**Viet Nam One Health Strategic Plan for Zoonotic Diseases 2016-2020**

**Technical Annex**

**22 June 2016**

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# Introduction and background information

Microorganisms have always been crossing from animals to humans, occasionally causing serious illness. This process appears to have accelerated over the past 50 years with a steady stream of novel and re-emerging infectious agents crossing from wild and farmed animals in different parts of the world to cause severe and widespread disease in humans (SARS, HIV, Nipah virus, MERS, Ebola virus disease and many others). Each year one or more new diseases emerge that threatens global health.

Avian influenza (H5N1), first detected in China in 1996, appeared as an urgent problem in Viet Nam and several other countries from late 2003 through 2005. Not only did this virus cause severe disease in poultry, it also resulted in serious disease in humans, raising concerns of a potential severe human influenza pandemic. To address this threat, Viet Nam produced the National Integrated Operational Program for Avian and Human Influenza (OPI) that guided control and prevention activities during 2006-2010. The Viet Nam Integrated National Operational Program on Avian Influenza, Pandemic Influenza and Emerging Infectious Diseases (AIPED) expanded the scope of actions beyond zoonotic avian influenza to cover potentially serious emerging and re-emerging diseases during the period 2011-2015. Under these programs, significant progress has been made from 2006 to 2015 in containing avian influenza and in preparing for disease emergencies in line with the overall objective of reducing the risk to humans and animals from avian influenza A(H5N1) and other emerging infectious diseases.

The AIPED adopted a **One Health approach** as recommended by the International Ministerial Conference on Animal and Pandemic Influenza (IMCAPI), held in Hanoi in April 2010. The One Health approach to disease control and prevention at the human-animal-environment interface is now recognised globally as the best method for effective control of emerging infectious diseases. Viet Nam is seen as a One Health leader because of its early adoption of this approach for the control of avian influenza.

## Purpose

This plan aims to reduce the health and other impacts of zoonotic diseases and animal-origin health concerns in Viet Nam through achieving the following objectives:

* Strengthened One Health capacity for zoonotic disease control and prevention
* Enhanced preparedness for a human emergency of animal origin and improved control of zoonotic disease outbreaks
* Application of One Health capacity to limit the public health impact of zoonotic influenza viruses, antimicrobial resistance, and rabies, and reduce the risk posed by agents in animals with pandemic potential that are yet to emerge

## Scope of this document

This document provides additional information to support information in the **Summary Plan** on activities to be undertaken during 2016 to 2020 to further reduce the risk from zoonotic diseases using a One Health approach.

Activities are divided into the following seven focus areas, discussed in more detail in individual chapters:

1. Those aimed at **general strengthening of capacity** to control and prevent zoonotic diseases using a One Health approach to consolidate the One Health platform that has been established in Viet Nam over the last 10 years

And those required to make progress against specific diseases or groups of diseases including:

1. One Health approaches to **human disease emergencies** of recent animal origin (managing major health security threats from zoonotic diseases)
2. One health approaches to managing **pandemic threats that are yet to emerge**
3. One Health approaches to managing **zoonotic influenza** (e.g. H5N1, H7N9, swine influenza viruses)
4. One Health approaches to managing **rabies**
5. One Health approaches to **antimicrobial resistance** (e.g. multi-drug resistant organisms such as extended spectrum beta-lactamase resistant organisms, plasmid-mediated colistin resistant enterobacteria); and
6. One Health approaches to **other important zoonotic diseases**/agents with little or no pandemic potential such as anthrax, leptospirosis, *Streptococcus suis*, brucellosis and others

One other group of diseases – **foodborne illnesses of animal origin** including diseases caused by chemicals and pathogens such as Salmonella, Campylobacter, Listeria, cysticercosis, hydatidosis, fish-borne trematodes - is briefly discussed because:

* There are likely to be benefits from a One Health approach,
* Control measures for these diseases have many links to those for the zoonotic diseases, and
* The One Health Partnership is increasingly playing a role in supporting these activities.

This approach of covering general *and* specific aspects was adopted because both strategies are needed to make progress in preventing, detecting and responding to zoonotic diseases. The Government of Viet Nam has defined zoonotic disease priorities and identified the major gaps in zoonotic disease responses; it was therefore considered necessary to demonstrate the achievements expected in these specific areas by 2020. Comprehensive zoonotic disease control plans under each of these specific focus areas, however, requires action across the spectrum of prevent, detect and respond as described in the GHSA. This is illustrated in Figure 2 of the Summary Plan – each of the focus areas contains 2 to 3 elements of the GHSA.

This plan does not cover diseases that originated in animals but which have become well established as human pathogens such as vector-borne diseases where the transmission cycle has shifted to humans as the predominant host (e.g. dengue, chikungunya, yellow fever, Zika virus). Management of these diseases is best achieved using an Ecohealth approach. Nonetheless, these diseases can still require an emergency response as seen, for example, with the teratogenic effects of infection with Zika virus during pregnancy in South America and the Pacific.

## Achievements

Considerable progress was made against the objectives of AIPED to control infectious diseases at source and implement measures to prevent disease emergence, detect and respond rapidly to new high impact diseases in both animals and humans, and enhance preparations for the consequences of pandemic disease of humans.

Major achievements over the period of AIPED (2011-15) include the following:

* Legislation to facilitate animal and human health sector collaboration and information sharing (Circular 16/2013)
* Passage of veterinary legislation that provides greater scope for controlling zoonotic diseases and the use of antimicrobials
* Meeting minimum IHR standards for core capacities in 2014
* High-level political engagement with the Global Health Security Agenda (GHSA) including as a lead country for the zoonotic disease action package (ZDAP) and a contributing country for the Emergency Operations Centre (EOC) action package, resulting in the establishment of an emergency operations centre
* Exercises to test national pandemic planning and risk communications
* Commitment to global plans on AMR and rabies
* Drafting of a national plan to address antimicrobial resistance (AMR)
* Rapid legislative and administrative responses to prepare for Ebola virus disease and Middle East Respiratory Syndrome-Coronavirus (MERS-CoV)
* Evolution of the national One Health platform to a One Health Partnership that now includes wildlife and environment stakeholders including the Ministry of Natural Resources and Environment (MONRE)
* Improved capacity to detect potential zoonotic and pandemic agents in wildlife and initial surveys on wildlife for these agents
* Enhanced surveillance for avian influenza and other influenza viruses at the animal-human interface
* Improved control of avian influenza and no known incursion of H7N9 virus
* Changes to poultry markets, slaughter points and farms aimed at improving food safety and disease control
* Developing an online reporting system for nationally notifiable communicable diseases
* Enhanced laboratory capacity and improved turnaround times for specimens
* Establishment of VOHUN in 2011 to train a One Health workforce

Other achievements are listed under specific focus areas below.

# 1 Building One Health Capacity.

##  Background

General strengthening of One Health capacity is vital to allow Viet Nam to detect, prevent and respond to zoonotic diseases. As described in the Summary Plan, One Health approaches are now recognised as the best way to achieve gains in these areas. Building One Health Capacity is not an end in itself – the capacity has to be used for action against specific zoonotic diseases. Strengthening is needed in a number of areas described in the Summary Document and this Technical Annex.

## 1.2 Strategic directions

* Continue to move towards a comprehensive, integrated approach to zoonotic disease threats through the development of legal and administrative structures and the inclusion of One Health approaches in all relevant government sectors
* Establish the national governance, financial and coordination mechanisms for all hazards including disease emergencies as well as sustained mechanisms for longer-term prevention and control of priority zoonotic diseases
* Move beyond self-reporting of IHR and PVS core capacities and regularly test functional capacities and planning including whole-of-society pandemic plans
* Build on existing structures for developing, coordinating and sharing communications to the public during emergencies and non-emergency situations
* Review, refine and fund surveillance programs for zoonotic diseases and institutionalise cross-sectoral information sharing including microbiological data from laboratories and epidemiological data from public health units
* Carry on refining and upgrading national human and animal laboratory networks including linkages, diagnostic capacity for priority diseases and biosecurity and biosafety
* Improve sharing of disease intelligence data with neighbours at key points of entry
* Improve infection prevention and control in health facilities and at key points in the livestock production and marketing chain
* Bring to bear the expertise of the environmental health sector in addressing environmental aspects critical to zoonotic disease emergence and prevention
* Improve communications between authorities as well as to and from the public for disease emergencies and for risk reduction messaging for better control of zoonotic infections
* Maintain progress on the development of a One Health literate workforce
* Ensure that research is focused on answering key clinical, epidemiological, public health and policy questions, is shared among stakeholders, and applied to policy and practice

## 1.3 Achievements in establishing One Health approaches in Vietnam

### 1.3.1. One Health coordination

Since 2003, Viet Nam has made successive improvements toward a multi-sectoral approach to address zoonotic diseases in response to domestic threats such as strains of highly pathogenic avian influenza, external threats such as Ebola virus disease, and global initiatives to promote One Health and health security such as the Manhattan Principles on “One World, One Health”, the International Health Regulations (IHR), the Performance of Veterinary Services (PVS) and the new Global Health Security Agenda (GHSA).

National planning has progressed from coordinated animal and human health activities to address avian influenza virus A/H5N1 under the OPI, 2006-2010, to a broader focus on emerging and re-emerging diseases under AIPED, 2011-15, and then to a national One Health roadmap, 2015-16, that outlines collective engagement across sectors to prevent and control zoonotic diseases. A new One Health forum for policy dialogue and information sharing, the Viet Nam One Health Partnership for Zoonoses, brings together 27 national and international partners including the Ministry of Agriculture and Rural Development (MARD), the Ministry of Health (MOH), and the Ministry of Natural Resources and Environment (MONRE). This is indicative of high-level multi-sectoral commitment to managing the risks of disease at the human-animal-environment interface and extends the local One Health approach beyond the “four-way linking model” of GDPM, DAH, WHO and FAO.

Two national steering committees - the National Steering Committee for Avian Influenza Prevention and Control (NSCAI, 2004) chaired by the Minister of MARD and the National Steering Committee for Human Influenza Pandemics Prevention and Control (NSCHP, 2006) chaired by the Minister of MOH – have been the principal mechanisms for national coordination of responses to zoonotic diseases during the periods covered by the OPI and the AIPED. Establishment of a new, unified, overall national steering committee has been proposed, with chairing at the level of Deputy Prime Minister. Design of this committee is currently under consideration. A range of other national steering committees is responsible for related areas where application of a One Health approach for additional health concerns at the human-animal-environment interface is highly relevant including the Steering Committee for Drug Resistance, the Central Steering Committee for Food Safety and Hygiene, and the National Committee for Climate Change.

### 1.3.2 Legislation to support One Health approaches

Legislation has fostered cooperation between the animal and human health sectors with decrees and circulars governing surveillance, epidemiological investigations, biosafety in laboratories, and prevention, quarantine and other measures during major epidemics. The *guidelines for coordinated prevention and control of zoonotic diseases* (inter-ministerial circular No. 16/2013/TTLT-BYT-BNN&PTNT, dated May 27, 2013) are a key legal advance towards multi-sectoral cooperation. Viet Nam has built a legislative framework for the reporting of nationally notifiable infectious diseases in the public and private sectors, aspects of animal health (animal disease management, animal slaughter, processing of animal products, veterinary inspection procedures), and food standards and safety (chemical and veterinary medicine residues, microbiological contaminants). The legal basis for the diagnosis, management and response to potential novel pathogens, like Ebola virus and Middle East Respiratory Syndrome (MERS) coronavirus, was promptly issued. Legislation has also been passed to regulate the management of captive wildlife, prohibit trafficking, and protect wildlife and biodiversity[[1]](#footnote-1).

### 1.3.3 Core capacities to support a One Health approach

Viet Nam has achieved core capacities for identifying and responding to disease outbreaks and public health events stipulated under the International Health Regulations (IHR, 2005), and has implemented a number of recommendations from past evaluations of the Performance of Veterinary Services (PVS)[[2]](#footnote-2) including bolstering the legislative foundation for these services (particularly the Veterinary Law, 2015). In addition to the passive surveillance systems for people and animals, sentinel surveillance systems have been established for priority diseases in key sites. For example, border and market surveillance for avian influenza in poultry, and a national sentinel surveillance system in provincial health facilities for influenza-like-illness and severe acute respiratory infections. A large network of human health laboratories is part of the national communicable disease surveillance network including two national reference laboratories, 63 provincial public health laboratories and more than 200 health facility laboratories. Progressive improvements of diagnostic capacity, standards and biosafety have been made under the Viet Nam Laboratory Accreditation Scheme (VILAS), with some laboratories also seeking ISO certification. A framework for cross-sectoral laboratory information sharing is now in place.

### 1.3.4 One Health workforce

A well-trained workforce capable of preventing and managing diseases of animal origin and working in multi-disciplinary teams is required. The Hanoi School of Public Health (HSPH), Hanoi Medical University (HMU), and the Faculty of Veterinary Medicine of the Viet Nam National University of Agriculture (VNUA) are foundation members of the South East Asian One Health University Network (SEAOHUN) supported through the EPT and EPT-2 programs. This academic network aims to build trans-disciplinary capacity to “*respond to emerging and re-emerging infectious and zoonotic diseases*”. 17 universities throughout Viet Nam are now part of the Viet Nam One Health University Network (VOHUN) and include faculties of medicine, public health, veterinary and animal sciences. In addition, the Field Epidemiology Training Program within MOH and the AVET program within MARD provide are well-established in-service training schemes.

### 1.3.5 One Health activities

An audit of One Health projects and programs in Viet Nam completed in 2015 identified 62 separate but related activities beginning in 2005 (see Table A1 in Annex 1). These activities focused on strengthening capacities common to the prevention and control of all emerging or zoonotic diseases, as well as specific activities for avian influenza, antimicrobial resistance, rabies, diseases of poultry and pigs, and various zoonotic bacterial pathogens. Many of these activities will continue into the next 5-year period. The One Health Communications Network (OHCN), a working group within the One Health Partnership, provides a platform for experts from human health, livestock, wildlife and eco-health to share information and promote public awareness about reducing the risks and drivers of zoonotic diseases.

## 1.4 Work underway

Viet Nam is a lead country in developing and implementing the *Zoonotic Disease Action Package* (ZDAP) of the **Global Health Security Agenda** (**GHSA**) and is a contributing country for the *Emergency Operations Centres Action Package*. This global partnership of almost 50 countries aims to drive progress to full implementation of IHR and the PVS pathway utilising the prevent-detect-respond framework. Local adaptation of these two action packages is in progress and is expected to complement other national One Health planning activities to address zoonotic diseases. While Viet Nam has put herself forward to achieve specific targets related to zoonotic diseases (prevent) and a national public health Emergency Operations Centre (respond), many of the other action packages are also important for functional ‘One Health’ capacity. Action packages related to prevention include antimicrobial resistance, biosafety and biosecurity, immunization; those related to detection support strengthening of national laboratory systems, real-time surveillance, disease reporting, and workforce development; and those related to response include linking public health with law and multi-sectoral responses, medical countermeasures and personnel deployment). It would be useful to regularly review developments made by GHSA member countries on these other action packages.

A related endeavour, Phase Two of the **Emerging Pandemic Threats Programme** (**EPT-2**) that began in 2015, is supporting the development of a Vietnamese One Health workforce, preparedness and response functions, and monitoring viruses with pandemic potential to guide surveillance and risk mitigation strategies (PREDICT-2). This builds on EPT-1 (2009-14) and activities on avian influenza that predominantly focused on controlling the threat posed by HPAI and identifying other potential threats at their source. Funded by USAID, EPT-2 is being implemented by a number of partners with technical collaboration from the U.S. Centers for Disease Control and Prevention (US CDC), the World Health Organization (WHO) and the Food and Agriculture Organization. This activity is discussed in more detail in Section xx especially in relation to detection of zoonotic agents with pandemic potential.

Viet Nam is ahead of the curve in terms of having a well-established domestic One Health Platform, the One Health Partnership for Zoonoses. This partnership is continuing to work towards enhancing its role in coordination, policy dialogue and knowledge management for zoonotic diseases and will receive additional support via EPT-2. The involvement of MONRE provides an opportunity for greater inclusion of agro-ecosystem health elements in local One Health approaches with the potential to embrace a longer-term, more strategic approach to national health security.

## 1.5 Alignment with existing policies/strategies

A number of domestic, regional and international plans provide an opportunity to align work on zoonotic diseases with other health system activities. Some of these plans specifically adopt a One Health approach for preventing and controlling zoonotic diseases; others are focused on different but interrelated areas. See Figure 1 in the Summary Plan for a diagrammatic representation of how the major international initiatives relate and overlap, and Figure 2 for how the OHSP links with these.

