 animal species. Wildlife farming in EAP includes rats, deer, foxes, bears, porcupines, civets, wild boars, and assorted birds including waterfowl.

Food systems are important transmission pathways for several zoonotic diseases and EIDs in EAP. Many emerging and reemerging hazards originate or are amplified in food systems. This can occur due to improper handling and slaughter of animals and unsanitary conditions and poor handling of animal products in production, traditional markets, and distribution systems, from livestock species, both harvested or in captivity, and from wildlife. The problem is exacerbated by poorly enforced food safety standards with lack of oversight, monitoring, and enforcement. These create an opportunity in food systems for zoonoses including those caused by viruses, such as the COVID-19, to cross-contaminate products, to be amplified and therefore pose serious risks to human and animal health.

Many zoonotic diseases are transmitted through defective food systems and exacerbated by poor or unenforced food safety standards

The complex value chains of both livestock and wildlife in EAP compromise the management of infectious diseases and food safety. With live animals and animal products often traded over long distances and by multiple actors along the value chains, live animals are often aggregated at collection points or in traditional markets with high frequency of contact between animals and between animals and humans, which increases the risk of disease transmission. Increasing demand for wildlife products, poor management of wildlife capture, farming, and trade, encroachment into wildlife habitats, and climate change all contribute to an increased risk of infection spillover in EAP.

The Pacific Island countries are particularly vulnerable to adverse impacts from animal diseases due to low levels of social and economic resilience combined with exposure to climate change and multiple natural disasters. These countries have few resources and poor resilience capacity. They are also exposed to increasing risks of waterborne, vector-borne, and food-borne diseases. Their animal health systems are very weak or absent due to limited resources, capacities, or effective programs.

One Health Approach

Because the origin and breadth of human and animal/wildlife diseases and zoonoses are complex and cut across multiple sectors, effective zoonoses and animal disease management must be risk-based and require proactive, coordinated actions through a One Health approach for effective disease risk management (Figure E.4). The One Health approach provides a framework for an integrated multi-sectoral and interdisciplinary approaches to improving the health of animals, people, and the environment. It is rooted in a risk-based approach that considers points of interactions between humans, livestock, and environment including wildlife and in the value chains for animal products.

To effectively manage the risks of spillover between species, critical control points must be identified which will guide the planning and coordination of subsequent effective control actions with control measures being commensurate with the risk assessed. A risk-based approach identifies the threats (spillovers and disease incursions) and considers the likelihood of their occurrence (probability) and the likely consequences (impacts). This requires systems for identifying and assessing the actual risks, collecting and analyzing relevant information, and converting findings into targeted policy, programs, and response.

The COVID-19 pandemic has demonstrated that once the spread of the disease among humans is established, it can be difficult to control and can have an escalating impact on human health and on national economies (Figure E.5). It is therefore apparent that the reactive model of outbreak control

needs to be changed, with greater emphasis shifted to the early stages of the transmission pathway, that is, prevention at source before these highly infectious diseases are transmitted from animals to humans. Early action limits the rising costs of control and prevents broader impact globally. World Bank economic analysis shows that investments in One Health systems for prevention and control of zoonotic diseases offers extraordinarily high expected benefits, with high rates of return far above those of other public and private investments. Every year, an investment of USD 3.4 billion would produce an expected benefit of USD 30 billion for the international community. The annual expected rate of return would be between 44 percent and 71 percent (corresponding to, respectively, half or all mild pandemics being prevented). The increasing threat of emerging pathogens and pandemic infectious diseases has been brought to the attention of authorities repeatedly, but the necessary mechanisms to proactively reduce the risk of spillover and prevent animal infections or diseases from escalating into future animal or human pandemics have not been adequately established. Greater emphasis must be placed on increasing mechanisms for prevention, early detection, and effective response and resilience to disasters.

Early detection of EIDs depends on timely reporting of disease outbreaks but producers and field staff may not see the benefits of this

Surveillance and the early detection of EIDs and novel pathogens with unknown disease epidemiology and transmission routes rely largely on passive surveillance, that is, systems for timely reporting of unusual disease outbreaks and unexpected health events. Inadequacies in surveillance and information failures are exacerbated by the lack of perceived benefits to producers and field staff. Policy must calibrate producer responsibility and market-based incentives for reporting disease outbreaks with catastrophic financing instruments to compensate for any economic losses. Upgrading scientific investigation infrastructure and capabilities is an important prerequisite for lowering the cost of action at source. Recent research by McKinsey shows that smart investments of as little as USD 5 per person per year globally can help ensure far better preparation for future pandemics, making a strong business case for strengthening the world's pandemic response capacity at the global, national, and local levels.

Assessing EAP's Readiness to Avert Spillover and Disease Spread

Many countries have updated their legislation related to animal health, zoonoses, and food safety, but there are still considerable gaps in their effectiveness due to under-investment in animal and public health for the control of zoonoses and the lack of risk-based approaches to animal disease management. Animal health and food safety policies for the livestock value chain are generally inadequate or absent. In effort to address the growing threat of AMR, most countries in the EAP region have developed national action plans but implementation is weak. Moreover, the science-policy interface required for the development of effective policies and programs to reduce the risk from EIDs and to promote One Health is generally weak across the region. Furthermore, data on, e.g., disease risks, environmental risk factors, and populations at risk, are not routinely being shared between human health, animal health, and the environmental health sectors.

A regional assessment found that currently animal health systems in the EAP region have limited ability to reduce the threat to human health and well-being, because there is insufficient capacity and commitment to implementing and institutionalizing the One Health approaches required.² Figure E.6 shows that country risks (using INFORM Epidemic Risk) and their capacity (as indicated by the size of the bubbles) to prevent, detect, and respond to EIDs, zoonoses, and food-borne infections vary markedly and correlate closely with a country's GDP per capita.