### 1.5.1 Domestic plans

The Ministry of Health (MOH) has submitted the next 5-year plan preventive health for Government approval; MARD’s 5-year plan for the animal health sector was approved in 2014. This means that One Health activities related to zoonotic disease control will continue to be fitted to existing health priorities. An online human communicable disease notification system (Circular 54/2015/TT-BYT) is anticipated to be up and running from July 2016; this is expected to improve disease reporting and create new demands for public health protective action.

**Selected list of government plans related to One Health**

|  |  |  |
| --- | --- | --- |
| General health plans | The Vietnam national strategy on preventive medicine to 2010 and orientations towards 2020 (Decision 225/2006- QĐ-TTG) | 2010-20 |
| Health Master Plan for the period 2016-2030 with a vision to 2050 (forthcoming) | 2016-30 |
| National Program on occupational health (Decision 05/2016/QĐ-TTg) | 2016-20 |
|  | National public health laboratory plan (forthcoming late 2016) |  |
| Emergencies | All-hazards contingency plan (forthcoming late 2016) |  |
| Zoonoses | Comprehensive Plan for Influenza/(re) Emerging Infectious Disease Pandemic Preparedness and Response in the Health Sector 2011–2015 with a vision to 2020 | 2011-15 |
| The national program to control and eliminate rabies (Decision 2731/QD-BNNTY) | 2011-15 |
| Guidelines for coordinated prevention and control of zoonotic diseases (Inter-ministerial Circular No. 16/2013/TTLT-BYT-BNN&PTNT) | 2013 |
| National One Health Roadmap | 2015-16 |
| National HPAI Plan | 2013-17 |
| National Agriculture sector plan for avian influenza prevention and control | 2014-18 |
| National plan on prevention and control of avian influenza H5N1 (438/QDBNNTY) | 2014-18 |
| Action Plan for emergency response to influenza viral strains capable of causing human disease | 2014 |
| Action plan for preventing and controlling avian influenza A/H7N9 (No 1126 /QĐ-BYT) | 2013 |
| AMR | National action plan on against drug resistance (2174/QĐ-BYT )  | 2013-20 |
| Guideline on the implementation of infection control in health facilities (18/TT-BYT) | 2009 |
| Food safety | Ensuring food safety in the transport, slaughter cattle, poultry (66/QĐ-BNN) | 2014-20 |
| The restructuring of husbandry sector towards increasing the added value and sustainable development (984/QĐ-BNN-CN) | 2014-20 |
| National Strategy for food safety 2011-2020 and a vision toward 2030 (20/QD-TTg) | 2011-20 |
| Allocation of tasks and cooperation among regulatory agencies in food safety management | 2014 |
| Environment | National Program on pollution and environmental improvement  | 2016-20 |
| The plan for implementation of national environmental protection strategy by 2020 with a vision to 2030 (Decision 166/QĐ-TTg) | 2020-30 |

### 1.5.2 Regional and international strategies

The **International Health Regulations** (IHR, 2005) commit states to develop eight core capacities to identify, investigate and respond to public health events that may constitute an emergency of international concern: (1) national legislation, policy and financing; (2) coordination of nationwide resources and multi-sectoral partnerships; (3) surveillance; (4) response; (5) preparedness; (6) risk communications; (7) human resources; (8) laboratory. Viet Nam has met minimum (self-reported) core requirements and is now considering how to assess functional performance of national capacities against the updated IHR monitoring and evaluation framework.

The World Organization for Animal Health (OIE) provides a similar framework for the progressive improvement in veterinary services with the tool for the evaluation of **Performance of Veterinary Services**(PVS). Unlike IHR, this assessment process has not yet evolved into a review of functional capacity.

The **Asia Pacific Strategy for Emerging Diseases** (APSED) provides a strategic framework for advancing national core capacities required under IHR (2005) through focus on eight areas: (1) surveillance, risk assessment, and response; (2) laboratories; (3) zoonoses; (4) infection prevention and control; (5) risk communications; (6) public health emergency preparedness; (7) regional preparedness, alert, and response; and (8) monitoring and evaluation. The aims are to reduce risk, strengthen early detection, rapid response and preparedness, and build sustainable partnerships. APSED is currently in the process of being updated for the next 5-year period and will be a key document for the national zoonotic disease action plan to be aligned with.

As discussed, the **Global Health Security Agenda** promotes the One Health model to prevent, detect and respond to emerging diseases. The tailoring of action packages on zoonotic diseases and emergency operations centres is still in progress and will incorporate realistic targets for the next 5-year period. These are described in the GHSA roadmap for Viet Nam – the first version of which was released in September 2015[[3]](#footnote-3).

The **2010 ASEAN Ministerial Statement on “Cooperation on Animal Health and Zoonoses: HPAI and Beyond”** provides a similar framework for animal and human health cooperation for priority zoonotic diseases including avian influenza, rabies, leptospirosis, food-borne salmonellosis and brucellosis among others.

The **Asian Development Bank** **(ADB)** is assisting Viet Nam through the **Greater Mekong Subregion Health Security Project** (2017-2022) to improve: (1) cross-border communicable diseases control particularly for mobile populations and along economic corridors; (2) surveillance for communicable diseases including electronic notification systems and capacity for outbreak response; and (3) district laboratory services and infection prevention and control procedures in district hospitals. The project is intended to support elements of APSED.

### 1.5.3 One Health and the environment

The newly adopted **Sustainable Development Goals** (SDGs) for the period 2016 to 2030 have a broader agenda than the previous Millennium Development Goals (MDGs). In addition to calling for strengthened country capacities for early warning, risk reduction and management of national and global health risks, the SDGs set targets related to social and environmental determinants of health that are relevant to the One Health approach. The following are examples of pertinent targets:

* Conservation, restoration, and sustainable use of ecosystems;
* Ecosystem and biodiversity values integrated into national and local planning, development processes, and poverty reduction strategies;
* Enhanced support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities;
* Enhanced inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management;
* Environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduced release into the air, water and soil to minimize their adverse impacts on human health and the environment;
* Climate change measures integrated into national polices, strategies and planning

These targets implicitly recognise that changes to ecosystems can result in the emergence of zoonotic diseases and other diseases linked to animal products. Loss of biodiversity due to habitat fragmentation has been identified as the main driver for the marked increase of cases of Lyme disease in North America. Changes in climate will alter the distribution of vector-borne diseases adding to the other health and socio-economic problems that will occur as greenhouse gas concentrations rise. The environments in which livestock are reared and sold influence the types of diseases that occur and their potential for transmission to humans, as demonstrated by human infections of H5 and H7 influenza in improperly managed live poultry markets. Human modifications to ecosystems facilitated the spread of Nipah virus from bats to pigs and then to humans in Malaysia; contact between humans and bats in caves is now recognised as the main source of spillover of Marburg virus in Africa; and preparation of wild animals for food resulted in transmission of viruses such as SARS and Ebola virus from animals to people. Pollution of the environment with persistent organic pollutants can result in the accumulation of these chemicals in livestock products.

Development in Vietnam with changes to both natural and man-made ecosystems will increase the probability of emergence of new agents and risks from pollutants. For this reason, MONRE is an important partner in One Health activities aimed at control and prevention of diseases of animal origin, reflected in their active support for the One Health Partnership.

SDG targets on supporting research and development of vaccines and medicines and providing access to affordable essential medicines and vaccines offer scope for applying the best possible resources to address zoonotic and neglected diseases for the human and animal health sectors.

The **Sendai Framework for Disaster Risk Reduction 2015-2030[[4]](#footnote-4)** will contribute towards achievement of the SDGs and applies to “small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters caused by natural or man-made hazards, as well as related environmental, technological and biological hazards and risks. It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors.” This framework therefore has direct relevance to zoonotic disease prevention and response. The four priorities for action are: (1) understanding disaster risk; (2) strengthening disaster risk governance to manage disaster risk; (3) investing in disaster risk reduction for resilience; (4) enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

## 1.6 Key factors for success

* Government commitment and leadership at all levels
* Strengthened governance structures with clear roles and responsibilities
* A strong legal framework and positive policy environment to facilitate inter-sectoral collaboration
* Inclusion of environmental health aspects for a more strategic application of One Health principles
* Close coordination between sectors and timely sharing of information
* Community engagement and mobilisation is critical to optimising zoonotic disease prevention and control efforts
* Technical and financial contributions of international partners are indispensable
* Incorporating research findings into policy and practice

## 1.7 Challenges and constraints

* The Ministry of Planning and Investment (MPI) has described general limitations of state structures that have relevance to key government One Health actors:

*State fragmentation refers to the lack of clear hierarchy and assignment of roles and responsibilities both within the central government and between the centre and the provinces – and the inertia and inefficiencies this generates in formulating and implementing policy. Horizontal and vertical fragmentation of power has resulted in overlapping mandates with conflicting rules and decisions.[[5]](#footnote-5)*

In particular, outside of emergency situations formal channels for human and animal health sectors to communicate, share data and plan action are still being developed, despite the issuance of the inter-Ministerial Circular 16/2013. A review of agencies involved in the protection of wildlife indicated the need for improved clarity in roles and responsibilities of related agencies at all levels[[6]](#footnote-6). An example of inefficiency could be the large number of public health laboratories throughout Viet Nam, which poses challenges to laboratory accreditation and sharing information across laboratories and to public health authorities.

* The 2015 Joint Annual Health Review noted the continued burden of communicable diseases including emerging diseases and antimicrobial resistance, weak surveillance systems, poor sharing of data between curative and preventive sectors, and the need for further development of preparedness plans and response capacity. This review also pointed to a number of underlying drivers of disease including climate change, urbanization, industrialization, and environmental pollution. As noted in the AIPED, the transformation of Viet Nam to a modern industrialized country by 2020[[7]](#footnote-7) carries with it the potential for “*increased anthropogenic stress on already over-burdened regional ecosystems (including agro-, aquatic, forest, wetland, coastal, and urban ecosystems)*. Unless managed, the “*result is continued elevated risks to human health not only from zoonotic diseases, but also from a wide range of threats, including deterioration in water quality and air quality and ongoing loss of biodiversity*”.
* There is still only limited recognition of the importance of upstream practices on downstream infectious disease risks. For example, developments and restructuring of the livestock industry with changes to land use, production zones or the distribution of livestock can introduce new risks from livestock waste including environmental damage and introduction of potential pathogens such as AMR bacteria. The current national plan is expected to result in an increase in livestock in the Central Highlands, which requires a proper assessment of the implications for the environment. Inadequate biosecurity measures in intensive production systems can amplify infectious diseases risks given the high number of uniform animals kept in confined spaces (e.g. swine and avian influenza). This risk can be exacerbated for livestock farms situated in areas with large numbers of wild animals, particularly where there is contact between poultry and wild birds. Wildlife farming also poses a potential threat. Farming of bar headed geese in China may have been a factor in the emergence of H5N1 in places such as Qinghai Lake with subsequent spread to other countries. Dong Nai province has a high concentration of wild life farms and a large livestock sector. The co-location of these industries in the same province, as well as the expectation that Dong-Nai will form part of the H5 influenza free zone, warrants close attention to ensure pathogens do not spillover in either direction.
* Coupled with these risks is a limited capacity to enforce regulations and prosecute breaches that influence the risks of zoonotic diseases e.g. animal products with microbiological or chemical contamination above standards, use of banned medications in livestock, dispensing of human antibiotics without a prescription, maintenance of sound biosecurity practices etc. Large-scale livestock farming can reduce the risk of certain diseases through improved management and biosecurity when compared with small-scale commercial production but needs to be well managed – regulation can play a role in ensuring this happens.
* Limited engagement with social sciences and the non-government sector to develop effective communications to change behaviours for improved prevention and control of zoonotic diseases. Health education and communications has been identified as a key aspect of responding to emerging disease threats such as avian influenza. However, there is a general acknowledgement that health education and communications are “*fragmented and have low effectiveness*”[[8]](#footnote-8) and there is a risk that communications during crises that are not sufficiently clear or timely may increase rather than allay community concerns.
* Uncertain funding for core functions related to zoonotic disease control such as the national sentinel surveillance systems for influenza-like illness and severe acute respiratory infections
* Overload of existing staff in MARD and MOH. For this reason, the plan focuses on a small number of important or potentially important zoonotic diseases.

## 1.8 Targets

In addition to the expected outcomes provided in the Summary Plan, Table 1 provides indications of other targets that are expected to be met during the 5 years of the strategic plan:

Table 1

|  |  |
| --- | --- |
| Area | Targets |
| Legal framework | Review multi-sectoral legislative framework and regulatory guidelines to address zoonotic disease emergence and multi-sectoral responses to zoonotic diseases and address gaps. This includes incorporating environmental protection additions to veterinary and agricultural legislation.  |
| Governance and coordination | Improved and timely information sharing between human and animal health sectors using established formal channels of communication (e.g. reporting of human cases of zoonoses to MARD and reporting of animal disease outbreaks of zoonotic potential to MOH) in line with Circular 16/2013. Improved information sharing and cooperation between MARD, MONRE, and MOH to prevent and control environmental pollution from livestock production and the prevention of zoonotic disease transmissionDefined indicators for monitoring and evaluation of central, regional, provincial and district level zoonotic disease coordination mechanismsDefined roles and responsibilities of agencies involved in managing and regulating wildlife farming, disease surveillance, conservation and trafficking, and agencies involved in environment and forest protection  |
| Prevention activities | Infection control processes and antibiotic stewardship programs established in all reference and provincial hospitalsBiosecurity measures established and enforced in large livestock and wildlife farms and for animal transport, and enhanced cleaning and disinfection of farms and marketsImproved regulation of antibiotic use in animalsReduce illegal wildlife traffickingImproved risk assessment tools for the environment and the emergence of zoonotic diseases. Application of tools to define high-risk settings and to inform economic development projects, livestock restructuring and land-use changes Defined national environmental standards in relation to agricultural land use and agreed on methodology for assessing the receptive capacity of land for safe agricultural production Assessment of the excretion of heavy metals and dangerous substances from industry and its impact on the environment and the health of animals and people. Implement measure for control and managementStrengthen capacity for pollution control and environmental protection in human and animal disease prevention and control units |
| Surveillance and reporting | Improved surveillance systems:* Established electronic communicable disease reporting system for human laboratories and public health units
* Established indicator-based surveillance for 42 priority human diseases
* Established event-based and syndromic surveillance system with evidence of animal and human health investigations of detected events/syndromes
* Established enhanced and sentinel surveillance among people and animals (including wildlife) for 5 priority zoonotic diseases and selected surveillance of high-risk animal groups

Improved information sharing:* Improved compatibility of animal and human health diagnostic and surveillance data collection systems to enhance rapid information sharing and move towards interoperable systems
* Improved information sharing across borders at key points of entry and joint planning to reduce the spread of disease across borders
* Reporting to OIE of detected listed diseases and to WHO of public health emergencies of international concern within designated time periods

Improved capacity to analyse and interpret surveillance data in both the animal and human health sectors |
| Laboratories | All human and animal health laboratories meet national accreditation standards and biosafety/biosecurity requirements and all reference laboratories meet appropriate international accreditation (e.g. ISO 15189, 17025, 17043) with established procedures for ongoing external quality assurance A public health laboratory network that meets national standards for minimum reporting requirements for nationally notifiable communicable diseases (diagnostics, specimen referral pathways, quality assurance, data collection, reporting)Review of the structure of the public health laboratory network including the functions and number of laboratories and assessment of how to improve efficienciesEstablished mechanism for sharing information between animal and human health laboratories |
| Emergency management and response | Established emergency operations centre at national level with an equivalent structure established in all regionsExercise(s) to test function of emergency operations centre and national pandemic / all hazards plans including at least one national disease emergency exercise that tests non-health impacts and whole-of-society responsesAt least one IHR joint external evaluation (coupled with a similar or preferably linked assessment of veterinary services)Evidence of joint outbreak investigations and management for zoonotic diseases Updated clinical and standard operating guidelines for the management of priority zoonotic diseases |
| Workforce | Separate and joint FETP and AVET training programs that are integrated into the staffing structure of MOH and MARD and other relevant institutions.Completion of VOHUN curricula development for undergraduate and postgraduate courses including the addition of risk and behaviour change communications modules Continuing to increase the number of people trained in One Health approaches via VOHUN with the support of EPT-2 including expanding training for students who will work in the environment health sector and in-service training on One Health Core Competencies for preventive medicine and veterinary practitioners Assess the impact of this training on practice and zoonotic disease outcomes.Nationally defined number of human health and animal health epidemiologists to be trained in IHR and PVS core competencies by 2020 |
| Risk communications | Lines of communication during health emergencies:* Established mechanisms for communications across and to lower levels of government during different phases of health emergencies
* Established mechanisms for communication between government and external agencies (e.g. NIHE) that can contribute specific expertise for the development of public health messages
* Established mechanisms for communicating to the public during health emergencies and for gathering information from the public to refine public messaging

Involvement of social sciences in the development and assessment of joint risk and behaviour change communications for priority zoonoses to reduce the drivers of disease emergence and transmission at the human-animal-environment interface The One Health Communications Network continues to meet and develop appropriate communications material that is assessed for impact once delivered and used both in peace time and during disease outbreaks*.*  |
| Research | Nationally defined research priorities for zoonotic diseases including research on health and livestock systems, social and Ecohealth aspects critical to zoonotic disease emergence, prevention and control, and the application of new tools to track and prevent the development antimicrobial resistance Established mechanism for researchers and academics to periodically inform policy makers of new developments and apply research findings to policy and practice Annual national One Health Forum meetingsParticipation in key regional and global meetings and conferences to further refine the application of the One Health approach |

## 1.9 Budget

The breakdown of the minimum funds required for general strengthening of One Health capacity in Viet Nam is as follows:

1. **Governance and coordination - mechanisms to coordinate action across sectors, including greater involvement of the environmental sector**

|  |  |
| --- | --- |
| What  | Estimate of minimum 5 year funds  |
| Well defined national coordination mechanisms for zoonotic diseases  | $100,000GoV |
| Engagement by government partners with key civil society organisations and external stakeholders  |  $200,000GoV and donors |
| Maintaining the One Health Partnership on Zoonoses and secretariat  | $1 millionGoV and donors |
| Conducting joint investigations into zoonotic disease outbreaks  | $500,000GoV and donors |

1. **Legal framework - the legislative framework to facilitate multi-sectoral cooperation (and application of the framework);**

|  |  |
| --- | --- |
| What  | Estimate of minimum 5 year funds |
| Measures to ensure wider adoption of Circular 16/2013  | $300,000GoV and donors |
| Additional legislation/directives/circulars  | $200,000GoV |

**iii) Risk assessments and communications to target upstream determinants of disease emergence**;

|  |  |
| --- | --- |
| What  | Estimate of minimum 5 year funds |
| Build capacity to undertake risk assessments at the human-animal-environment interface | $1 millionGoV and Donors |
| Improve risk communication on microbial hazards emerging at the human-animal-environment interface | $1.2 millionGoV and Donors |

**iv) Surveillance systems and laboratories that support testing programs;**

|  |  |
| --- | --- |
| What  | Estimate of minimum 5 year funds  |
| Enhance laboratory capacity and quality management systems | $2 million GoV and Donors |
| Enhance data management systems to allow rapid sharing and analysis of new findings | $600,000GoV and Donors |
| Conduct sufficient surveillance to ensure early detection of zoonotic pathogens especially those with pandemic potential.  | See Focus area 3 |

1. **An adequate, trained One Health workforce.**

|  |  |
| --- | --- |
| What  | Estimate of minimum 5 year funds  |
| Sufficient professional staff are appropriately trained in One Health practices | $1million |

1. **Appropriate One Health research**

|  |  |
| --- | --- |
| What  | Estimate of minimum 5 year funds  |
| Undertake appropriate research to fill gaps in application of One Health approaches including research on specific diseases  | $2.5 millionGoV and donors |
| Enhanced land use planning for the livestock sector | $400,000GoV and donors |

 At the **district** **level**, ADB is supporting the Viet Nam government with an USD80 million loan through the *Greater Mekong Subregion Health Security Project* (2017-2022) to develop the public health workforce including training in outbreak response, risk analysis, risk communication and managing disease control campaigns. This project also supports the strengthening of district surveillance systems, district hospital infection prevention and control processes, and district laboratories.

# 2 One Health approaches for managing human disease emergencies of zoonotic origin

## 2.1. Background

All countries need to be prepared to manage a severe pandemic disease resulting from the spillover of an animal virus (or other agent) into the human population. Severe pandemics, such as those caused by influenza, are rare events but when they occur will have major whole-of-society effects. A number of other diseases that emerged from animals and crossed to humans, such as SARS, MERS and Ebola virus disease, have posed and remain a threat to all countries, including Viet Nam; experiences demonstrate the extreme economic and social consequences of even relatively short local transmission chains of these diseases (e.g. SARS in 2003, MERS in South Korea in 2015).

Preparation offers the best chance of averting prolonged crises and preventing avoidable morbidity and mortality. Ebola virus disease in West Africa demonstrated the challenges of coordination within government ministries and between government and international agencies, NGOs and the private sector. A One Health approach involving coordinated intersectoral collaboration is required for effective management of these events. Able command and control systems need to be well designed and regularly tested; rapid responses rely on efficient surveillance and data management systems to detect and report cases. The Ebola emergency also highlighted the initial failure of public communications to reduce the risk of transmission because messages were inadequately tailored to local communities.

## 2.2 Strategic directions

Preparedness for disease emergencies requires:

* Appropriate coordination systems from the highest level of government
* Emergency management systems to identify and rapidly respond to outbreaks of human disease from zoonotic origin
* Dedicated funding independent of normal budgets

## 2.3 Achievements

Vietnam has previously established inter-ministerial steering committees to coordinate intersectoral responses to specific human disease emergencies of zoonotic origin, such as SARS and avian influenza H5N1, and other disease emergencies. The Prime Minister has been directly involved in chairing these mechanisms in peak outbreak risk periods. Emergency response plans have been drafted (e.g. the action plan for the prevention and control of influenza A(H7N9) in Vietnam, decision No. 1126/QD-BYT, dated 5 April 2013) and some aspects have been tested in simulations and exercises with the support of the US-CDC and WHO. The development of an ongoing national inter-ministerial steering committee to deal with prevention and control of public health emergencies, including zoonoses, is currently under consideration.

## 2.4 Work underway

Viet Nam has already built the physical infrastructure of the EOC within GDPM and commenced workforce training. Planning for activities in the next 5 years has commenced with the first iteration of the GHSA roadmap for Viet Nam produced in September 2015. This is in the process of being updated and will provide the operational plans for building the capacity and functions of the EOC.

## 2.5 Alignment with existing strategies

The **Global Health Security Agenda** was developed based on the recognition that the effects of infectious diseases emergencies can be mitigated through strengthened national and global capacity to prevent, detect and respond. This initiative aims to accelerate achievement of the core capacities required by the **IHR** and **PVS** frameworks. Viet Nam is leading the *Emergency Operations Centre action package* which has the following targets: (1) a public health EOC functioning according to minimum common standards; (2) trained EOC staff capable of activating a coordinated emergency response within 120 minutes of the identification of a public health emergency; (3) maintain trained, functioning, multi-sectoral rapid response teams; and (4) ‘real-time’ biosurveillance laboratory networks and information systems.

## 2.6 Key factors for success

The main factors for success in this area are commitment from all players likely to be involved in an emergency response, appropriately trained staff at all levels; regular testing of emergency responses either through exercises or actual events; and, access to high-quality, timely surveillance data.

## 2.7 Challenges and Constraints

* No specific contingency funds to manage disease emergencies (although funds are allocated for this purpose in the case of actual outbreaks or high risk of an outbreak).
* Ensuring the work of the emergency management centre remains relevant to those outside of MOH. For example, it is not yet clear how the EOC would operate if H7N9 virus was detected only in poultry before any human cases occurred.
* Maintaining sufficient numbers of trained staff to operate the EOC at all times.
* Coordinating with lower levels of the health system particularly given the non-uniform training of provincial and district response teams to conduct investigations, analyse data and institute control measures.
* Limited materials such as personal protective equipment and logistical support to conduct rapid responses.
* Sustaining surge capacity in public health laboratories for extended periods.
* Disease outbreaks are rarely as straightforward to manage as emergency plans suggest. Even in places with established emergency plans these are often found to be imperfect, as was the case with a number of developed countries that had imported cases of Ebola virus disease. The H1N1 pandemic in 2009 also demonstrated that plans had to be flexible and adapted as the outbreak continued, especially with the shift from containment to mitigation.

## 2.8 Targets

Expected outcomes are described in the Summary Plan. The GHSA Roadmap sets out Intermediate targets for this focus area.

## 2.9 Budget

The expected expenditure in this area is estimated to be approximately USD 2 million. It will include funds from GoV and the GHSA funding envelope and does not include funds for actual outbreak responses.

A portion of the USD20.8M funds allocated by the ADB Greater Mekong Subregion Health Security Project to improve surveillance and outbreak response capacity will be used to achieve targets in this focus area particularly related to staff training, exercises and the development of electronic notification systems that can provide more timely data.

# 3. One Health approaches for managing zoonotic agents with pandemic potential that are yet to emerge, especially in wildlife

## 3.1 Background

 Infectious agents have crossed over from animals to humans for millions of years. However, this process appears to have accelerated over the past 50 years as a steady stream of infectious agents carried by wild and farmed animals have crossed over and caused severe disease in humans.

Most of these diseases have caused only localised disease outbreaks rather than global pandemics (e.g. Ebola virus[[9]](#footnote-9), Nipah virus). Those that have spread globally, even if only responsible for relatively few human cases[[10]](#footnote-10), have caused immense economic disruption (e.g. SARS in 2003[[11]](#footnote-11), MERS in South Korea). Tremendous human health impacts have also been caused by vector borne agents transmitted by mosquitoes that thrive in urban environments (such as Zika virus), especially those that have developed human-to-human infection cycles largely independent of the original animal host species.

The emergence of human immunodeficiency virus (first detected in the 1980s), Influenza A(H5N1)(1997 onwards), Nipah virus in Malaysia (1998), and SARS (2002-03) catalysed work to understand the drivers of disease emergence, recognition of global hotspots, and identification of potential agents and species that pose a threat to global health. These diseases also spurred development of One Health approaches.

Viet Nam has experiences with a number of these diseases and the disruption that they can cause (e.g. Influenza A(H5N1), SARS) and is located within one of several identified global hotspots for disease emergence. For the past five years, Viet Nam has supported studies to identify potential pathogens, develop interventions that would help prevent emergence of new agents and prevent existing agents from re-emerging, and focused on building One Health capacity. This work has been supported by the USAID emerging pandemic threats programs (EPT-1, EPT-plus and EPT-2) as well as work on avian influenza[[12]](#footnote-12).

By gaining a greater understanding of the key risks at the human-animal-environment interface and the nature of these risks, Viet Nam can build better systems for prevention and response to these diseases of animal origin with pandemic potential.

## 3.2 Strategic direction

* Identifying potential pandemic agents before they emerge
* Detecting evidence of spillover from animals to humans of zoonotic agents, including newly emerging agents
* Preventing emergence through broad scale interventions

## 3.3 Achievements

Among the many achievements in this area are the identification in Viet Nam of high risk practices such as bat guano farming, characterisation of areas with intensive wildlife farming, understanding patterns of trade, training in wild animal handling and sample collection, and the identification of a number of potential high risk agents. There has also been a shift in attitudes towards One Health and a greater acceptance of the importance of One Health training including consolidation of the Viet Nam One Health University Network (VOHUN). Laboratory capacity for detection of these agents has been enhanced and specific tests for a range of agents introduced to two laboratories, one in Hanoi, at the Viet Nam National Agricultural University (VNUA) and one in Ho Chi Minh City, at the Regional Animal Health Office (RAHO6).[[13]](#footnote-13) Information has been collated on the regulation of wildlife in a project supported by the One Health Partnership. Information on risks associated with livestock and poultry production and market chains have been better defined.

## 3.4 Work underway

The tightly linked EPT2 and GHSA programs are expected to extend throughout the 5-year period from 2016 to 2020 and to include activities aimed at understanding, preventing and controlling these agents in animals (domestic and wild) before they pose a threat to global health. The three overarching objectives of EPT-2 are: (1) prevention of the spillover, amplification, and spread of new zoonotic viruses; (2) early detection of new viruses when they do emerge; and (3) their timely and effective control.

EPT-2 has 7 areas of strategic focus of which the following are directly related to detection and control of infectious agents that pose a threat to health security:

* Developing longitudinal data sets for understanding the biological drivers of viral evolution, spillover, amplification, and spread;
* Understanding the human behaviours and practices that underlie the risk of “evolution, spillover, amplification and spread” of new viral threats; and
* Promoting policies and practices that reduce the risk of virus evolution, spillover, amplification, and spread.

Generic guidance on reducing the risk for new development projects have been produced[[14]](#footnote-14) and should be used for all new projects in which contact between wild animals and humans or livestock is expected to occur.

## 3.5 Alignment with existing strategies

Work on emergence of zoonotic agents will align with the GHSA, APSED, the IMCAPI ministerial declaration and the activities of the international human and animal health agencies (WHO/FAO/OIE). These Tripartite agencies are developing risk assessment tools for assessing and managing risks at the human-animal-environment interface (HAEI)[[15]](#footnote-15). WHO HQ has outlined the following objectives for work on zoonotic diseases at the HAEI[[16]](#footnote-16):

* Strengthen national public health systems for existing and emerging threats at the HAEI
* Assist in assessing and managing health threats at the HAEI
* Provide frameworks, tools and international political support for cross-sectoral approaches
* Build national mechanisms for information sharing and joint risk assessment for zoonotic influenza and other threats at the HAEI, including sustainable inter-ministerial communication and collaboration
* Assess global public health risks posed by endemic, epidemic, and potential pandemic events
* Ensure coordination between WHO and international animal health organizations

: Viet Nam is one of the two lead countries for the Zoonotic Disease Action Plan ( ZDAP) of GHSA, and is playing a major role in its development and coordination. ZDAP provides guidance for Viet Nam and other countries on activities in this area. The five-year target for ZDAP is to adopt measured behaviours, polices and/or practices that minimize disease risk and the spillover of zoonotic diseases from wild and domestic animals into human populations.

## 3.6 Key factors for success

The key factors required for success are sustained surveillance at the HAEI and sharing of information across sectors, successful engagement across sectors including trade, wildlife and land use sectors, and the application of new understandings of the drivers of disease to policy and practice.

## 3.7 Challenges and Constraints

The following constraints are expected to affect Viet Nam’s capacity to understand and contain potential emerging agents:

* Finding sufficient animals from each class to test and testing enough animals for early detection (short shedding time of some agents also affects the sensitivity of the system)
* Finding sufficient clinically affected humans in contact with animals
* Finding culturally appropriate behavioural change strategies that can be applied successfully in a particular industry or sector (e.g. extractive industries)
* Distinguishing pathogens likely to result in health security events from organisms that will not cross the species barrier or cause significant disease in humans.
* Economic drivers of wildlife trade that promote risky behaviour
* Mismatch between the rate of development of wildlife farming and capacity to regulate and provide appropriate technical services especially in the area of animal health
* Challenges of data sharing between ministries and even within ministries

## 3.8 Targets

The main objectives are presented in the Summary Plan. Other targets include:

* Tests for a minimum of 4 virus families will be conducted in all relevant animal taxa – coronaviruses, filoviruses, paramyxoviridae and influenza viruses (see also the specific section on zoonotic influenza viruses).
* Established enhanced and sentinel surveillance among people and animals for 5 priority zoonotic diseases and selected surveillance of high-risk animal groups
* Evidence of collection, recording, sharing and analysis of data across sectors

## 3.9 Budget

The minimum funds required to conduct this work over the next 5 years is estimated to be USD 3 million. The majority of the budget falls within the EPT-2 project supported by USAID with contributions from the GoV.

# 4. One Health approaches for managing zoonotic influenza

## 4.1 Background

Influenza viruses in animals represent an important on-going zoonotic and potential pandemic threat in Viet Nam. Each of the last three human pandemic influenza viruses involved either avian or swine influenza viruses in some way and Viet Nam already has almost 15 years of experiences in dealing with the pandemic threat posed by avian influenza viruses of the H5 subtype.