All countries in the region have at least basic capacity to detect and respond to EIDs and emerging issues but capacity to prevent disease is very limited. Public health emergency of international concern has been declared at least five times globally since the International Health Regulations were created in 2005. Nevertheless, preparedness has been undervalued, underfunded, and largely treated as optional in several countries. There is also little development of policies and programs to support recovery that could reduce the impacts on food security, livelihoods, and economic development. Instead, across the region, the emphasis has been on outbreak detection and response. A strategic approach to threat identification and risk management is rarely undertaken.

² The assessment was conducted to study the systems, institutional capacity, and performance of the two pillars of animal health services (both domestic and wildlife) in EAP, by using the available WOAHP Performance of Veterinary Services (PVS), WHO Joint External Evaluation (JEE), and the 'State Party Self-Assessment Annual Reporting' (SPAR) tool reports.

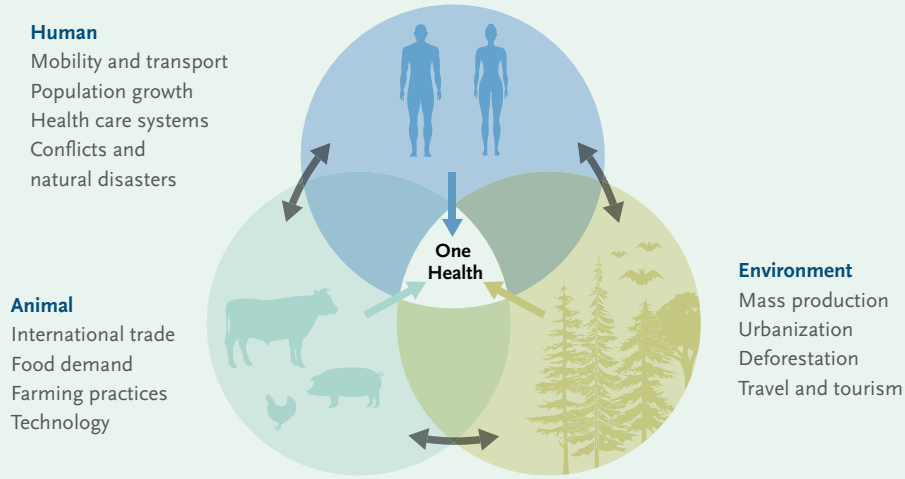


Figure E.4: One Health for effective management of spillovers and zoonotic diseases Source: adapted from Bedford et al. 2019.

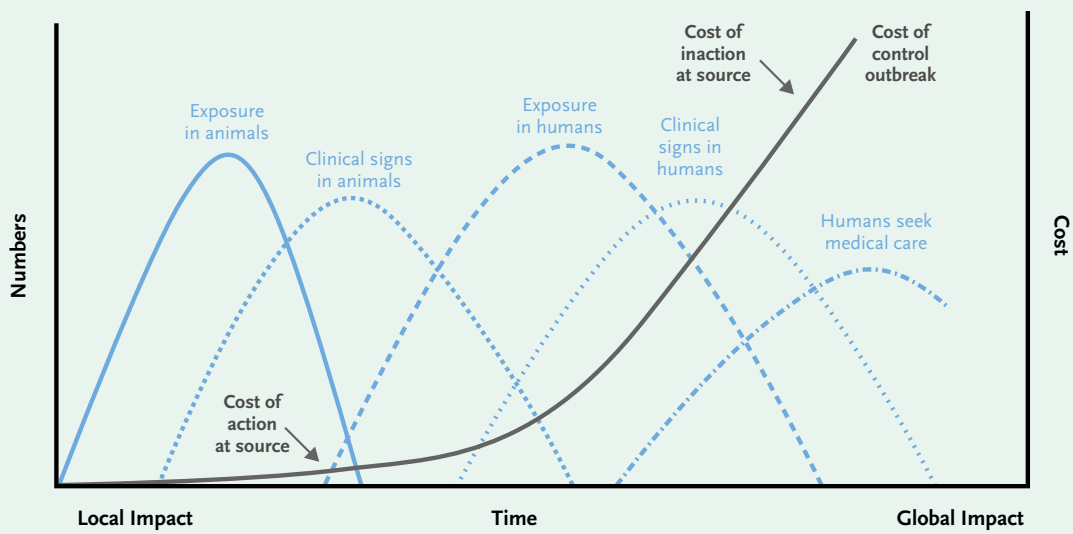


Figure E.5: Cost of actions and inaction as the pandemic traverses from local to global proportions Source: World Bank 2012 adapted by the authors.