Avian influenza (AI) viruses remain the main concern for Viet Nam. A number of different AI virus subtypes are involved - some are present in Viet Nam (e.g. H5N1, H5N6) and some occur in neighbouring countries or elsewhere (e.g. H7N9). The capacity of avian influenza viruses to evolve rapidly through point mutations and gene reassortment plus the many susceptible avian hosts that share environments (domestic and wild birds in farms and markets) allow new strains of influenza to emerge frequently in the region

**H5N1 AI virus** became widespread in Vietnam in 2003-04 resulting in the death or destruction of some 45 million head of poultry. It also caused serious disease in humans, raising concerns about its potential to cause a severe influenza pandemic if it developed the capacity to transmit readily between humans. This concern persists but the level of fear has diminished due largely to the fact that the virus remains (genetically) an avian virus. Although experimental studies suggest only a few mutations are required to allow airborne transmission in a mammalian model, the virus has not yet acquired this capability despite over 20 years of human exposure to this virus

All highly pathogenic H5 avian influenza viruses in Viet Nam are related to the Goose/Guangdong H5N1 AI virus detected in China in 1996. However, H5 AI viruses have evolved, forming different clades and genotypes, a number of which have become established in Viet Nam. Since 2013, new H5 subtypes have emerged, including H5N6, which are the dominant strain in China in 2016 (and have caused some human cases in China since 2014). Viruses of this subtype have also been found in Viet Nam and appear to be displacing earlier H5N1 strains. No human cases associated with this strain have been reported in Viet Nam. Human cases associated with H5N1 AI virus have decreased dramatically since the peak from 2003 to 2005 (Table 2). Much of this is attributed to the enhanced control of these viruses in poultry but some may be due to changes in pathogenicity of recent viruses for humans.[[17]](#footnote-17)

Table 2 Human cases of Influenza A(H5N1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2003 - 2005 | 2006-2009 | 2010-2014 | 2015 - June 2016 | Total  |
| 93 (42 fatal) | 19 (15 fatal) | 15 (7 fatal) | 0 | 127 (64) |

**H7N9 viruses** emerged in China in 2013 as a cause of severe zoonotic disease associated mainly with live poultry markets. Many more human cases and fatalities have been recorded in China as a result of infection with H7N9 virus than from H5 infection. So far, no cases of H7N9 infection have been detected in Viet Nam (in poultry or humans), but if the virus remains poorly contained in China it will almost certainly enter Viet Nam based on previous experiences with H5 AI viruses.[[18]](#footnote-18) If this virus were to become established locally, it would trigger a major disease emergency and would almost certainly result in human cases if it were not identified soon after it enters the country. Unlike H5 viruses, the H7N9 virus has not been shown to cause clinical disease in infected poultry and detection requires active surveillance.[[19]](#footnote-19) Measures being implemented to prevent smuggling will reduce the risk of introduction to Viet Nam but it is unlikely that all illegal imports of poultry can be prevented as long as price differentials exist across the border between China and Viet Nam for the same product (e.g. day old chicks, spent hens). H5N6 virus, which emerged at about the same time as H7N9, still gained entry to Viet Nam despite the crackdown on smuggling to prevent spread of H7N9.

**Other avian influenza virus** subtypes have also crossed the species barrier between animals and humans, including H9N2 (present across much of mainland Asia but so far not causing severe disease in humans), H6N6 and H10N8 (both causing a few human deaths in China). H9N2 AI viruses are regarded as important because they were the source of viral genes that are in part responsible for the high virulence of some H5 and H7N9 viruses in humans

**Swine influenza viruses** are widespread globally. The 2009 H1N1 swine influenza pandemic demonstrated that a swine influenza virus can cross the barrier to humans and cause a human influenza pandemic (albeit one that in that case was not particularly severe).

Swine influenza viruses in the region, especially in China, are already showing signs of divergence away from human seasonal influenza strains and could once again emerge as a threat to human health as they did in 2009.[[20]](#footnote-20) The biology of swine influenza is complex with infection of pigs by human-adapted strains of virus also occurring, thereby adding to the influenza gene pool in swine[[21]](#footnote-21). Avian influenza viruses have also been detected in swine on occasions providing opportunities for reassortment between mammalian and avian viruses if two viruses infect the same animal cells simultaneously.

Influenza viruses in other species also need to be monitored. Farmed dogs in China have been found to harbour H3N2 viruses that were derived originally from avian viruses but which have obtained genes from human H1N1 2009 influenza virus. Other reassortant viruses have also been detected in dogs in the Republic of Korea.[[22]](#footnote-22)

## 4.2 Strategic directions

Progressive control of infection and prevention/early detection and response to novel zoonotic influenza viruses with pandemic potential.

## 4.3 Achievements

The containment of H5N1 highly pathogenic avian influenza in Viet Nam is recognised globally as a One Health success. Despite having more human cases than any other country by the end of 2005, a marked increase in the total poultry population including domestic ducks (from 220 million in 2005 to over 300 million in 2016), as well as conditions that facilitated transmission and persistence of these viruses such as the structure of the poultry industry, Viet Nam succeeded in reducing the number of human cases and the number of avian outbreaks. Containment was achieved through strong leadership from the highest levels of government, strong intersectoral coordination and strong support from donors and international agencies. Viet Nam has modified production and marketing practices in many areas so as to reduce the risk posed by these viruses. Vaccination is still being used as a tool for management of this disease and the vaccination programme is subject to regular reviews.

H5N1 avian influenza was the catalyst for the production of the OPI (Green Book) covering activities from 2006 to 2010. This was followed by the AIPED for the period from 2011 to 2015 which expanded the scope of the programme to other emerging diseases as the importance of One Health approaches to disease management became evident.

Viet Nam has recognised that virus elimination is a longer term objective and one that will only be achieved when the factors that allowed the virus to gain entry and persist change. The threat of resurgence remains given zoonotic avian influenza viruses continue to circulate in Vietnam and the broader region. Circular 16/2013 also identifies zoonotic influenza as one of the priority zoonotic diseases for which information sharing is required.

Based on experiences, studies and prevention and control efforts over the past decade, Viet Nam also now has a much greater understanding of the biology of H5 AI viruses including much better information on the genetic relationships between strains of virus in and outside of Viet Nam. Maps are being produced that demonstrate the location of outbreaks and these are tied to the clade of virus involved. (see Fig. 1)



**Figure 1**

**H5 viruses in Viet Nam 2014 – an example of the genetic information on these viruses (courtesy of FAO Viet Nam)**

## 4.4 Work underway

AIPED pointed out that Viet Nam was in the **consolidation phase** for avian influenza control, having gone through a **control phase** in which emergency responses to outbreak were the main activity (as was the case in 2003-04 when 45 million poultry were culled or died from the disease). The outbreak control activities have continued during the consolidation phase as required, but outbreaks were generally small and resulted in only relatively few birds being culled.

The goal of the consolidation phase is to maintain the gains made in the control phase, and to reduce further the levels of circulating virus (in part through changes to the manner in which poultry are reared and sold but also from other activities such as vaccination). Certain well managed farms were expected to demonstrate freedom from infection.

The five-year period covered by AIPED resulted in a number of significant changes to some live poultry markets and to farm biosecurity that reduced the risk of infection. During this time many commercial chicken farms have remained free from evidence of infection and disease, as planned.

During the five-year period from 2016 to 2020 it is expected that parts of the country will move to the **eradication (elimination) phase**. Viet Nam has already made some progress towards virus elimination, with a number of large commercial farms recognised as being and remaining free from H5 virus infection. The number of farms determined to be free from infection or disease will gradually increase, although this will require strengthening of passive surveillance systems so that any increase in mortality on farms is accompanied by submission of samples so that infection is detected. However, virus is still circulating, especially in the domestic duck population, and this will be more difficult to prevent unless greater controls are placed on the movement of ducks, thereby reducing the risk of onward transmission to other duck flocks and other types of poultry.

So far, moves to produce a better commercial vaccine for ducks have not yielded a suitable product despite considerable global research into this area. A viral vector vaccine based on duck virus enteritis was expected to be available by 2015 but has still not been used widely in China.

The eradication phase is costly because of the increased surveillance requirements to ensure freedom[[23]](#footnote-23), the increased costs associated with culling any infected flocks (regardless of whether they are showing signs of disease) and the cost of stringent movement controls. It will only be successful in places where there is relatively low heterogeneity in the poultry sector and is facilitated by centralised slaughtering of poultry rather than sale through traders and markets.

Planned activities are laid out in the action plan for H5 avian influenza in the poultry sector for the period from 2014 to 2018. This plan recognises that provinces have different risk factors for and prevalence of H5 avian influenza (based on findings from active surveillance in markets and reports of disease through passive surveillance systems).

At any point in time, provinces in Viet Nam fall within one of three categories:

* High risk - outbreaks detected in the past two years and/or high levels of virus contamination detected via active surveillance. This covers most of the provinces in the Red River and Mekong Deltas
* Low risk - no outbreaks reported for two years, some infection detected in active surveillance. This covers a number of provinces in the central and northern parts of Viet Nam
* Temporarily disease free - where outbreaks have not been reported for 5 years and active surveillance finds no or only occasional virus. This describes a number of provinces including some in the south east region and the central coast.

The status of provinces will change over time as a result of increased/decreased rates of detection of virus and/or outbreaks of disease attributed to H5 virus. The five-year goal is to reduce the number of provinces categorised as high-risk. By 2018, Viet Nam is also aiming to **establish disease free zone(s)** in the south-eastern region, a site of marked increase in intensive poultry production in the period from 2010 to today. When the 2014-18 plan was produced, these provinces were already regarded as being either free from infection or had limited evidence of infection; however several provinces in this area experienced outbreaks in 2014 and again in 2015-16. Therefore, it is unlikely that freedom from the virus will occur until at least 2020.

The proposed free zone also includes Ho Chi Minh City, which responded aggressively and (largely) successfully to the H5 AI problem when it emerged by closing urban live poultry markets and shifting to sale of chilled poultry from centralised slaughter facilities.

Development of this infection-free zone will need to be supported by strict control measures on poultry production, marketing and movements in the free regions and an appropriate combination of active and passive surveillance providing a high degree of confidence in claims regarding freedom from infection. The first step in this process is to ensure that development of a disease free zone is feasible and whether the resources needed to support it are available. This is only likely if the formation of a disease free zone provides access to lucrative export markets.

Other elements of the poultry sector plan include on-going vaccination (focussing on ducks), which remains one of the largest costs of the programme, rapid response to disease outbreaks, continuing communication campaigns, and enhanced biosecurity measures. If monitoring and evaluation show that the situation is not improving as expected, it will be possible to reassess whether changes in the approach are needed. The effectiveness of vaccination programmes will need to be assessed (i.e. the extent to which they are reducing viral loads), especially given the large amount spent on this aspect, building on results from earlier studies including USAID’s GETS project. This is not currently included in the existing surveillance programme.

On the **human health** side, all suspected cases of avian influenza will be tested and managed according to appropriate, standardised infection control procedures. MOH will inform MARD of the case and field investigations will be conducted to determine the source of infection, to assess whether other cases have gone undiagnosed and to ensure that onward transmission is not occurring (at present onward transmission of zoonotic avian influenza viruses in humans occurs sporadically and chains of transmission rarely extend beyond one generation). Investigations will be conducted as joint investigations where this avoids duplication and is cost effective.

***H7N9***

Plans for H7N9 avian influenza have also been prepared that cover scenarios ranging from no local infection to avian and human cases. Once human cases occur it is expected that this will be regarded as a disease emergency and will be managed accordingly (see focus area 2).

At present the virus has not been detected and surveillance activities will continue in areas identified as being at high risk of introduction of the virus (mainly in northern provinces).

If H7N9 were to occur it is likely that it would involve live poultry markets (as seen in China).

***Swine influenza***

Some work has already been conducted through the EPT+ program to detect and characterise swine influenza viruses. This work will continue.

## 4.5 Aligning with existing strategies/strategies

In 2010 ASEAN released an ambitious plan for elimination of H5N1 (and related) avian influenza from the region by 2020. Elimination by 2020 from ASEAN is a challenging target, but improvements are occurring in disease control that will bring some countries, including Viet Nam, closer to this goal. The reality is that these viruses are likely to be present for at least another 10 to 15 years or longer unless there are major changes to the virus or in production and marketing systems and if neighbouring countries also managed to control the disease. Three key factors in the persistence of the virus are the smuggling of poultry from endemically infected countries; a large population of free-running ducks vaccinated with products that do not necessarily prevent virus shedding (if a vaccinated duck is subsequently infected)[[24]](#footnote-24); and poorly controlled movement and sale of poultry. At present there are too many niches where this virus can survive, including sufficient avian host species.

The cost of a country-wide virus elimination programme would likely be over USD 100 million[[25]](#footnote-25), with no guarantee of long term success. Even if it were possible to eliminate H5 virus from Viet Nam the risk of reinfection would remain very high. Changes are occurring in the poultry sector in Viet Nam but there are still hundreds of millions of poultry reared and sold under conditions of relatively weak biosecurity. It is possible for well managed farms to remain free from infection and it may be possible to develop disease free zones with an effective approach.

The ASEAN H5 plan has seven strategic goals, all of which are included in activities to control H5 AI in Viet Nam:

1. Strengthening Veterinary Services for capacity development to prevent, control and eradicate animal diseases of economic and public health importance
2. Achievement of disease-free status in progressive manner at compartment, zone, region and country levels
3. Effective reduction of circulating HPAI virus in the environment leading to its progressive control and eradication
4. Effective and rapid containment of infections and outbreaks in affected flocks or zones
5. Effective surveillance capacity to detect and respond appropriately to the presence of H5N1 virus infection and other disease threats
6. Sustainable market chain policies and intervention in reducing risks of spreading and contamination to poultry and human populations
7. Enhancing and promoting biosecurity as a long term cost effective preventive measure to keep HPAI virus out of farms/flocks

## 4.6 Key factors leading to success

Viet Nam has a long history of dealing with zoonotic influenza and has learnt many lessons on how to minimise the risk of transmission to humans. Among the key factors needed for success are buy-in from all stakeholders to any new measure; the importance of recognising and gradually addressing constraints to virus elimination or control and enhancing the quality of support services, including veterinary services to the poultry sector

## 4.7 Challenges and Constraints

* Effectiveness of vaccination and vaccination programme in ducks

The AIPED pointed out that one of the main constraints to effective control of H5 HPAI is that existing duck vaccines, although able to reduce shedding and to protect ducks from disease, were still imperfect. One of the cornerstones of control of the disease in Viet Nam is the vaccination of ducks, aimed at reducing shedding of virus by these birds. This strategy is sound provided the effectiveness of the vaccination matches that of laboratory studies.

Further work is still needed to determine the extent to which the existing vaccination programme is reducing viral shedding. The current programme relies on a single dose given to birds every 6 months (although there is variation in the field). Surveillance from markets suggest that a considerable number of ducks are still shedding virus (although the vaccination status of these birds is not always known) indicating that more work is required to ensure vaccination is achieving the expected result. Changes in the antigenic characteristics of viruses as new strains become established also make vaccination harder to apply. Studies to assess the effectiveness of vaccination need to be continued and will require support from donors.

* Illegal movements will be difficult to eliminate

Long land borders and cross-border price differentials make it difficult to prevent all smuggling. The risk of a new strain of zoonotic avian influenza virus being introduced to Viet Nam is still high, including the risk of H7N9 introduction.

In Viet Nam the movement of large consignments of poultry can be managed better through check points between farm and market and at the final destination, but small volumes of poultry transported by motor cycle are much harder to regulate and control. Experiences with Clade 2.3.2.1c viruses demonstrate that viruses can move from the north to the south of the country (which was not a feature when the AIPED was prepared). If disease-free zones are to be developed it will be essential to prevent the uncontrolled movement of poultry into and through the zones.

* Wild birds could potentially carry virus into Viet Nam or into disease free zones

It is considered highly likely that most H5 AI viruses in the past were introduced and spread within the country through trade in poultry, however the close association between wild birds and domestic poultry in places where birds are not confined allows for potential transfer between the two. In other parts of the world wild birds have played an important role in introduction of virus (e.g. South Korea).

* Few incentives to acquire status as being free from avian influenza

Unless there are sound commercial reasons for establishing disease free zones, such as development of export markets for certain products (e.g. duck meat), then it may be difficult to convince provinces to invest the necessary resources to maintain freedom from infection.

* Difficulties of detecting H5 avian influenza infection in infected duck flocks or vaccinated chicken flocks.

Active surveillance in markets shows that some otherwise healthy birds sent to market are infected. The absence of clinical signs in many infected ducks means that intensive active surveillance is required to assess the status of infection on farms and to verify infection status in provinces aiming for freedom from disease. Experiences from earlier projects (e.g. GETS) suggest that it is easier to detect virus in markets than it is in farms. Even when sentinel ducks were being monitored on farms few positive results were obtained when using virus isolation.

* The need for active surveillance to detect infection (H5 and H7N9 viruses) and the cost associated with collection and testing of samples.

Surveillance is expensive and this limits the number of samples that can be collected and tested. This has implications for testing to confirm “freedom from infection” especially if using virological testing for this purpose. The number of tests required to have a high degree of confidence of claims to “freedom” will be much higher than that currently being undertaken in these provinces.

The cost of surveillance also has implications for the detection of H7N9 virus. Given the limited number of samples that can be collected and tested it may be possible for the virus to circulate for some time before being identified, complicating efforts to eliminate the virus.

* Quality of veterinary services

Veterinary services still require additional strengthening and resources based on the results from the OIE PVS reviews. All provinces that are aiming for freedom from infection would need to commit sufficient resources to veterinary services to ensure that the standards have been met and followed. If international trade in products is to occur from a zone, then it will be necessary to demonstrate to trading partners that the area is free from infection. Additional resources will be required to meet this requirement.

* The nature of the poultry sector

The poultry sector in Viet Nam is changing with greater intensification and a gradual shift away from live bird sales to centralised slaughtering (especially in the south of the country). There is still a large population of mobile ducks that move through the Mekong Delta, including cross-border movement between Viet Nam and Cambodia, and many millions of households still rear poultry.

* Limited possibilities for pre-emptive action in the event of detection of a potentially pandemic swine influenza virus

Even if a swine influenza virus is found that has characteristics suggesting it might become a human pandemic agent it is doubtful that action will be taken to eliminate the virus given that the virus is likely to be widespread and the uncertainty about the actual (rather than potential) effects. The main response will be production of a pre-pandemic vaccine antigen for humans.

* Buy in from poultry traders to market closures in the event of human or avian H7N9 infections

Control of avian influenza (H7N9) depends on support from market traders who will be required to close market stalls temporarily and in some cases permanently. Traders many not see the importance and value of this measure especially given the short term costs.

## 4.8 Targets

The major outcome by 2020 of the national plans are described in the Summary Report:

Other important targets include:

* Reduction by 50% in the number of positive samples for H5 virus in market surveillance from levels in 2015 (using the same techniques and timing for sample collection)
* Continue efforts to reduce smuggling of poultry either through enforcement or creating cost-neutral legal trading channels
* Management of any incursion of H7N9 virus in accordance with contingency plans
* Better understanding of the range of swine influenza viruses in Viet Nam, including their pandemic potential
* Investigate all human cases of zoonotic influenza assessing for source and onward transmission
* Application of the Tripartite risk assessment tool for selected high-risk industries to assess risks and develop risk management plans

Additional targets are listed in Table 3 below:

Table 3

|  |  |
| --- | --- |
| Area | Targets  |
| 1. Status of provinces | 1.1 Annual revision of status (high risk, low risk, interim disease-free)1.2 1.3 Reducing the number of high risk provinces by 80% |
| 2. Surveillance | 2.1 Conduct passive surveillance on farms (poultry)2.2 Conduct passive surveillance in zoos 2.3 Conduct planned active surveillance in markets2.4 Conduct planned active surveillance on farms in H5 free area (poultry)2.5 Conduct active surveillance on farms or slaughterhouses for swine influenza virus2.6 Obtain information on genetic information on all virus isolates2.7 Obtain information on antigenic characteristics of viruses especially those from fully vaccinated poultry and, as necessary, update vaccine antigens2.8 Conduct appropriate surveillance to detect zoonotic influenza in humans including close contacts of confirmed cases |
| 3. Outbreak response | 3.1 Rapid culling of affected and in contact poultry with payment of compensation3.2 Movement management 3.3 Thorough investigation of all outbreaks to determine the source3.4 Reporting to human health authorities of all human cases (this includes reports from clinicians and from laboratories to reduce the chance of missed reports)3.5 Reporting to MARD of suspected and confirmed human cases3.5 Provide appropriate communications to inform the public about risk and ways they can reduce the spread of disease, as well as actions the authorities are taking to protect the public |
| 4.Poultry vaccination | 4.1 Mandatory duck vaccination completed in selected provinces4.2 Conduct appropriate post-vaccination monitoring to demonstrate the extent of the response to vaccination in selected provinces4.3 Biennial reviews of results from vaccination to determine whether changes are needed to the programme4.4 Introduction of new vaccine antigens when required |
| 5.Quarantine and movement management | 5.1 Restricted movement of poultry from areas where virus exists and especially into disease free areas 5.2 Enhanced border controls to minimise smuggling |
| 6. Biosecurity | 6.1 All poultry farms with > 2000 head meet biosecurity standards6.2 Enhanced cleaning and disinfection of farms and markets |
| 7. Communications | 7.1 Produce appropriate materials to facilitate behavioural change7.2 Share effective strategies/materials across sectors  |
| 8.Research | 8.1 Conduct relevant research into H5 and other zoonotic influenza viruses to facilitate understanding of their ecology in Viet Nam8.2 Determine the extent of circulation on low pathogenicity H5 viruses 8.3 Undertake research on the effectiveness of control measures, especially vaccination8.4 Undertake research into any cases that occur in disease free zones to determine the likely source(s) of the virus8.5 Support sharing of current knowledge among human and animal health providers, researchers, laboratory staff, and industry |
| 9.Human infections | 9.1 Test all suspected human cases of AI 9.2 Manage suspected and confirmed human cases of AI with appropriate infection control measures9.3 Conduct contact tracing and investigate source of infection 9.4 Advise MARD (and other sectors/stakeholders as needed) of human cases of zoonotic influenza (+/- conduct joint field investigation to determine source of infection)  |
| 10.Monitoring and Evaluation | 10.1 Measure progress towards indicators established under specific work plans and targets |

## 4.9 Budget

The minimum funds required for activities related to zoonotic influenza over the next 5 years is estimated at USD 45 million assuming that vaccination remains a core part of control and prevention. Most of this will be spent in the agriculture sector. The GoV will provide most of the funds with contributions from donors, especially for surveillance activities, and the private sector (vaccination

# 5 One Health approaches to managing rabies

## 5.1 Background

Rabies is an important zoonotic disease in Viet Nam responsible for 78 recorded human deaths in 2015[[26]](#footnote-26) (Table 4). The majority of cases occur in the north of the country often in remote communities although cases of rabies in dogs were detected in 23 provinces in 2014, including lowland provinces. Disease is more frequent during hot seasons.

**Table 4 Reported rabies cases in humans 2006-2015**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| 82 | 131 | 91 | 68 | 78 | 110 | 58 | 105 | 67 | 78 |

Canine rabies is not a disease with pandemic potential but is of considerable significance regionally with all countries in the region committed to enhanced control and virus elimination. Rabies is also one of five priority zoonoses in Viet Nam[[27]](#footnote-27). It is highly suited to a One Health approach, and provides a practical opportunity to develop effective inter-sectoral coordination and collaboration in Viet Nam. The main cost associated with rabies prevention are the direct and indirect costs of post-exposure prophylaxis for those potentially exposed to a rabid animal with some 400,000 courses administered each year at a cost exceeding USD 100 per course.

## 5.2 Strategic directions

Elimination of human rabies cases in Viet Nam and the broader region depends on:

* Control of rabies in dogs, coupled with
* Universal post-exposure prophylaxis (PEP) in humans exposed to potentially rabid animals.

Both aspects need to be addressed for sustainable control of the disease. Most human cases in Viet Nam occur as a result of contact with rabid dogs but cats can also play a role. Some cases have occurred via preparation of rabid dogs for food. Other wild mammals can also be infected with rabies virus but are not regarded as an important source of disease for humans. The focus of control should be on dogs (and to a lesser extent cats) but monitoring of other animal populations will continue. Rabies tends to be seasonal so public awareness campaigns need to be targeted to periods of high risk (hotter months)

It is estimated that there are some 8 to 10 million dogs in Viet Nam. Dogs in villages are owned but are allowed to wander during the day. Turnover of dogs is relatively high, which has the potential to affect population immunity once intensive vaccination campaigns are implemented. Most cases of human rabies occur in remote communities.

**Control of rabies represents an important area for One Health activities in Viet Nam in the period from 2016-2020 and one for which significant measurable gains are expected to be made.**

## 5.3 Achievements

Already a number of steps have been taken to improve rabies control in Viet Nam but more needs to be done to further reduce the number of cases and eventually eliminate the disease. Human rabies cases, a more accurate indicator than canine cases due to better reporting, has fallen from 400-500 people in the early 1990s to 78 cases in 2015. This improvement has been achieved through enhanced awareness, some improvements in dog vaccination coverage especially in high-risk provinces, and improved uptake of PEP with some 400,000 courses given each year following dog bites

Table 5 provides details of activities undertaken on rabies in Vietnam in the recent past, some of which are on-going.

Table 5

|  |  |  |  |
| --- | --- | --- | --- |
| **Title** | **Donor** | **Period** | **Theme** |
| ASEAN Rabies |  | 2015-20 | Regional strategy (development) |
| Rabies transmission from neighbouring countries | NAFOSTED | 2015-17 | Surveillance, laboratory, research |
| National Program on Rabies prevention & control | GoV | 2011-15 | Response, behaviour change, coordination |
| Institutional and inter-sectoral strengthening for rabies control | AusAID | 2014-15 | Surveillance, control, communications |
| Partnership on global animal health and biosecurity | DRAFF | 2009-13 | Prevention, Risk reduction, Communication, Training |
| Workshop on rabies 2016-2020  | FAO, WHO | 2015-16 | Reviewing 2016-2020 plan[[28]](#footnote-28) |
|  Highly pathogenic emerging and re-emerging diseases (HPED) | EU | 2010-14 | Dog vaccination, Risk reduction, Communication |

## 5.4 Work underway

Viet Nam has made a number of commitments internationally and regionally to work towards canine rabies elimination making rabies control one of the most important goals for zoonotic diseases in the period from 2016 to 2020. A 5-year One Health operational plan for rabies control to 2020 (see expected outcomes below) has been drafted. This plan has as its strategic objective the elimination of human cases by 2020, an ambitious objective that can only be achieved if there is strong commitment from stakeholders at all levels of the plan, including funding commitments for canine vaccination and improved access to PEP in remote communities.

Vietnam’s action plan for rabies control for the period from 2016-2020 adopts a One Health approach and covers all pillars of disease control for MARD and MOH and other involved partners. The goal is to have one overall plan for rabies control and prevention and a single steering committee. The implementation of this plan will include many partners including relevant government departments from central to local level, international agencies/partners, mass organizations, NGOs and the public.

Joint training has been conducted (see Nguyen et al 2016[[29]](#footnote-29)) and Circular 16/2013 includes rabies as one of the five diseases for which information will be shared and joint investigations conducted.

## 5.5 Alignment with existing policies/strategies

WHO, OIE and other agencies have singled out rabies as a priority through the global strategic framework for rabies elimination released in 2015. The overall strategic goal of this framework is elimination of human rabies by 2030. The global strategic framework comprises five pillars – sociocultural, technical, organization, political and resources - each of which include a number of elements. Table 6 summarises these and indicates progress in Viet Nam: (+) areas where there has been good progress; (+/-) areas where some work has been done but where more work is required; (-/+) areas where limited progress has been made; and (-) areas where major action is needed to fulfil requirements.

**Table 6**

|  |  |  |
| --- | --- | --- |
| Pillars  | Elements | Viet Nam  |
| Socio-cultural | Covers a wide range of stakeholders including the general publicBuilding awarenessPromoting responsible dog ownershipBite prevention and treatment programmesProviding post-exposure prophylaxisEnsure community engagement | +/--/++/-+/--/+ |
| Technical  | Need effective human and animal health services (fill the gaps)Vaccination – mass dog vaccination is the most cost effective interventionLogistics – collect data on needs and meet these needsDiagnostics – appropriate lab supportSurveillance – support improved systemsTechnical support – Proof of concept – scale up small scale programmes building on successes | -/++/--/++/-+/-+/- |
| Organization | The need for a One Health approachPromote intersectoral collaborationEstablish good governanceAlign work plans with national and regional prioritiesCoordinate and combine human resources infrastructure and logistics Identify targets and their indicatorsMonitor and evaluate national plans to ensure cost-effective, timely delivery  | +++/-+-/++/--/+ |
| Political | Success depends on political will and support for elimination Encourage request for a resolution through WHO and OIE assemblies on eliminationEstablish and enforce appropriate legal frameworksDemonstrate the case for mass dog vaccinationSupport active national and regional engagement | +/---/++/-+ |
| Resources | Elimination spans several years and resources are required for the duration of the campaignDemonstrate the case for investmentPrepare business plans based on the global frameworkEncourage different forms of investment including private sector | -/++/--/+-/+ |
|  |  |  |

Although the categories used in Viet Nam’s integrated plan are not an exact match for the five pillars of the global strategic framework, all elements are present. Viet Nam has also aligned its national plan with the Stepwise Approach to Rabies Control developed by FAO and GARC[[30]](#footnote-30), is the lead country for the ASEAN regional strategy on canine rabies elimination, and, with Indonesia, is also one of the two lead countries for the Zoonotic Diseases Action Package under the GHSA.

## 5.6 Key factors leading to success

Key factors identified for success as described in the global strategic framework include:

* Long term political and social commitment
* Community engagement
* Sustainable vaccination of 70% of the at-risk dog population
* Demonstrate that the system works by starting small and working up (e.g. one to two provinces)
* Promote vaccine banks and other strategies to ensure sufficient supply of vaccines (human and canine) and immunoglobulin
* Reaching remote communities
* Measurement of performance
* Maintain trained and motivated personnel for implementation

## 5.7 Challenges and Constraints

The main constraints for rabies control and elimination in Viet Nam include:

* Limited implementation of existing regulations
* Limited political commitment and funding commitment at provincial levels
* Difficulty in mobilising funds by provincial sub-departments of Agriculture
* Ensuring provincial support for the programme which includes buy in by local authorities
* Limited laboratory capacity for rabies diagnosis (three labs)
* Poor information on dog numbers
* Non-registration of dogs and allowing dogs to roam freely
* Low canine vaccination coverage with only a few districts approaching required coverage levels
* Ensuring sufficient resources to maintain high-level vaccination coverage for a number of years.
* The relatively short life span of dogs in Vietnam that will rapidly reduce population immunity
* Illegal imports of unvaccinated dogs from countries with poorly controlled rabies
* Relatively high awareness about rabies at community level that does not convert to appropriate behaviours
* Low proportion of bites treated with post-exposure prophylaxis which is a function of low community awareness and limited access to PEP

Rural and remote communities face particular challenges in accessing rabies post-exposure prophylaxis which is predominantly available in urban areas[[31]](#footnote-31)

These constraints are linked. The most important constraints relate to ensuring buy in at all levels of the importance of canine virus control and eventual elimination from Viet Nam which, in turn, requires funding for canine vaccination and funds for delivery of PEP at least until the disease is very well controlled in dogs. Rabies vaccination of dogs will be required well beyond the 5-year time frame of this document. A share of the funds will need to be sourced from dog owners to continue this essential control measure beyond 2020 otherwise gains made in control will be lost, especially if neighbouring countries do not control rabies and illegal imports of live dogs from these countries continues to occur.

A review of the program after the first 1-2 years of implementation will identify areas where progress is not being made. Behavioural change programs will need to be carefully monitored and adapted if targets are not being achieved. Ecohealth approaches may be applied, involving local dog owners and other stakeholders, to understand the drivers of existing behaviours and measures that might result in appropriate modifications.

## 5.8 Targets

The current objective of the Vietnam national plan as listed in the summary plan is to strive for eliminating human rabies deaths/cases by 2020[[32]](#footnote-32).

This is an ambitious target given the challenges in sustaining vaccination coverage among canine populations of over 70% unless there is full commitment from all parties and sufficient funds provided by owners for canine vaccination. In other words, rabies may still be only partially controlled in canine populations by 2020, which will mean continued reliance on PEP and PrEP for disease prevention in humans.

WHO has noted that the costs for post-exposure management account for nearly half of the total costs associated with rabies, so cost savings are only anticipated with sustained vaccination coverage among dogs.[[33]](#footnote-33) . However, demand for PEP is unlikely to fall until there is confidence in rabies control measures in dogs, including evidence of very low prevalence, specific information on the vaccination status of dogs that bite and measures in place to monitor dogs that bite, as well as high levels of PrEP in high-risk communities. In addition, because many of the rabid dog cases occur in remote communities not all people bitten by a potentially rabid dog will choose to receive PEP and not all potential rabid dogs will be identified.

Other specific targets are, that by 2020:

* 70% of communes manage dog populations (through implementation of dog population management and responsible dog ownership programs)
* At least 70% of dogs are vaccinated at communal level
* 70% of provinces report no rabies cases in animals
* 20% decrease in human rabies cases annually (best measured using 3 year rolling averages).