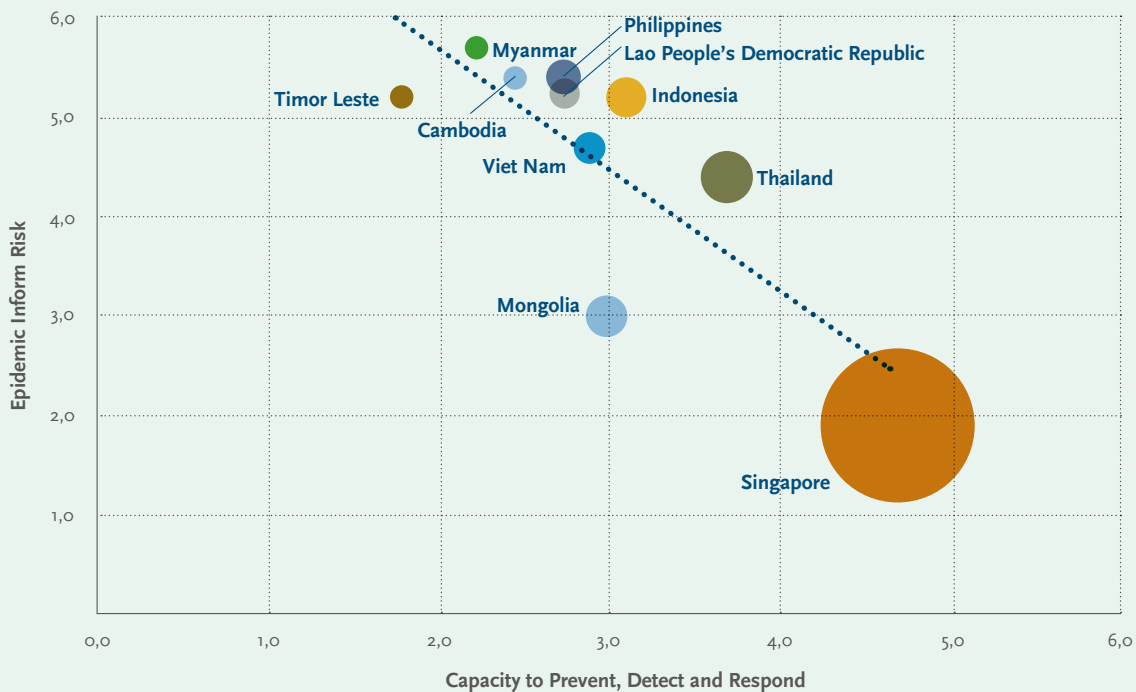


Figure E.6: Institutional capacities for managing EIDs linked to livestock, zoonoses, and food-borne infections Source: Authors' own elaboration.

The capabilities and capacity of veterinary services in the region are dependent on the level of development in countries and there is considerable variation in the quality and quantity of relevant infrastructure. Lower-income countries generally have the weakest veterinary services even in countries where the investment in livestock is significant. Animal health field services are often provided by poorly qualified staff with insufficient veterinary supervision. The region lacks capacity in epidemiology and there is little integration between national and sub-national systems for economic assessments, disease prevention, detection, and response. All countries in the region have some surveillance capability but with varying levels of reliability and timeliness. In terms of infrastructure and equipment, a number of countries have limited equipment at all levels, while others have adequately equipped facilities in the national headquarters and the main national and regional laboratories but lack the necessary infrastructure at the sub-national levels. It can be noted that although there is a lack of laboratory information management systems (LIMS) and bioinformatics capabilities, the availability of information management systems, internet access, and smart phones in better resourced countries has resulted in improved communications, data capture, and lines of reporting. Also, the technical quality of veterinary laboratories in the region varies considerably, but many are now operating at high standards with good reliability.

The quality and availability of veterinary services varies greatly, with poorly qualified staff providing unsupervised field services in some countries

Across the region, there is little evidence of dedicated institutional mandates for wildlife health and emerging disease prevention, detection, and response. Wildlife health systems and programs in the region are underdeveloped. There is a lack of clarity over the responsibility for the different wildlife subsectors – free-ranging, captive, and farmed wildlife. Few or no veterinarians are employed to monitor wildlife health in most countries. There are few wildlife disease surveillance programs in EAP. Moreover, the lack of a clearly defined mandate for wildlife health results in a lack of ownership with no or only a few programs that monitor wildlife health and changes in health status which could provide early warning of increased threats to wildlife and of potential spillover to humans and domestic animals. A key challenge for the systematic strengthening of national wildlife health programs is the lack of a dedicated tool to study a country's ability to assess and manage wildlife and wider environmental functions and to prioritize areas of investment. Efforts to date in the region have largely focused on specific diseases and/or species, rather than building systems. Globally, investment in wildlife services is limited, of which only 5 percent goes to support wildlife health.

Adopting One Health approaches in EAP has been a slow process, with respect to both policy development and implementation in most countries across the region. Cross-government coordination to deliver One Health has been initiated in almost all EAP countries, but they often lack sufficient commitment. An important challenge for establishing effective One Health coordination with improved policies and programs is the different priorities set by the different ministries.

Cross-regional coordination is limited as no single entity covers the whole East Asia and Pacific region. A Tripartite Regional One Health Coordination Group has been established in the EAP region covering FAO, WHO, and WOA and their regional and sub-regional offices. Regional and international agencies and development partners have developed a number of regional programs and frameworks to support laboratory capacity building, disease control in livestock production, and trade, with a focus on a number of prioritized animal diseases in the region. These programs, however, have not been fully effective in delivering successful prevention or sustainable control of the diseases. Collaboration was established also with UNEP on AMR especially.

Building Animal Health and Wildlife Systems for One Health

Public health systems (wildlife, animal, and human) need to be strengthened through a coordinated One Health approach to better understand the epidemiology and risk factors for zoonoses and to reduce the burden of zoonoses more effectively. A simple Theory of Change shows how establishing a One Health approach can deliver improved human health and well-being by reducing the risks from emerging pathogens and zoonotic diseases from improvements in wildlife, animal health, and public health systems (Figure E.7). The Theory of Change demonstrates the interconnectedness and array of coordinated activities at the regional, national, and sub-national levels that must be addressed to effectively reduce the threat from existing and emerging zoonoses and the promotion of food security, improved production efficiency, and a reduced impact on the environment.