## 5.9 Budget

The minimum funding required for rabies control programs in Viet Nam over the next 5 years is approximately USD 24.8 million. This does not include the costs borne by the private sector (PEP for those bitten by potentially rabid dogs and payment for dog vaccination by dog owners which is estimated to be in the order of $40 million to $45 million per annum). Funds from ADB may be available to support supplementary activities such as PrEP in children in high-risk border areas.

|  |  |
| --- | --- |
| What  | Estimate of minimum 5 year funds  |
| One Health approaches (including relevant meetings at local level) | $2.25 millionGoV  |
| Information and communications | $1.86 millionGoV |
| Technical training | $1.34 millionGoV |
| Improved Dog population management | $11.6 millionGoV |
| Strengthening Border controls | $225,000GoV |
| Vaccines for humans and animals (high risk occupations and poor communities) | $3.8 millionGoV |
| Understanding the epidemiology of rabies | $1.44 millionGoV  |
| Strengthen laboratory capacity | $707,000GoV |
| Diagnosis and treatment of human cases | $23,000GoV |
| Scientific research into rabies | $1.5 millionDonors |
| Developing policy and legislation | $150,000GoV |

# 6. One Health approaches to managing antimicrobial resistance

## 6.1 Background

 Antimicrobial resistance (AMR)[[34]](#footnote-34) is a growing concern globally[[35]](#footnote-35) with Asia acknowledged as an “epicentre of antimicrobial resistance”[[36]](#footnote-36). Some of the highest rates of hospital and community-acquired resistant infections in Asia have been reported in Viet Nam3,[[37]](#footnote-37). A paper published in 2013 from Viet Nam suggests that:

*“****Antimicrobial resistance may represent the greatest global threat by an Emerging Infectious Disease issue. Its insidious nature may not have the cachet of SARS, pandemic influenza or Ebola but its impact on public health is likely to be far greater. Like other Emerging Infectious Diseases, drug resistance can quickly spread from one country to another and hence the need for concerted national and international action****.”*[[38]](#footnote-38)

Antimicrobial resistance can arise in any place where there is poorly controlled use of antimicrobial drugs. Management and containment of this problem requires action in human and animal health and environmental sectors to reduce the number of untreatable bacterial infections that now occur both in and out of hospitals and the high levels of resistance in bacteria in animals, especially in livestock farms and aquaculture. Environmental dimensions are also important given the presence of antimicrobial drugs and resistant organisms in human and animal waste water. In addition, many of the same principles of managing AMR can be applied to stewardship of treatments for other infectious diseases such as malaria, viruses and fungi.

## 6.2 Strategic directions

The strategic direction for AMR can be summarised as “use less antimicrobials and use them wisely”

Human actions in health care, livestock production, environmental health and other related areas can either limit or accelerate the development of drug resistant bacteria. Reductions in AMR depend on improved and controlled use of existing drugs through better practices. Infection prevention through enhanced infection control in health care settings and biosecurity/preventive measures on farms and other places where animals are kept are also core components of the response to AMR.

The overall objective of the Vietnam antimicrobial action plan to 2020 is to promote prevention of drug resistance so as to ensure effective treatments for humans are available[[39]](#footnote-39) - *“No action today, no cure tomorrow”*.

## 6.3 Achievements

The major achievements include:

* National, regional and international recognition of the magnitude of the problem and the need to manage and prevent AMR across sectors (MOH, MARD, MOIT, MONRE, WHO, FAO, US-CDC, OUCRU)
* Compilation of initial data on the extent of antimicrobial resistance in the animal and human health sectors and factors likely to be associated with AMR particularly through The Asian Network for Surveillance of Resistant Pathogens (ANSORP)
* Development of a national action plan (Decision No. 2174/QD-BYT, dated June 21, 2013)
* Official guidance on the management of the use of antibiotics in hospitals (Decision No. 772/QĐ-BYT dated March 04, 2016 of the Ministry of Health)
* Establishment of an antibiotic stewardship program in 16 hospitals via the Viet Nam Resistance Project (VINARES) that monitors resistance patterns for hospital acquired infections in intensive care units, tracks antibiotic consumption, and institutes microbiological analyses to guide empiric and specific treatment
* Establishing the National Hospital of Tropical Diseases as the national reference laboratory for AMR and the national reference hospital for antimicrobial stewardship
* Participation in global and regional networks including the Global Antibiotic Resistance Partnership (GARP) which is supporting the establishment of a national reference laboratory for AMR and the implementation of the national action plan for AMR, and the Tokyo Meeting of Health Ministers on Antimicrobial Resistance (April 2016).

Other activities have been conducted including regional work by FAO supported by USAID[[40]](#footnote-40) to understand and document AM use and AMR in livestock production industry, enhance awareness, promote AM stewardship and strengthen capacity in surveillance of AMR and residues in livestock. A network of laboratories is being established to provide AMR surveillance data. Studies on AM use have also been conducted by CIRAD. Other activities from the One Health matrix include:

|  |  |  |  |
| --- | --- | --- | --- |
| APEIR-AMR | IDRC | 2013-16 | Ecohealth |
| Environmental and food reservoirs of AMR organisms | Vlir | 2013-15 | Training, research |
| Molecular epidemiology of AMR Salmonella / Campylobacter | NAFOSTED | 2012-15 | Laboratory, surveillance, research |

## 6.4 Work underway

An integrated effort across a wide range of sectors is required to address AMR. In 2013 Viet Nam became the first country in WHO’s Western Pacific Region to approve a national action plan to combat Drug Resistance. An aide-memoire signed in June 2015 commits the Ministry of Health, Ministry of Agriculture and Rural Development, Ministry of Trade and Industry and Ministry of Natural Resources and Environment (MONRE) to coordinate and jointly implement the national action plan.

The plan requires the formation of an interministerial steering committee chaired by the Minster of Health with five subcommittees covering infection control; treatment; monitoring and inspection of use of AM in health facilities and communities and in farming; logistics; and education and communication. This committee will be required to coordinate with other related national coordination mechanisms related to One Health and the GHSA.

Viet Nam’s AMR action plan contains 6 sub-objectives described below. Provided there is buy-in and support from all involved parties, significant improvements can be made in the way antimicrobial drugs are used within the next 5 years as defined by a number of measurable and meaningful outcomes. Additional information on the extent of the problem is not needed before action is taken - sufficient information is already available to demonstrate there is a problem - although on-going measurement of the extent of the problem should continue as described in sub-objective 2 (AMR patterns in various organisms, and patterns of use in humans and animals).

The first 5 sub-objectives of the AMR action plan are mainly within the remit of the Ministry of Health (MOH), however, key elements of some of these sub-objectives also involve the agriculture sector (for example, surveillance systems on the use of antibiotics and the development of drug resistance). The 6th sub-objective focuses explicitly on antibiotic use in livestock, poultry, aquaculture and cultivation, under the responsibility of MARD.

|  |
| --- |
| **Sub-objectives of the national action plan on combatting drug resistance** 1. **Raise awareness of antimicrobial resistance among the community and health workers**

This important area requires a good understanding of the drivers of existing behaviours. As has been shown with other One Health issues, raising awareness is important but if it does not result in behavioural change then it will not achieve the desired goal. For example, a number of antibiotics cannot be used legally in livestock in Viet Nam yet their use continues, suggesting that farmers see benefits in using these drugs and few disincentives from doing so. This sub-objective also applies to farmers, veterinarians and veterinary paraprofessionals. 1. **Strengthen national surveillance systems on the use of antibiotics and drug resistance**

On-going monitoring needs to be funded. Laboratories currently undertaking this work and those planning to undertake this work need to maintain their capacity to perform the necessary testing using appropriate quality management programmes. In the animal health area, capacity is needed to test for AM in feed, wastewater and tissues as well as for determining resistance patterns of key organisms. Diagnostic services assist in determining whether diseases in animals can be controlled by other means such as vaccination. While it is important to continue (and enhance) surveillance, sufficient evidence is already available to recognise that there is an urgent problem requiring immediate action through behaviour change to reduce demand, enforcement mechanisms to limit poor practices, and supply side measures.1. **Ensure adequate supplies of quality medicines to meet the needs of people**

This applies to both human and animal health. If antimicrobial resistance increases, then it will becomes more difficult to achieve this goal. It has already been reported that the cost of antimicrobial treatments in hospitals is increasing as more expensive drugs are required to replace those that are no longer effective in treating infections.[[41]](#footnote-41) 1. **Promote proper safe use of drugs**

All hospitals are expected to have antimicrobial stewardship programs and the proper use of antibiotics in the community is expected to improve. A review of prescribing practices in Vietnam has led to an urgent call for change[[42]](#footnote-42). 1. **Promote infection control**

Infection control/prevention in hospitals and on farms are both recognised as important elements for reducing the need for antimicrobial drugs and the spread of drug resistant organisms. While some investment is necessary to ensure infection control/farm biosecurity measures are in place, the main outcome is changes in behaviour (e.g. hand hygiene, following approved procedures, good animal husbandry practices, etc.). Over time, the savings from these measures are expected to offset their costs. Vaccination can also be used to prevent many diseases and reduce the need for antimicrobials, and will be promoted. 1. **Promote proper, safe antibiotic use in livestock, poultry, aquaculture and cultivation**

Assessments of farming practices in Viet Nam has already shown that much work needs to be done in changing the behaviour of farmers in the way they use antibiotics. These drugs are freely available, and mostly used as empirical treatments without submission of samples for diagnostic tests. In many ways it will be harder to change patterns of antimicrobial use in animals than in humans. A significant proportion of antimicrobial drugs for humans are used in hospitals where it is (relatively) easier to implement programmes on antimicrobial stewardship. Animals are reared on millions of separate farms and many paraveterinarians rely on antimicrobial drug sales as an important part of their income. During the next 5 years, the use of antibiotics in animals that are critical for treatment of human infections will be assessed. For example, CircularNo.06/2016/TT-BNNPTNT dated May 31, 2016 from MARD defines the list of antibiotics that can be used in animal feed for growth promotion and their maximum concentrations. It applies until December 31, 2017. Review at that time provides an opportunity to modify the list of drugs that can be used for this purpose and also allows for consideration of any adverse consequences of proposed changes, such as increased use for therapy or disease control. The overall goal is to reduce use of antibiotics in animals and to improve controls on antibiotics that are critical for human use.One of the major drivers of improved use of antimicrobial drugs in aquaculture and strengthened enforcement programs has been the requirements of importing countries, rather than produce for local consumption. Resistance to viral infections has also been reported in some parts of the world as a result of illegal use of antiviral drugs in livestock. This area also needs to be examined in Vietnam to ensure these drugs are not being used. |

Support for work on AMR will be provided during the next 5 years from a number of sources including the government, through the GHSA, and other initiatives including the Global Antibiotic Resistance Partnership (as well as disease-specific initiatives such as for tuberculosis, HIV and malaria that fall outside the scope of this plan). The overall goals are to reduce the quantities of antimicrobials used, establish appropriate systems of antimicrobial stewardship, and limit the use in animals of critically important antimicrobials for humans.

Resources are not the major constraint to improve use of antimicrobials. As stated elsewhere it is possible for measures to tackle AMR to be cost neutral[[43]](#footnote-43). Most of the improvements will come from behavioural and system changes. However these changes need full buy-in to the solutions from the highest level of government, in hospitals, in local clinics, pharmacies and veterinary supply stores as well as from the general public and farmers. The experiences with laws and enforcement of laws on motorcycle helmets in Viet Nam provide lessons for programmes on antimicrobial use.

The problem of antimicrobial use in animals is compounded by an absence of a proper identification system for livestock. If an animal is found in a slaughterhouse to have been treated with an illegal antibiotic (through residue testing) it is not possible to trace this back to the farm of origin*.* Given the importance of livestock tracing for food safety, systems of animal identification will be assessed and, if feasible, implementation will commenceby 2020 *(*see Section 7.10*).*

## 6.5 Alignment with existing strategies

WHO has developed a global action plan for antimicrobial resistance, endorsed at the 2015 global assembly, with five objectives:

1. To improve awareness and understanding of antimicrobial resistance through effective communication, education and training;
2. To strengthen the knowledge and evidence base through surveillance and research;
3. To reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures; to optimize the use of antimicrobial medicines in human and animal health;
4. To develop the economic case for sustainable investment that takes account of the needs of all countries, and
5. To increase investment in new medicines, diagnostic tools, vaccines and other interventions.

The WHO action plan highlights “*the need for an effective “one health” approach involving coordination among numerous international sectors and actors, including human and veterinary medicine, agriculture, finance, environment, and well-informed consumers. The action plan recognizes and addresses both the variable resources nations have to combat antimicrobial resistance and the economic factors that discourage the development of replacement products by the pharmaceutical industry*.”

One Health approaches are required because of the need for intersectoral collaboration, because misuse in one sector (e.g. livestock farming) can potentially affect others (e.g. human health) and also because of the considerable behavioural change that will be required to reduce the misuse of these drugs. A One Health approach is needed to protect existing antimicrobials especially given that resistance between bacteria can be transmissible and resistant bacteria in one species can transfer to other species through the environment or food chain. Already the global nature of this problem is evident with certain resistant strains of bacteria being detected in multiple locations around the globe, reviewed in detail elsewhere.

Levels of use of antimicrobials in hospitals are much higher in Vietnam than in European countries (defined doses per bed day) and resistance in a range of organisms in both animal and human pathogens has already been demonstrated including resistance to third and fourth generation cephalosporins and fluoroquinolones and carbapenem. Recent discoveries of colistin-resistance in carbapenem-resistant enterobacteria in a number of countries mean that suitable drugs are not available for treatment of infections with these organisms.

 A regional plan[[44]](#footnote-44) has also been developed that promotes three priorities areas:

1. Strengthen development and implementation of comprehensive national plans to contain AMR and raise awareness in multiple sectors.
2. Improve surveillance of AMR and monitoring of antimicrobial use.
3. Strengthen health system capacity to contain AMR

Under each of these priority areas a number of steps and indicators are provided, with most of the indicators being qualitative.

The Viet Nam national plan contains all of the elements of the global and regional WHO plans.

MOH is the lead agency on human health and use of AM in health care settings with a large number of departments responsible for implementing specific components of the national action plan.

MARD is the lead agency for use of AM in animal production and aquaculture and horticulture.

## 6.6 Key factors leading to success

Behavioural change is key to progress in dealing with AMR. The entire population of Viet Nam is a stakeholder on this issue but special attention needs to focus on those using and prescribing the majority of antimicrobials. This occurs in health care settings and farms. Information is also needed on the quantities and types of antimicrobials being used so that changes in patterns of usage over time can be measured.

## 6.7 Challenges and constraints

The challenges and constraints are well recognised and have been well described, as the following selected extracts from Nguyen et al 2013 demonstrate[[45]](#footnote-45).

*“Patients, physicians, veterinarians, clinics and hospitals, and retailers – from large pharmacies to local drug sellers – have little motivation to weigh the negative impact of their antibiotic use on others, especially those in the future.* ***Policy solutions must alter incentives for patients, physicians and others in the healthcare system to act in society’s best interests****.”*

Many of the laws and processes necessary for sound regulation of the quality and use of drugs have been defined but remain inadequately implemented. Enforcement is still weak and has not achieved its intended objective. This will be an area of development in the next 5 years.

*“There are many barriers preventing effective enforcement of regulations designed to improve antimicrobial stewardship in developing countries: insufficient funding and lack of expertise, human resources and financial incentives. It is important to foresee possible negative consequences of enforcement: financial losses and reduced healthcare access. Accounting for this will improve policy implementation in these settings. Furthermore, it is important to know where to focus regulatory efforts: a focal point too far downstream may create targets too numerous or dispersed for enforcement to be feasible.”*

From a One Health perspective, there is also a challenge in ensuring the full integration of human health, livestock production and environmental health aspects of AMR prevention and control within the overall national approach.

## 6.8 Targets

Activities will be conducted in each of the areas in the national action plan and as a result improvements are expected under each of the six sub-objectives as described in the Summary Plan. A multitude of existing policies and processes provide a ready operational framework for implementation of the national action plan. Indicators for these are being developed.