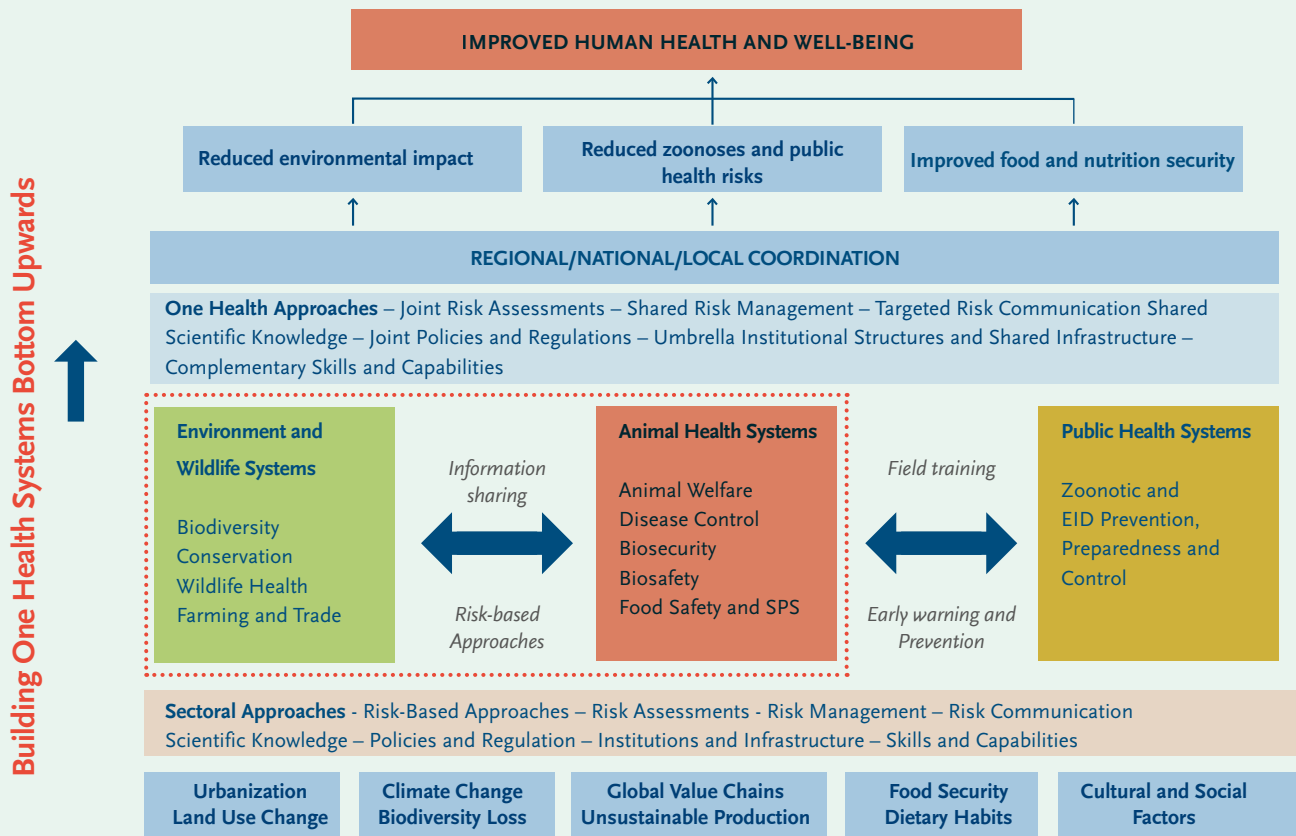


Figure E.7: Theory of Change for building animal health and wildlife systems for One Health *Source: Authors' own elaboration.*

Aligning incentives for local actions in wildlife and animal health with global public health benefits under One Health, however, involves complex political economy issues. Most arguments for investments in One Health are rooted in the cost savings from preventing nationally and globally significant public health crises. However, the returns from upstream preventive measures and surveillance for human health related to One Health investments might not fully compensate the local governments, the private sector, and the communities for their investments in animal and wildlife health unless additional value and revenue streams are created to increase the pool of local benefits and improve investment efficiency. While transfers or ecological compensation mechanisms could be instituted for transmitting global benefits to local areas, taking a food system approach for preventing zoonotic diseases, enhancing food safety, and reducing AMR could add up to significant local benefits.

Developing effective One Health systems in EAP

One Health systems need to be developed and harmonized in EAP to protect and promote human health, animal health (including livestock health and production and wildlife health), and environmental health to reduce the risks of spillover. Key gaps are found when addressing the majority of zoonoses that arise from animal-based food systems and the weak wildlife and environment health institutions and capacities. Legislation covering animal health services (including wildlife), the risk management of wildlife and animal use systems, and emergency preparedness and response should be reviewed and revised. This includes providing the authority to take the necessary rigorous surveillance and control measures for emergency response, particularly funding and the development of required systems and staff resources. Cross-sectoral training and development of capacity in epidemiology and One Health should support this.

Political leaders and senior managers need to understand the many, well documented benefits of One Health policies and programs

Enhanced national commitment to One Health policies and programs should be developed through advocacy to political leaders and senior managers using evidence-based information on the benefits of this approach. These include fostering improved knowledge of livestock demographics and trading patterns, the wildlife trade, disease surveillance in animals and people, and economic impact and cost-benefit studies. One Health risk governance and cross-sectoral engagement should be established through legal commitment, functional coordination, and establishment of operational mechanisms with the line ministries.

One Health approaches are needed to strengthen governance structures and institutions at national and sub-national levels to meet the challenges from emerging pathogens, EIDs, and zoonoses to human and animal health. This requires a clear mandate with well-defined roles and responsibilities and how coordination and collaboration is to take place between the relevant ministries and agencies (e.g., Ministries of Agriculture and Food, Environment, Public Health, Transport, Commerce, Food Safety, and other related agencies). Institutions, their systems, staffing, and budgets will need to be developed to provide the necessary capabilities in risk reduction. It is important to remember that strengthening animal health is not a one-off activity but a process that needs to be integrated into the institutional setup and processes. Table E.1 shows that One Health approaches can be built through multi-sectoral, multi-domain, and multi-level coordination between wildlife systems, animal health, and public health agencies.