On the human health side and indicative of the establishment of health care processes for regulating the quality and use of antibiotics, tracking AMR infections and preventing in-hospital infections, the following outcomes are anticipated by 2020:

* Defined measure(s) to track antibiotic consumption and prescribing in tertiary hospitals. For example:
	+ A 50% reduction in the number of defined daily doses/100 bed-days will have been achieved from current levels. Estimates in the national action plan suggest that antimicrobial use in Vietnamese hospitals is around five times that of similar sized facilities in Europe.
	+ A 75% reduction in inappropriate post-operative antibiotic prophylaxis regimens
* Defined measure(s) to track the effectiveness of infection control procedures in tertiary hospitals. For example, a 50% percent reduction in hospital-acquired infections in intensive care units with resistant organisms will be recorded as a result of changes in behaviour and improved infection control. (Current estimates suggest that one in four ICU patients are infected with a hospital-acquired infection and the systems for monitoring this have already been established in large hospitals through the VINARES project.)
* Established national laboratory network of 18+ laboratories with ISO 15189 compliance and accreditation for AMR surveillance

Under the six components of the national action plan the following targets have been set:

|  |  |
| --- | --- |
| Area | Targets  |
| 1.Raise awareness | 1.Compile documents for training2.Develop IEC materials3.Organise communications activities4.Assess knowledge of the community about AMR |
| 2. Surveillance system | 1.Building appropriate laboratories including reference laboratories for animal health - National Center for Veterinary Hygiene and Inspection – and human health – The National Hospital for Tropical Diseases2.Quality management systems for laboratories (30 + labs)3.Establish surveillance systems4.Curriculum development for tertiary institutes5.Continuing education for clinical microbiology lab staff6.Develop cooperative programs with overseas institutions7.Develop a database of antibiotic use and antibiotic resistance (*human and animal)* |
| 3. Supply quality drugs | 1.Update documents listing essential medicines 2.Invest in production/supply of quality drugs at reasonable prices3.Implement management systems for ensuring drug quality  |
| 4.Safe use of drugs | 1. Develop documents regulating rational antibiotic treatment2. Conduct training on good prescribing practice and pharmacy practice3. Improve capacity of Council of Drugs and Treatment4. Monitor and supervise safe use of drugs5. Develop and use training material on clinical pharmacy practice |
| 5. Strengthen infection control | 1. Improve documents on infection control2. Provide continuing education on and monitor infection control 3. Promote monitoring system for infection control4. *Enhance farm biosecurity measures and promote GAHP* |
| 6. Safe use of drugs in animals (livestock, poultry, aquaculture) | 1. Develop manuals on prescribing and use of antibiotics in animals2. Develop a list of permitted antibiotics for animals3. Prescribe and enforce residue limits4. Establish monitoring systems for appropriate use of antibiotics*5.* Enhance control on discharge from farms that will contain AM and resistant bacteria (MONRE) |

## 6.9 Budget

The minimum funds required for work on AMR using One Health approaches over the next 5 years is estimated to be in the order of $20 million. Funding is expected to come from government, the GHSA funding envelope, ADB and other partners. Budgets for individual components are being developed under the GHSA Roadmap.

# 7. One Health approaches to managing other zoonotic diseases

## 7.1 Background

A wide range of other zoonotic diseases occurs in Viet Nam. *Streptococcus suis*, leptospirosis and anthrax are included in Inter-ministerial Circular 16/2013 (along with avian influenza (H5) and rabies). A One Health perspective can help reduce the burden of illness from these diseases. The main diseases are listed in Table 7.

**Table 7 Other zoonotic diseases (excluding influenza and rabies)**

|  |  |
| --- | --- |
| Disease | Comments |
| *Streptococcus suis* | Circular 16 disease Some disease due to occupational exposure, consumption of raw pork or pig blood, but some with no known exposure to pork[[46]](#footnote-46)  |
| Leptospirosis | Circular 16 diseaseNo evident occupational risk but higher risk in rural communities. High prevalence of exposure in rats in southern Vietnam. |
| Anthrax | Circular 16 disease Localised outbreaks associated with consumption of animals that died from anthrax |
| Brucellosis | Need to monitor given high levels in region, expansion of dairy sector and high volume of trade in live cattle with neighbouring countries.  |
| Other | A range of other zoonotic agents occur or have occurred and could re-emerge. Most are associated with individual cases of disease rather than outbreaks |

***Streptococcus suis*** causes meningitis and, occasionally, streptococcal toxic shock in humans. It is carried by many healthy pigs, though can also cause severe disease in pigs including septicaemia, meningitis and endocarditis. Most human cases are associated with butchering of pigs or pig meat and also with consumption of raw or undercooked pork products, including raw pig blood[[47]](#footnote-47). A possible association between Porcine Reproductive and Respiratory Syndrome (PRRS) outbreaks in pigs and increased human cases of disease caused by *Streptococcus suis* has been reported in Viet Nam[[48]](#footnote-48). This association suggests that control of non-zoonotic epidemic diseases of swine may help to prevent zoonotic diseases. Local research has demonstrated the difficulties in changing attitudes and practices towards consumption of raw pig blood through behavioural change communication and regulation[[49]](#footnote-49). Nevertheless, there is a need to continue developing appropriate information for school curricula on the risk of infectious diseases (*Streptococcus suis* and other food-borne pathogens) with consumption of raw pork and pork blood including consumption of products from animals that appear healthy. Vaccines against *Streptococcus suis* are still some years away.

**Leptospirosis** has been examined in a number of studies in Viet Nam[[50]](#footnote-50) and the region but additional work is required to understand the disease and to determine the extent to which it occurs. It is under-recognised given it is difficult to diagnose both clinically and in the laboratory. Much of the disease appears to be water-borne and linked to heavy rainfall and flooding, but our knowledge about the risks associated with disease is incomplete. Climate change has the potential to increase the range and the risk of leptospirosis in Viet Nam. Livestock, pets and wild animals (especially rats) appear to be the main reservoirs for leptospires but the links between animals and humans is not always direct.

**Anthrax** has caused 413 human reported cases and three deaths in northern Vietnam between 2006 and 2011 and occasional outbreaks continue. All cases have been linked to slaughtering/eating dead ruminants.[[51]](#footnote-51) In areas where the disease is known to occur, vaccination for livestock will be used and combined with communication campaigns about the importance of not consuming dead ruminants.

Other zoonotic diseases also occur in Viet Nam:

* **Japanese encephalitis** (JE) is a locally important cause of encephalitis especially in children and is associated with spillover of virus from either swine or wild birds. It is an epidemic-prone disease that can be controlled through increasing and sustaining vaccine coverage of a locally produced vaccine among eligible children with possible catch up of older age groups depending on the epidemiology of the disease[[52]](#footnote-52). Currently, the national immunisation schedule includes 2 doses of JE vaccine (separated by 2 weeks) when a child is 12 months of age, and a 3rd dose when the child is 2 years old (vaccination of pigs is not recommended because of the difficulties associated with obtaining high level herd immunity given the rapid rate of turnover). Studies will continue to determine the major causes of encephalomyelitis in humans in Viet Nam building on those undertaken in the past. The data from these studies will help to guide JE vaccination strategies, detect any antigenic variants and identify other pathogens.
* **Murine typhus**[[53]](#footnote-53) also occurs as a source of rat-borne disease transmitted by fleas and is controlled through both rodent and flea control. These activities will continue.
* Other zoonotic diseases that cause problems in other parts of Asia - and probably exist in Viet Nam but are rarely diagnosed - include **brucellosis**[[54]](#footnote-54) and **bovine tuberculosis**. The marked increase in size of the dairy sector could result in an increase in one or both of these diseases, although it is highly likely (based on testing) that imported dairy cattle and their progeny on large farms are free from infection. Nevertheless, there is considerable trade in other cattle in Viet Nam some of which move over long distances from other countries in the region and are only held in Viet Nam temporarily. Large markets provide opportunities for spread of these diseases. Brucellosis has become an important zoonotic disease in China, another country that has rapidly expanded its dairy sector. **Plague** caused by *Yersinia pestis* has not been diagnosed in Viet Nam for over 10 years but caused epidemics in the past. **Q fever** could occur in areas with high populations of goats.
* **Zika virus,** while not strictly within the framework of this plan as discussed in the Introduction was originally a virus of zoonotic origin. It has emerged as a serious cause of human disease in South and Central America, the Caribbean and French Polynesia, affecting foetal development and associated with **Guillian**-Barre syndrome in some cases. Zika virus is present in Viet Nam, demonstrating the capacity of local mosquito populations to transmit the virus but the disease associated with local strains is generally mild. Studies will continue to characterise local viruses to define whether there is a local host animal population (See Focus Area 3) and to compare local strains with those from the Americas. Special attention will be paid to the capacity of local strains to cause disease during foetal development. If a strain of virus similar to that found in the Americas is detected in Viet Nam and is transmitting locally this would be handled as an emergency using capacity built for emergency disease management (see Focus Area 2).

## 7. 2 Strategic directions

Application of One Health approaches for control, prevention and management of existing zoonotic diseases

## 7.3 Achievements

The main achievements on these zoonotic diseases include conducting of research (see 7.1) and development of guidance on directions for future work.

## 7.4 Work underway or planned

Work is expected to be conducted in the following areas for the following diseases

|  |  |
| --- | --- |
| Disease | Area |
| Leptospirosis | Additional researchPublic awarenessInteragency coordination/Circular 16 including case investigations |
| *Streptococcus suis* | Additional research Public awarenessInteragency coordination/Circular 16 including case investigations |
| Anthrax | VaccinationPublic awarenessInteragency coordination/Circular 16 including case investigations |
| Brucellosis/tuberculosis | Additional research including risk assessment of imported cattle Management of major cattle market Diagnostic tests and reagents (surveillance) |
| Japanese encephalitis  | Human vaccinationCase investigationsPublic awareness |
| Other zoonotic diseases  | Public awarenessEmergency contingency for severe disease outbreak |

## 7.5 Alignment with other programs

APSED will continue during this period and activities will be aligned with this program. The GHSA has action packages that encompass these diseases including the immunisation action package.

## 7.6 Key factors leading to success

The main factors that result in success in managing zoonotic diseases are good surveillance and case detection systems including laboratories capable of conducting appropriate tests for these diseases. It is critical to involve stakeholders in the development of appropriate disease control strategies. Vaccinations exist for some of these diseases and need to be implemented in accordance with agreed schedules with appropriate properly stored vaccines.

## 7.7 Challenges and Constraints

The major challenges and constraints for control and prevention of these diseases include:

* Under-reporting or under-ascertainment of diseases
* Lack of familiarity with requirements of Circular 16 especially at lower levels
* Resources for One Health approaches to these diseases
* Difficulties in changing behaviours

## 7.8 Targets

The main targets are provided in the Summary Plan.

Over the next 5 years the following targets are expected:

* Ensure implementation of Circular 16 at all levels with reporting of all cases in the human and animal sector to both the MOH and MARD as well as their local counterparts
* Additional research to further define the extent of these diseases and to develop appropriate control and preventive measures, building on work already undertaken
* Communications to ensure awareness about leptospirosis for communities and the medical profession
* Improved diagnostic capacity for leptospirosis in human and animals
* Continued increase in the coverage of JE vaccine for children eligible under the National Immunisation Schedule with reductions in the number of human cases of Japanese encephalitis
* Risk assessment on brucellosis from trade in ruminants from neighbouring countries

## 7.9 Budget

The estimated minimum cost for activities on other zoonotic diseases is $5 million over the next 5 years. This figure does not cover the cost of treatment of human cases

## 7.10 Foodborne diseases from animal products

### 7.10.1 Background

Foodborne diseases resulting from the presence of pathogenic organisms or toxic chemicals in/on food of animal origin are an important cause of morbidity and less commonly mortality in Viet Nam. The range of diseases and agents involved in Viet Nam has been reviewed[[55]](#footnote-55) and bacterial foodborne diseases were ranked in the top five conditions that should be prioritized for action based on disease severity, outbreak potential and public attention[[56]](#footnote-56).

As a rule, reported cases of food poisoning represent only a small proportion of all cases. Contamination can occur anywhere along the chain from farm to consumer and some of the risks are mitigated through processing, including cooking. Fragmentation of the livestock sector into millions of producers with consequent difficulties in identifying individual poultry and pigs inhibit efforts to improve traceability. Nevertheless, aquaculture products destined for export *are* traceable and demonstrate that viable systems can be developed to improve food safety.

Many of the measures implemented to prevent food-borne diseases of animal origin will have significant effects in containing and controlling other diseases. For example, residues of antimicrobial drugs have been implicated in the development of antimicrobial resistance[[57]](#footnote-57) as well as being potentially harmful to humans exposed to excessive levels. Methods used to test for residues in pigs at slaughter require a tracing system back to the farm of origin. Similar methods are also required for other chemicals such as illegal use of beta-agonists, including salbutamol and clenbuterol.

At present, foodborne diseases are managed through other mechanisms including the Food Safety Network to which the One Health Partnership secretariat contributes. Therefore, they are not included as a core element of the 2016 – 2020 zoonotic disease One Health plan and are not dealt with in detail in this document. The One Health Partnership can, however, facilitate inter-ministerial action on foodborne diseases of animal origin and can help prevent duplication of activities in areas such as animal identification systems and the development and application of good animal husbandry practices[[58]](#footnote-58) which are also needed for the control of other zoonotic diseases. There is a common interest in improving aspects of transport, slaughter, handling and marketing for prevention of emerging infectious diseases and foodborne disease.

Food safety in Viet Nam is recognised as a major issue by the public and is an area in which major actions are expected to be taken in the next five years. Both the immediate effects of acute foodborne illness and the long-term effects of consumption of products that contain excess levels of persistent organic pollutants or other chemicals are of concern to the general public.

Among the important foodborne bacterial pathogens are non-typhoidal Salmonella, *Campylobacter* spp, verotoxigenic *Escherichia coli* and *Listeria* spp. A range of parasites are also foodborne, including toxoplasma, cysticercosis/taeniasis, trichinellosis and trematodes from fish.

The law on Food Safety was passed in 2011 with responsibility for animal products largely delegated to MARD.

Importing countries (e.g. EU requirements for animal products)[[59]](#footnote-59) also play a role in driving food safety standards as has been seen with aquaculture products. This can be used as a major driver for improving food quality especially if these same procedures are used for local products. Much of the work on improving food safety requires behavioural change and it is necessary to involve stakeholders in developing appropriate solutions. In addition, major food companies also have quality management systems in place to ensure that products supplied in restaurants and supermarkets do not pose a risk to consumers. This expertise should be utilised.

One Health approaches are gradually being implemented on food safety issues in Viet Nam and elsewhere.

The Codex Alimentarius Commission, the body that sets standards for food, embodies the One Health approach. It was established by FAO and WHO to develop an international food code aimed at ensuring safe produce.

### 7.10.2 Work underway

A number of agencies are involved in prevention and management of foodborne diseases from animal products in Viet Nam. A World Bank project includes a major food safety component (LIFSAP) and has introduced improvements to markets and slaughter points to reduce the risk of foodborne pathogens. This project also supports the introduction of good animal husbandry practices. In January 2016 a meeting was held at the World Bank in Viet Nam to assess the critical gaps and issues on food safety in Viet Nam as the first step towards a formal risk assessment.

FAO and WHO are supporting the GoV in review of the food safety law to assess the implications of the law across multiple sectors; the review will be completed by 2019.

The following extract from a report on a meeting on food safety issues highlights the range of stakeholders involved in food safety.

 “*The Food Safety Working Group (FSWG) is an initiative to bring key Government Agencies/Line ministries and development partners (DPs) together for joint policy dialogue and discussions on food safety issues in Viet Nam. It was created at the request of, and convened under the auspices of, the Deputy Prime Minister Vu Duc Dam at a meeting in June 2015 chaired by DPM Dam and benefits from the active participation of Office of Government (the designated focal point of coordination), Ministry of Health (MOH), Ministry of Agriculture and Rural Development (MARD), Ministry of Industry and Trade (MOIT) from the Government side and of the Food and Agriculture Organization (designated focal point among development partners), Asian Development Bank (ADB), Canadian Embassy, JICA, New Zealand Embassy, and the World Bank.*”

Meetings of the FSWG in January and March 2016 included participants from various departments and institutes within MARD including the National Ago-Forestry-Fisheries Quality Assurance Department (NAFIQAD), representatives from FAO, WHO, and the Ministry of Industry and Trade, One Health Partnership, the private sector, ADB, World Bank and various donor countries.

### 7.10.3 Challenges and Constraints

* The biggest constraint is the fragmentation of the livestock sector into millions of small farms, poor traceability and limited capacity for testing.
* Food handling practices from slaughterhouse through markets to final preparation by and for consumer (including the absence of appropriate refrigeration) provide conditions for pathogens to multiply in meat.
* The lack of enforcement results in use of chemicals that should not be employed in food animals.
* Persistent environmental contaminants are present in animal products from certain areas

### 7.10.4 Targets

As described in the Summary Plan by 2020, it is expected that systems for identification of food animals going to slaughter will have been examined for feasibility, such as a tattoo system for pigs, to allow traceability of pigs and carcasses back to farms or traders.

A risk assessment on food safety will have been completed highlighting areas where improvements to food safety are required and can be made.