Table E.1: Building One Health system with multi-sectoral, multi-domain, and multi-level coordination *Source: Authors' own elaboration.*

	Country Level	Regional Level
Domain Specific	<ul style="list-style-type: none"> - Engaging with politicians and senior decision-makers to advocate for One Health policies and programs - Developing One Health champions within key institutions - Addressing legislative, regulatory, and institutional voids and harmonizing with global standards - Strengthening analytical base for risk-based approaches - Aligning animal disease and wildlife health programs with risk-based approaches with strong One Health links - Improving enforcement capacity with transparency and accountability - Incentivizing private sector for responsible production, biosecurity, hygiene, and safety compliance 	<ul style="list-style-type: none"> - Establishing One Health leadership forums - Support harmonizing legislative, policy, and regulatory frameworks with global standards - Technical assistance, training, and capacity building - Investing in surveillance programs for emerging infectious disease and transboundary animal diseases (TAD) and wildlife health programs - Information networking, developing data standards, and regional data sharing - Promoting safety standards, trade protocols, and inspection procedures for 'fail-safe' systems regional disease surveillance and control
Multi-Domain	<ul style="list-style-type: none"> - Bridging sectoral mandates, institutional arrangements, and enforcement mechanisms - Using economic analyses to optimize utilization of resources - Sharing risk analytics and improving risk communication promoting trust and respect - Information systems using 'dashboard approach' on a need-to-know-and-act basis - Strengthen early warning using novel approaches and disruptive technologies, e.g., syndromic surveillance, social media - Collaborative research, academic courses, and capacity building on One Health in medical and veterinary schools - Market-based and consumer approaches for food safety and to reduce the risks from AMR, zoonotic, and EIDs 	<ul style="list-style-type: none"> - Facilitate regional One Health policy forums engaging with WHO, WOH, ASEAN, APEC, etc. - Strengthen evidence base for One Health risks - Information exchange on cross-border risks and emerging risks - Reciprocal exchanges and mutual assistance to provide enhancing surge capacity for combating pandemics - Regional funding mechanisms to promote One Health investments in member countries - Networking One Health facilities and capabilities complemented by remote diagnostic and surveillance technologies - Support for regional centers of academic excellence for advancing One Health research

Fixing the weak links in animal health and wildlife systems first

The 'chain of command' of veterinary services needs to be re-established to ensure efficient and effective service delivery with clear lines of authority or clear mechanisms of coordination and information flow. Veterinary services in EAP countries need to be enhanced with greater emphasis on and integration with national and regional disease monitoring and prevention systems, strengthened disease intelligence with improved analysis and reporting (greater use of epidemiology and economics), improved detection and response mechanisms, and clearly defined communication channels.

There is an urgent need for wildlife management services to be strengthened with close coordination and integration with the human and livestock health services to support prevention, detection, and risk reduction of pathogen spillover, EIDs, and zoonoses. Greater understanding of the legal and illegal wildlife trade (including free-ranging wildlife, captive wildlife, and wildlife farming) needs to be developed to identify the high-risk pathways that require urgent attention, taking into account the socio-cultural drivers of demand and the economics of supply. The risks posed by the increasing encroachment into wildlife areas arising from activities such as farming, logging, mining, tourism, urbanization, etc. and the threats from climate change should be assessed, options for reducing the risks identified, and a program of risk reduction needs to be implemented. Enhanced cross-sectoral coordination among sectors would improve the efficacy of wildlife surveillance systems, the identification and management of the risks of wildlife disease and pathogen spillover, and more broadly ecosystem health and population ecology.

Efficient and effective sectoral surveillance programs need to be supported by structured scientific risk assessment to identify and prioritize risks using the One Health lens. This, in association with public health surveillance systems, will provide early warning for pathogen emergence and provide the evidence base for the development of controls to minimize risks to human health. National information management systems should be developed to ensure that timely and reliable information is available to develop targeted risk-based surveillance programs to address the prioritized risks for EIDs, zoonoses, and food-borne infections. Mapping out the complex interactions between humans, livestock, and wildlife all along value chains for animal products and the changing interactions with wildlife through trade, farming, and ecosystem change should form the basis for the risk assessment. Having identified the highest risks, mitigation measures need to be implemented to reduce these risks, based on coordinated One Health approaches with functional cross-sectoral systems that can rapidly detect spillover events and are able to respond quickly and effectively.

Applying a One Health approach to food systems will address many of the world's emerging threats to human health, such as food safety and AMR

Cultivating One Health practice during peacetime

Applying One Health approaches to food systems would address some of the emerging priorities and global public health threats such as food safety and AMR. Working across multiple sectors has demonstrated that strengthening food safety along the food value chain aligns closely with the One Health approach and provides entry points to address emerging infectious diseases and zoonoses (See Figure E.8). Risk assessments should be undertaken with a sound understanding of domestic animal and wildlife diseases, food-borne infections and residues, and the risk from potential zoonotic pathogens and how they could be transmitted through the food value chain. Quality assurance programs should be used to support investment in food safety and the reduction of food-borne disease risks. Animal and animal product identification and traceability are essential for food safety assurance and improvement in disease control. Traders, markets, and other 'aggregation points' such as collection yards, live animal markets, and slaughterhouses pose a high risk for disease transmission between animal populations and humans. Programs that reduce this risk should be developed using the principles of science-based structured risk assessments.

One Health systems for EIDs and zoonotic diseases can build on and benefit from experience of adopting a holistic approach to addressing the threat of AMR. Countries in EAP should further develop the necessary legislation and enforcement to minimize and eventually stop the misuse of critically important antimicrobials and strengthen surveillance of antimicrobial usage and AMR. Animal production practices need to be significantly improved throughout the region to reduce the need to use antimicrobials. The reduction in the use of antimicrobials needs to be supported by increased awareness building of the AMR problem among producers and consumers and be combined with targeted investment and programs to incentivize the improved biosecurity measures to reduce the risk of disease. Improved biosecurity measures should address poor production practices and utilize in situ risk management protocols such as zoning and compartmentalization, tracking of movement of live animals and animal products, Good Animal Husbandry Practices (GAHP), Good Hygiene Practices (GHP), Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Points (HACCPs), etc.