# Appendix 1

## Table A1.1 List of selected One Health activities from 2005-2020 by disease focus

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Disease focus | Title | Donor | Period | Theme |
| AMR | APEIR-AMR | IDRC | 2013-16 | Ecohealth |
|  | Environmental and food reservoirs of AMR organisms | Vlir | 2013-15 | Training, research |
|  | Molecular epidemiology of AMR Salmonella / Campylobacter | NAFOSTED | 2012-15 | Laboratory, surveillance, research |
| Avian influenza | H5N1 avian vaccine | MOST | 2013-18 | Vaccine production |
|  | Surveillance for AI | USAID | 2013-15 | Coordination, research, surveillance, training,  |
|  | REVASIA – evaluation of AI surveillance systems | France | 2009-15 | Surveillance, research, training, coordination |
|  | H7N9 outbreaks | USAID | 2010-14 | Biosecurity, training |
|  | Emergency preparedness for HPAI | USAID | 2007-14 | Preparedness, surveillance, response |
|  | Address risks of AI | FAO, USAID | 2013 | Biosecurity, surveillance |
|  | APEIR-CM (HPAI) | USAID | 2008-11 | Surveillance, control |
|  | GETS - vaccination strategies for HPAI | USAID | 2009-11 | Response |
|  | GRIPAVI - epidemiology/ecology of HPAI | France | 2007-11 | Research, training, coordination |
|  | Joint Vietnam-UN program for HPAI | Multiple | 2006-10 | Coordination, Response, Preparedness, Behaviour change |
|  | AI behaviour change communication | FHI360 | 2005-09 | Behaviour change, Training |
|  | AI BCC support activity | USAID |  | Behaviour change, Training, Advocacy |
| Influenza | Surveillance / characterization of influenza viruses posing risks for next pandemic | USAID | 2012-15 | Surveillance, research, training, coordination |
|  | EPT+ | USAID | 2012-14 | Surveillance, coordination |
|  | USAID Avian and Pandemic Influenza Initiative | USAID | 2009-13 | Surveillance, disease control, preparedness, training, biosecurity |
|  | Viet Nam Avian and Human Influenza Preparedness Project (VAHIP) | GoV, Japan, WB | 2007-13 | Control, preparedness, training, coordination |
|  | VN-VAHIP | WB | 20011- | Control, preparedness, training, coordination |
|  | Vietnam Influenza Program | CDC | 2005-09 | Training, surveillance, diagnostics |
| EIDs | Regional capacities for the prevention, control and eradication of HPED | EC | 2013-17 | Coordination, Education and Training, Research |
|  | APEIR | USAID | 2010-16 | Research, surveillance, Ecohealth, coordination |
|  | APSED | WHO | 2010-16 | Systems |
|  | Strengthening capacity for OH implementation in Viet Nam | USAID | 2013-15 | Coordination, communications |
|  | GREASE Research network for emerging epidemic risks | Members, CIRAD | 2012- | Research, coordination |
|  | IMCAPI 2010 | USAID | 2009-11 | Advocacy, conference, communications |
| Neglected diseases | Research capacity for neglected diseases | Japan | 2012-14 | Research, surveillance, diagnosis, laboratory |
| Non-specific | Field Building Leadership Initiative | IDRC | 2012-17 | Research, training, Ecohealth |
|  | Enhance the research capacity on emerging diseases - ERID | Nagasaki University | 2011-16 | Coordination, research |
|  | IHR | WHO | 2010-16 | Systems |
|  | A-AVET | USAID | 2013-14 | Training |
|  | Food and Agricultural Products Quality Development and Control | CIDA | 2008-14 | Prevention, biosecurity, surveillance, training, research, production |
|  | IDENTIFY | USAID | 2010-14 | Laboratory capacity |
|  | RESPOND -VOHUN | USAID | 2010-14 | Coordination, Education and Training, Research |
|  | LIFSAP | WB | 2010-14 | Food safety, Biosecurity |
|  | KMP-API | USAID | 2012-13 | Coordination, management, policy |
|  | Global health security capacity | PEPFAR | 2013 | Detection, response, laboratory |
|  | Animals, water & public health | IDRC | 2012-13 | Ecohealth, research |
|  | AVET | USAID | 2009-13 | Training |
|  | FETP | USAID, CDC, WHO | 2008-13 | Training, research |
|  | BECA | IDRC | 2010-12 | Research, Ecohealth, policy |
|  | Four-way linking project for health risks at human-animal interface | WHO | 2011 | Laboratory, detection, coordination |
| Rabies | ASEAN Rabies |  | 2015-20 | Regional strategy |
|  | Rabies transmission from neighbouring countries | NAFOSTED | 2015-17 | Surveillance, laboratory, research |
|  | Institutional and inter-sectoral strengthening for rabies control  | AusAID | 2014-15 | Surveillance, control, communications |
|  | National Program on Rabies prevention & control | GoV | 2011-152016-20 | Response, behaviour change, coordination |
|  | Partnership on global animal health and biosecurity | DRAFF | 2009-13 | Prevention, Risk reduction, Communication, Training |
| Strep. suis | OUCRU – S.suis | Wellcome | 2012-15 | Research |
| Swine diseases | PigRisk | ACIAR | 2012-17 | Production - value chains, Research |
|  | SWEID – surveillance on swine emerging diseases | NIH, HKU, AIRD | 2013-17 | Surveillance, research, training, coordination |
|  | Eco-EID (poultry production) | USAID | 2011-14 | Ecohealth, Research, production |
|  | Hygienic practices of small-scale poultry slaughterhouses  | ICDRC | 2012-13 | Training, Research, Production - slaughterhouses |
| Wildlife diseases | PREDICT | USAID | 2010-14 | Research, Surveillance and laboratory |
|  | PREVENT | AusAID, USAID | 2010-14 | Detection, Risk reduction, Biosecurity, Training, Research, Behaviour change |
| Zoonoses | GHSA Zoonotic disease action package | CDC, USAID | 2015-20 | Surveillance, detection, preparedness, response, training, policy |
|  | Study at human-animal interface for influenza and zoonotic diseases | CDC | 2012-17 | Surveillance, research |
|  | Impacts of livestock intensification on community health - ECOMORE | AFD | 2013-16 | Surveillance, detection, preparedness, response, training |
|  | VIZIONs | Wellcome | 2012-16 | Research |
|  | Circular 16 | USAID, UN joint plan | 2015 | Response, coordination, surveillance |
|  | Eco-EID (eco-bio-social approaches to EIDs including vector-borne, zoonoses) | ICDR | 2012-14 | Ecohealth, research |
|  | EcoZD – leptospirosis | ICDR-EcoZD | 2008-13 | Ecohealth, research |

1. Strengthening Capacity for the Implementation of One Heath in Viet Nam. State management of captive wildlife in relation wildlife health and the risk of interspecies and zoonotic disease transmission. Report commissioned by the One Health Partnership for Zoonoses Secretariat Office, MARD. 2015 [↑](#footnote-ref-1)
2. OiE PVS reports: [2006](http://www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/pdf/FinalReport-Vietnam.pdf), [2010](http://www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/pdf/PVSFollowUpReport-Vietnam.pdf) [↑](#footnote-ref-2)
3. See GHSA Roadmap available at <https://ghsagenda.org/docs/Vietnam-GHSA-5-year-RoadMap-2015.pdf> [↑](#footnote-ref-3)
4. <http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf> [↑](#footnote-ref-4)
5. Page xxvii, International Bank for Reconstruction and Development/The World Bank and the Ministry of Planning and Investment of Viet Nam. Vietnam 2035: Toward Prosperity, Creativity, Equity and Democracy. 2016. [↑](#footnote-ref-5)
6. Strengthening Capacity for the Implementation of One Heath in Viet Nam. State management of captive wildlife in relation wildlife health and the risk of interspecies and zoonotic disease transmission. MARD. 2015 [↑](#footnote-ref-6)
7. 11th Vietnam Communist Party Congress: “striving by 2020 to fundamentally transform Vietnam into a modern industrialized country 2020” [↑](#footnote-ref-7)
8. Health Partnership Group (2011). Joint Annual Health Review 2011. Strengthening management capacity and reforming health financing to implement the five-year health sector plan 2011–2015. Viet Nam Ministry of Health. Ha Noi [↑](#footnote-ref-8)
9. Although the Ebola virus disease outbreak in West Africa affected three nations severely and caused considerable concerns about the poor response to the outbreak in those countries, the nature of the causative agent meant that it could be prevented even if some cases are imported. None of the seven other countries that had imported cases experienced extensive outbreaks [↑](#footnote-ref-9)
10. Compared to other diseases [↑](#footnote-ref-10)
11. SARS was responsible for far fewer human deaths than the 2009 H1N1 pandemic, despite the latter often being described as a ‘mild’ pandemic. [↑](#footnote-ref-11)
12. https://www.usaid.gov/sites/default/files/documents/1864/EPT2-Narrative-508.pdf [↑](#footnote-ref-12)
13. The full range of achievements through EPT’s Predict project in Viet Nam are available here http://www.vetmed.ucdavis.edu/ohi/local\_resources/pdfs/chapters/35\_predict\_vietnam.pdf [↑](#footnote-ref-13)
14. See http://www.usaid.gov/what-we-do/global-health/pandemic-influenza-and-other-emerging-threats/programs/extractive-industry-engagement and http://www.chathamhouse.org/about/structure/global-health-security/extraction-industry-infectious-disease-risk-assessment-and-management-idram-project [↑](#footnote-ref-14)
15. http://www.rr-asia.oie.int/fileadmin/Regional\_Representation/Programme/JTF\_One\_Health/2015\_6th\_Tripartite\_Sapporo/Presentations/11.\_JRA\_on\_Zoonotic\_influenza\_WONGSATHAPORNCHAI.pdf [↑](#footnote-ref-15)
16. http://www.who.int/foodsafety/about/flyer\_zoonoses.pdf?ua=1 [↑](#footnote-ref-16)
17. There have been few human cases of H5 avian influenza due to Clade 2.3.2.1c which has been the dominant strain in the past few years and despite being widespread and poorly controlled in China there have only been 16 cases of Clade 2.3.4.4 Influenza A(H5N6) to end-April 2016, despite circulating for several years. Given the differences in population (both human and avian) between China and Vietnam the expectation is that there would be few H5N6 human cases in Viet Nam. Scientific studies on Clade 2.3.4.4 viruses demonstrate lower pathogenicity for mammals. [↑](#footnote-ref-17)
18. it is noteworthy that H5N1 virus was first detected in China in 1996 but the first human cases of disease in Viet Nam did not occur until 7 years later. [↑](#footnote-ref-18)
19. H5 AI viruses generally cause disease in infected chickens but infection can occur silently in domestic ducks and in poultry markets. Active surveillance is needed for all avian influenza viruses – passive surveillance systems will not detect a significant proportion of cases. [↑](#footnote-ref-19)
20. http://www.ncbi.nlm.nih.gov/pubmed/26711995 [↑](#footnote-ref-20)
21. http://elifesciences.org/content/5/e12217v1 [↑](#footnote-ref-21)
22. http://www.ncbi.nlm.nih.gov/pubmed/27138550 [↑](#footnote-ref-22)
23. When an exporting country makes a claim of disease freedom based on surveillance results, importing partners must have confidence that the claim is valid and that the surveillance has been carried out in such a way as to meet certain basic requirements. (Cameron 2012). This means that the demands for surveillance for disease freedom are usually greater than routine surveillance [↑](#footnote-ref-23)
24. This can occur with ducks given one dose of vaccine [↑](#footnote-ref-24)
25. The current plan for 5 years which will not achieve freedom is costed at $38 million. To achieve freedom while the current production systems in place would require a major test and slaughter programme for duck flocks that could result in the destruction of 20 to 30 million head of ducks and other poultry [↑](#footnote-ref-25)
26. There is a possibility of under-reporting See http://www.who.int/wer/2016/wer9102.pdf [↑](#footnote-ref-26)
27. Circular No. 16/2013/TTLT-BYT-BNN dated on 27 May 2013. [↑](#footnote-ref-27)
28. http://www.fao.org/vietnam/news/detail-events/en/c/409842/ [↑](#footnote-ref-28)
29. http://www.ncbi.nlm.nih.gov/pubmed/26895745 [↑](#footnote-ref-29)
30. http://caninerabiesblueprint.org/IMG/pdf/stepwise\_approach\_toward\_rabies\_elimination\_sept\_2014.pdf [↑](#footnote-ref-30)
31. Nguyen TH (2013). Rabies in Vietnam: Situation, Challenges and Prevention Strategies. Presentation given at the 9th Asian Rabies Expert Bureau Meeting cited in www.who.int/rabies/epidemiology/Rabies\_CP\_Vietnam\_09\_2014.pdf [↑](#footnote-ref-31)
32. By 2017 it may be necessary to review and revise this goal perhaps to aim for no human cases in a smaller number of high risk provinces in which pilot programmes are well implemented with strong provincial and district support, and to revert to the strategic vision of the OIE/WHO global framework of year 2030 for no human cases. It is noteworthy that Thailand, despite its marked reduction in canine rabies cases over the past 10 years is yet to achieve the target of no human cases. [↑](#footnote-ref-32)
33. Rabies vaccines: WHO position paper. Weekly epidemiological record. No. 32, 2010, 85, 309–320 [↑](#footnote-ref-33)
34. The broad term antimicrobial resistance is used in this document to cover changes in resistance patterns in all classes of micro-organisms to drugs used in treatment and prevention. However the main focus for the One Health approach is resistance in bacteria. [↑](#footnote-ref-34)
35. See http://www.princeton.edu/pei/news/S1473309913703189-main.pdf [↑](#footnote-ref-35)
36. Kang C-I, Song J-H. Antimicrobial Resistance in Asia: Current Epidemiology and Clinical Implications. Infection & Chemotherapy. 2013;45(1):22-31. doi:10.3947/ic.2013.45.1.22. [↑](#footnote-ref-36)
37. Kim SH, Song J-H, Chung DR, et al. Changing Trends in Antimicrobial Resistance and Serotypes of Streptococcus pneumoniae Isolates in Asian Countries: an Asian Network for Surveillance of Resistant Pathogens (ANSORP) Study. Antimicrobial Agents and Chemotherapy. 2012;56(3):1418-1426. doi:10.1128/AAC.05658-11. [↑](#footnote-ref-37)
38. [Nguyen et al 2013](http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-13-1158) [↑](#footnote-ref-38)
39. It is also important to have appropriate drugs available for animals [↑](#footnote-ref-39)
40. (OSRO/RAS/502/USA) [↑](#footnote-ref-40)
41. See Nguyen et al 2013 [↑](#footnote-ref-41)
42. See Nguyen et al 2013 [↑](#footnote-ref-42)
43. Nguyen et al 2013 [↑](#footnote-ref-43)
44. http://www.wpro.who.int/entity/drug\_resistance/documents/action\_agenda.pdf?ua=1 [↑](#footnote-ref-44)
45. See also Table 2 in [Nguyen et al](http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-13-1158) 2013 for more information on constraints that need to be overcome [↑](#footnote-ref-45)
46. http://cid.oxfordjournals.org/content/46/5/659.full [↑](#footnote-ref-46)
47. <http://cid.oxfordjournals.org/content/48/5/617.long>, [↑](#footnote-ref-47)
48. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4697300/ [↑](#footnote-ref-48)
49. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4214319/ [↑](#footnote-ref-49)
50. <http://www.ncbi.nlm.nih.gov/pubmed/10326104>

<http://www.ncbi.nlm.nih.gov/pubmed/25629781> [↑](#footnote-ref-50)
51. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3938847/ [↑](#footnote-ref-51)
52. http://www.ncbi.nlm.nih.gov/pubmed/25995736 [↑](#footnote-ref-52)
53. http://www.ncbi.nlm.nih.gov/pubmed/25778504 [↑](#footnote-ref-53)
54. http://www.rr-asia.oie.int/fileadmin/Regional\_Representation/Programme/Emerg/2014\_Brucellosis\_Chiang\_Mai/15.Vietnam.pdf [↑](#footnote-ref-54)
55. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3938847/ [↑](#footnote-ref-55)
56. http://www.jidc.org/index.php/journal/article/view/26719937 [↑](#footnote-ref-56)
57. Residues probably play a lesser role than resistant organisms on or in food of animal origin [↑](#footnote-ref-57)
58. http://www.worldbank.org/en/results/2016/04/14/vietnam-better-food-safety-and-production-efficiency-with-good-animal-husbandry-practices [↑](#footnote-ref-58)
59. http://ec.europa.eu/food/fvo/act\_getPDF.cfm?PDF\_ID=10116 [↑](#footnote-ref-59)