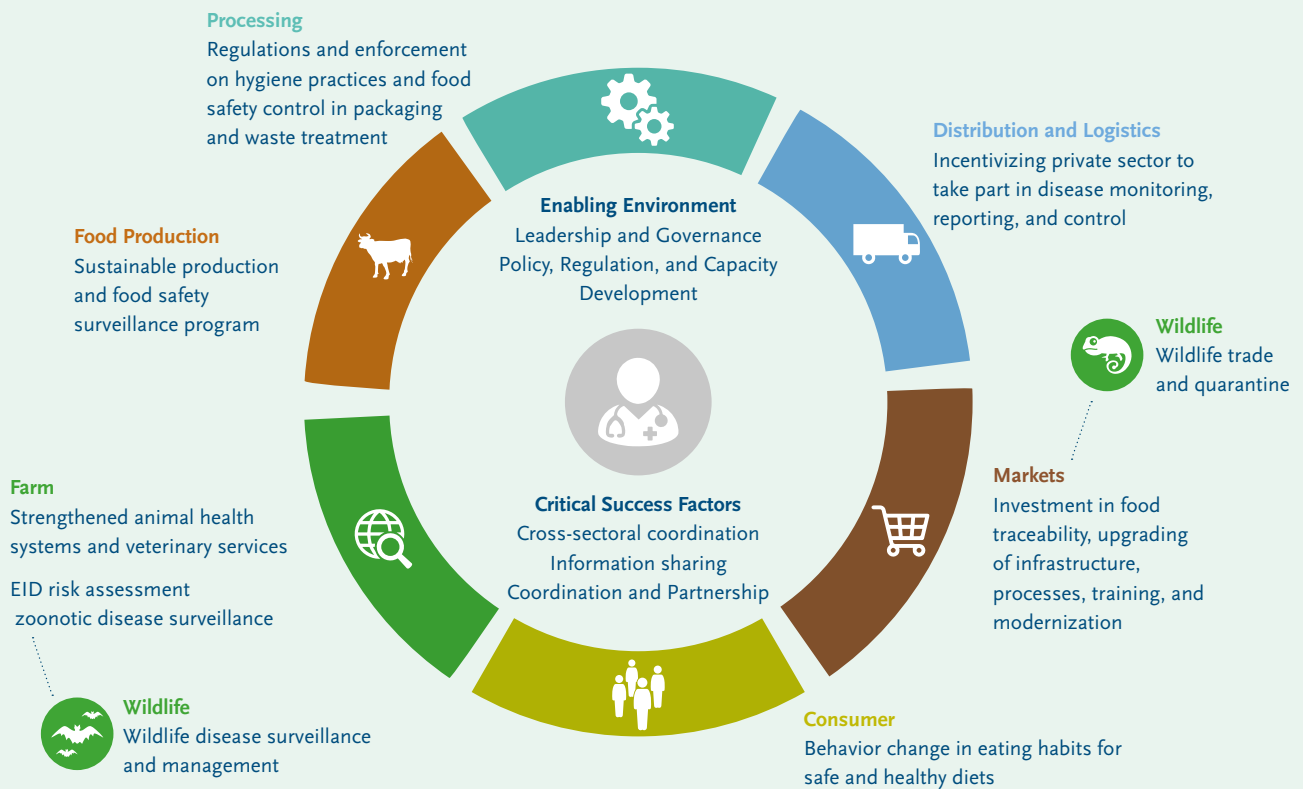


Figure E.8: Entry points for One Health approach in food systems Source: Authors' own elaboration.

Coordination beyond local jurisdictions for preventing pandemics

The global benefits of local actions in wildlife and animal health 'with global public health benefits' under One Health justify mobilizing international public financing for this purpose. Taking a food-systems approach for preventing zoonotic diseases, enhancing food safety, and reducing AMR generate significant local benefits and thus justify public and private investments in animal and wildlife health by local actors such as communities, private sector entities, and local governments. Nevertheless, local benefits to these actors may not be immediate compared to the urgent national, regional, and global need for these preventive investments and the significant global public good that they create. Surveillance everywhere is of value, but the global returns to investment will be highest in the countries in which surveillance is weakest. The cost savings from preventing nationally and globally significant public health events that investments in One Health would bring could justify instituting national and international public transfers or ecological compensation mechanisms to certain local private and public investments, given that they generate global public benefits.

A food systems approach to prevent zoonotic diseases, improve food safety and reduce AMR bring many benefits that fully justify public and private investment

Regional policy support should be strengthened to better coordinate and improve the policy, legislative, and regulatory environments across countries in the region. Regional centres should be further developed as regional resources to support less developed countries – this applies particularly to the Pacific Island countries. Evaluations, such as the World Organisation for Animal Health – Performance of Veterinary Services (WOAH-PVS) and the World Health Organization – Joint External Evaluation (WHO-JEE), should be encouraged and supported. In parallel, a dedicated equivalent tool should be developed to sufficiently assess the capacity needs for wildlife and environmental health services to cover the full One Health 'triad'. Regional information sharing and coordination systems should be further strengthened and mandated with full transparency and dynamic real-time sharing of data and information. National animal health information systems will be important platforms to support the more efficient exchange of data across the region. Promoting regional collaborative programs to harmonize protocols, guidelines, and standard operating procedures and developing capacity especially to monitor pathogen mutation and spillover risks are also needed.



INDONESIA
The farmer was assisted under a social protection program PKH at Cirebon, Indonesia.
Photo credit: Nugroho Sunjoyo/ World Bank



INDIA
Fruit bat (flying fox) eating papaya Kerala, India.
Photo credit: Shutterstock



PHILIPPINES
Man and water buffalo in rice fields, Philippines.
Photo credit: Edwin Huffman/World Bank



Chicken farm
Photo credit: FAO/Jim Caro



CAMBODIA
Carcass surfaces are roasted with a gas burner in the wet market in Phnom Penh, Cambodia.
Photo credit: ILRI/David Aronson

Lessons from the Field

Experiences from several developing countries provide real-case examples of One Health that illustrate how the concepts explained in the report are applied in practice along with the key elements for successful programing enumerated in the report including the following.

Risk-based human animal disease prevention and control

The implementation of effective global, regional, and national programs for the prevention and control of EIDs, zoonoses, and food-borne infections requires strong commitment for the development of well-resourced, coherent One Health policies and programs to support risk-based approaches. The global program for the eradication of rinderpest in 2011 demonstrated that risk-based approaches for disease control can be used to successfully control and eradicate priority animal diseases with multiple hosts at the global, regional, national, and sub-national levels. Several global strategies are also in place to prevent and control major animal diseases such as the global strategic plan to end human deaths from dog-mediated rabies by 2030, Global Foot and Mouth Disease (FMD) Control Strategy, and the Global Strategy for the Control and Eradication of PPR (peste de petits ruminants) and several other diseases such as brucellosis and ASF.

Food safety as a driver for change

Food safety is a major driver of change as consumers' demand and knowledge increase which in turn also provide impetus for higher-level political support. For example, Ho Chi Minh City has a strong commitment to improving food safety and has largely been successful in banning the sale of live animals in traditional markets. This approach of providing consumer confidence in the product rather than simply banning a traditional market source of animals is being well accepted and is also benefiting the better producers with higher market returns. Compared with other parts of the country, Ho Chi Minh City now has a significantly higher proportion of consumers using improved markets than traditional markets which continue to suffer from compromised hygiene and sanitation.

Greater consumer knowledge and demand can be a major driver for change in the area of food safety

Targeted approach to reducing AMR

Setting priorities provides leadership and structure for changing paradigms. As part of the global effort in combating AMR, China issued a multi-ministerial national action plan to contain antimicrobial resistance. Under the plan, a series of actions are being taken to strengthen the surveillance, supervision, and management of antimicrobial usage, to carry out pilot projects on reduction of on-farm antimicrobial use, and to introduce a traceability scheme for evidence-based veterinary drug use. The approach requires a high level of government commitment, public awareness, and monitoring to ensure its effectiveness to ensure progress is made and sustained.

Traditional markets

The traditional markets vary in terms of EID, zoonotic, and biodiversity risks. The key features that determine their risk profile include (i) the presence of higher-disease-risk species, (ii) the presence of live animals, (iii) hygiene conditions, (iv) market size, (v) animal density and interspecies mixing, and (vi) complexity of the supply chain. When classified based on the presence or absence of live domestic and wild animals, traditional markets can be categorized along a continuum of risks to human health and biodiversity and would show the proportionately small number of traditional markets selling live, wild animals that have been the source of many previous EID outbreaks. Looking forward, policy makers should prioritize regulating the traditional markets and taking steps to prevent resurgence of their most high-risk aspects. These factors impede the coordinated approach that is essential to improve hygiene standards and food safety in markets.

Digital technology and disruptive innovation

Digital technology is radically changing the world and providing opportunities for improved forecasting, better identification of emerging issues, optimized application of risk mitigation measures, and monitoring of residual risks. In Sri Lanka, an Infectious Disease Surveillance and Analysis System was launched, as part of which 40 field veterinarians were recruited and trained in the use of the mobile phone for data capture of animal health events for three species (chickens, cattle, and buffaloes), including global positioning service (GPS) data on locations. The increase in real-time information flow compared to the previous situation where data was summarized and only reviewed monthly resulted in early notification of suspected cases.

Public-private sector opportunities

The public and private sectors working together can provide real opportunities for synergy for achieving improved delivery of animal and veterinary services. It also opens the possibility for potential cost sharing for program delivery. For example, the Guangdong provincial authorities in China and the private owners of a large live bird market jointly funded a public-private partnership (PPP) to improve biosecurity in the market. The project involved a detailed analysis of the market and its operations and provided recommendations on how to improve its biosecurity measures. This partnership resulted in the construction of privately operated facilities for the wash-down of trucks, crates, cages, and equipment, the design of improved workflows, replacement of crates, redesign of the drainage system, improved processes for cleaning, and the reduction of time in market. Staff were also trained in improved hygiene and biosecurity practices.

By working together the public and private sectors can together deliver better animal and veterinary services, sharing the delivery costs

Country-Specific Recommendations

There is considerable variation among the countries in the EAP region with respect to their animal health and wildlife management systems capacity. Therefore, countries need to strengthen animal health and wildlife systems based on their individual context and risks. Table E.2 summarizes the key priority actions for each country.

Table E.2: Recommendations for strengthening One Health systems in select EAP countries *Source: Authors' own elaboration based on NAPHS, JEE, PVS reports and expert reviews.*

Country	Recommendations	
	Animal Health	Wildlife Systems
Cambodia	Improve coordination and service delivery. Increase veterinary staff capacity and reduce dependence on veterinary paraprofessionals. Review and strengthen zoonoses and animal disease surveillance and control programs. Strengthen border control. Improve food safety at markets and slaughterhouses. Strengthen cross-sectoral emergency preparedness and response systems.	Train veterinarians and paraprofessionals. Develop cross-sectoral rapid response teams for a coordinated response. Reduce contact between wildlife, animals, and humans at markets. Provide resources for activities and development of institutional capacity and systems.
China	Strengthen enforcement of laws and adoption of good practices to improve biosecurity, food safety, and AMR control stewardship along the agri-food production and value chains to better prevent the EIDs like H7N9 influenza, COVID-19, etc.	Review and define institutional mandates for wildlife health risks and harmonize the regulations and enforcement procedures to address vulnerabilities in the detection of emerging disease. Reduce contact between wildlife, animals, and humans at farms, aggregation, and markets. Improve community engagement and promote public awareness.
Indonesia	Improve coordination and chain of command of animal health services. Strengthen One Health coordination and collaboration. Strengthen cross-sectoral emergency preparedness and response systems. Increase use of risk assessments for disease surveillance, control, and the reduction in AMR. Improve food safety at markets and slaughterhouses. Develop staff competencies and specialist veterinary skills.	Strengthen surveillance systems and improve One Health coordination and collaboration. Train staff at provincial and district levels. Promote public awareness. Reduce contact between wildlife, animals, and humans at markets. Improve food safety at markets and slaughterhouses. Provide resources for activities and development of institutional capacity and systems.

<p>Lao People's Democratic Republic</p>	<p>Improve coordination and service delivery. Increase veterinary staff capacity and reduce dependence on veterinary paraprofessionals. Review and strengthen zoonoses and animal disease surveillance and control programs. Strengthen border control. Improve food safety at markets and slaughterhouses. Strengthen cross-sectoral emergency preparedness and response systems.</p>	<p>Strengthen mechanisms for intersectoral collaboration, including with environmental health. Increase information sharing between sectors for timely response. Develop cross-sectoral rapid response teams for a coordinated response with the use of the Field Epidemiology Training Program (FETP) and the Regional Field Epidemiology Training Program for Veterinarians (FETPV). Provide resources for programs. Reduce contact between wildlife, animals, and humans at markets. Provide resources for activities and development of institutional capacity and systems.</p>
<p>Mongolia</p>	<p>Strengthen One Health coordination and collaboration. Strengthen emergency preparedness and response systems and provide resources. Increase use of risk assessments for disease surveillance, control and the reduction in AMR. Improve food safety at markets and slaughterhouses. Develop staff competencies and specialist veterinary skills. Strengthen cross-sectoral emergency preparedness and response systems.</p>	<p>Develop human resources for wildlife surveillance and management. Undertake surveillance and develop mechanisms for sharing information across the human, animal, and wildlife sectors. Provide resources for activities and development of institutional capacity and systems.</p>
<p>Myanmar</p>	<p>Increase veterinary staff capacity and reduce dependence on veterinary paraprofessionals. Review and strengthen zoonoses and animal disease surveillance and control programs. Strengthen border control. Improve food safety at markets and slaughterhouses. Strengthen cross-sectoral emergency preparedness and response systems.</p>	<p>Increase support and coordination for the One Health approach. Improve wildlife disease surveillance and the integration of information across sectors. Develop human resources for wildlife surveillance. Provide resources for activities and development of institutional capacity and systems.</p>
<p>Philippines</p>	<p>Further develop One Health coordination and collaboration. Strengthen coordination for emergency preparedness and response systems and provide resources. Increase use of risk assessments for disease surveillance, control, and the reduction in AMR. Improve food safety at markets and slaughterhouses. Develop staff competencies and specialist veterinary skills.</p>	<p>Improve wildlife surveillance and the harmonization, data exchange, and multi-sectoral analysis of data between human and the animal/wildlife sectors.</p>
<p>Timor-Leste</p>	<p>Increase veterinary staff capacity and reduce dependence on veterinary paraprofessionals. Improve coordination and service delivery. Review and strengthen zoonoses and animal disease surveillance and control programs. Strengthen border control. Improve food safety at markets and slaughterhouses.</p>	<p>Develop human resources for wildlife surveillance and management. Undertake surveillance and develop mechanisms for sharing information across the human, animal, and wildlife sectors. Reduce contact between wildlife, animals, and humans at markets. Provide resources for activities and development of institutional capacity and systems.</p>
<p>Viet Nam</p>	<p>Improve coordination and service delivery. Increase use of risk assessments for disease surveillance, control, and the reduction in AMR. Improve food safety at markets and slaughterhouses. Strengthen border control. Develop staff competencies and specialist veterinary skills.</p>	<p>Improve coordination between the wildlife, animal, and human sectors – both for wildlife hunting/trade and farming. Reduce contact between wildlife, domestic animals, and humans at markets. Contribute to planning, data sharing, and coordinated response to zoonoses. Provide resources for activities and development of institutional capacity and systems.</p>



CHINA

White raccoon in cages on a farm.
Photo credit: chinahbzyg/Shutterstock



MONGOLIA

Little boy feeding the goat kid,
Mongolia.
Photo credit: Gonchig Gan-Ulzii



The scientist pipettes an animal cell
sample on a clean bench.
Photo credit: Shutterstock



MONGOLIA
Livestock Commercialization
Project, Mongolia
Photo credit: Erdenechimeg S.



INDONESIA
Land Use Change, Indonesia.
*Photo credit: Flore de Preneuf/
World Bank*

Investing in One Health – cross-sectoral, multidisciplinary coordination and collaboration across the human health, animal health, and environmental health sectors – is crucial for maintaining healthy agricultural and food systems and addressing global health security risks. Such action can reduce the threat of future pandemics through upstream preventive actions, early detection, and agile responses to zoonotic and emerging infectious diseases outbreaks, coupled with measures for promoting food safety, including anti-microbial resistance. This regional review, conducted jointly by the World Bank and the Food and Agriculture Organization of the United Nations, assesses the socioeconomic impacts of zoonotic diseases and epidemics across the East Asia and Pacific region, providing a background on why emerging infectious diseases are occurring more frequently in this region. This review looks at the benefits of using a risk-based approach, assesses the management of animal and wildlife health and the ability to identify and respond to emerging threats and protect the health, agricultural production, and ecosystem services. It provides recommendations on priority activities to be undertaken, and offers governments and their development partners the evidence and analysis needed to make more and better investments in wildlife systems and animal health to improve global health security.

**From Reacting to
Preventing Pandemics**
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