A Global Strategy for the Progressive Control of Highly Pathogenic Avian Influenza (HPAI)

Food and Agriculture Organization (FAO, Rome)
World Organisation for Animal Health (OIE, Paris)
in collaboration with
World Health Organization (WHO, Geneva)

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LIST OF ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AGAH	Animal Health Service of FAO
AGID	agar gel immunodiffusion
AI	avian influenza
APAARI	Asia Pacific Association for Agriculture Research Institutes
APHCA	Animal Production and Health Commission for Asia and the Pacific
ARIs	advanced research institutions
ASEAN	Association of Southeast Asian Nations
ASEAN+3	Association of Southeast Asian Nations plus PR China, Japan and Republic of Korea
BSE	bovine spongiform encephalopathy
CSF	classical swine fever (also known as hog cholera)
DIVA	differentiation of infected from vaccinated animals
DPR	Democratic People's Republic
EA	East Asia
ECTAD	Emergency Centre for Transboundary Animal Diseases
ELISA	enzyme-linked immunosorbent assay
EMPRES	emergency prevention system
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
GF	global framework
GF-TADs	global framework for progressive control of transboundary animal diseases
GLEWS	global early warning systems
GREP	Global Rinderpest Eradication Programme
HPAI	highly pathogenic avian influenza
JSDF	Japan Social Development Fund
FMD	foot-and-mouth disease
IAEA	International Atomic Energy Agency
IDA	International Development Association
NARES	national agricultural research and extension systems
NGO	non-governmental organization
OFFLU	OIE/FAO Network for avian influenza expertise
OIE	World Organisation for Animal Health (Office International des Épizooties)
PCR	polymerase chain reaction
PDR	People's Democratic Republic
PPE	personal protective equipment
PR China	People's Republic of China
RAP	Regional Office for Asia and the Pacific
RT-PCR	reverse transcriptase polymerase chain reaction
SA	South Asia
SAARC	South Asian Association for Regional Cooperation
SAR	Special Administrative Region
SARS	severe acute respiratory syndrome
SEA	Southeast Asia
TADs	transboundary animal diseases
TCP	technical cooperation project
UK	United Kingdom
USAID	United States Agency for International Development
WB	World Bank
WHO	World Health Organization
WTO	World Trade Organization

FOREWORD

This draft document entitled *Global Strategy for the Progressive Control of Highly Pathogenic Avian Influenza* was produced in response to the recommendation made during the 2nd FAO/OIE Regional Meeting on Avian Influenza Control in Asia (23-25 February 2005) held in Ho Chi Minh City, Viet Nam. The recommendation that 'a master coordination plan be prepared with a global vision defining the road map and time frames for the short, medium and long term priority activities, to be endorsed and supported by individual countries and regional organizations' was very much stimulated by the worsening crisis of highly pathogenic avian influenza in Southeast Asia causing an increasing number of deaths in human beings.

FAO and OIE, within the umbrella of the global framework for the control of transboundary animal diseases (GF-TADs), and in collaboration with WHO have taken the initiative to develop this draft strategy paper. The document was prepared in consultation with key partners from Asia following a meeting in the FAO's Regional Office for Asia and the Pacific, Bangkok between 17 and 18 May 2005, and provides vision and goal towards diminishing the risk of avian influenza to humans and poultry. It also provides approaches and implementation plans for the control of avian influenza. This document represents a first step in the elaboration of a global strategy for the control of highly pathogenic avian influenza. Because of the seriousness of avian influenza in Asia, the current strategy focuses on Southeast Asia, East Asia and South Asia as priority areas for intervention. It is intended that other regions in Asia, Africa, Americas and Europe will also be covered in due time through a series of consultations to make the strategy truly global.

The strategy paper will be consolidated and complemented by more detailed country specific avian influenza control plans. These plans are currently being prepared for several countries in Southeast Asia through project formulation missions organised by FAO. The strategy paper will serve an important role in assisting the affected and non-affected countries in appreciating the global nature of this transboundary zoonotic disease problem, improve their disease control programmes and will also be important for the donors considering providing financial assistance.

EXECUTIVE SUMMARY

Why a global strategy for avian influenza?

The continuing outbreaks of highly pathogenic avian influenza (HPAI) in several Southeast Asian countries that begun in late 2003 and early 2004 have been disastrous to the poultry industry in the region and have raised serious global public health concerns. Nearly 140 million domestic poultry have either died or been destroyed and over a hundred people have contracted the infection, of which 54 have died as at May 2005. Economic losses to the Asian poultry sector are estimated at around $10 billion, but despite control measures the disease continues to spread, causing further economic losses and threatening the livelihood of hundreds of millions of poor livestock farmers, jeopardizing smallholder entrepreneurship and commercial poultry production and seriously impeding regional and international trade and market opportunities.

With the present situation, the potential of the HPAI virus to become transmissible among humans is of serious concern to the global community. If the virus adapts itself to human-to-human transmission, millions of lives may be threatened. The WHO estimates that millions of people could die of HPAI should a human pandemic occur. Considering the potential for this scenario, the recent Regional Meeting in Ho Chi Minh City, Viet Nam, and the international scientific AI conference in Paris in April 2005 have strongly recommended that a global strategy be developed and implemented to help stem the broad negative impact of the disease.

FAO and OIE, in collaboration with WHO, have taken the initiative to start a stepwise and consultative process of developing the strategy. This approach is seen as an integral part of the FAO/OIE Global Framework for the Control of Transboundary Animal Diseases (GF-TADs). The first step in this process has been the development of a strategy for Asia, the region of major HPAI crisis. This step has now been completed through a formal consultative meeting of the key stakeholders in Asia, held in Bangkok in mid-May 2005. The draft document presented here is an interim and evolving document that describes a strategy for HPAI control in Asia. The document provides a long term vision, goal, approach and implementation plans to control HPAI in Asia with a phased disease control programme. It is intended that similar plans for Central Asia, Africa, Americas and Europe will be developed.

Vision and goal

The long-term vision of the strategy is to minimize the global threat and risk of HPAI in humans and domestic poultry, through progressive control and eradication of HPAI, particularly that caused by H5N1 virus, from terrestrial domestic poultry in Asia. Achieving this goal will diminish the global threat of a human pandemic, stabilize poultry production, enhance a robust regional and international trade in poultry and poultry products, increase human and food safety, and improve the livelihoods of the rural poor.

A phased approach

The global strategy will be implemented over three time frames: immediate to short (1-3 years), short to medium (4-6 years) and medium to long term (7-10 years). During this period the spread of HPAI, mainly of the H5N1 strain, will have been progressively controlled in domestic poultry of all infected countries of Asia, and prevented from affecting those Asian countries not currently infected, but at high risk (Figure 1).

The immediate to short term objective is to reduce the risk to humans by preventing further spread of HPAI in those countries that are currently infected by H5N1. Of these, the focus will be on Viet Nam, Cambodia and Thailand, all of which have had or are continuing to have

human cases of bird flu. The strategy proposes aggressive control measures for Viet Nam through the deployment of the conventional control methods of culling, biosecurity and movement control, combined with strategic vaccination of domestic poultry and ducks. To this end, immediate evaluation of the feasibility of vaccinating ducks and the study of the epidemiology of the disease is essential, to develop approaches to duck vaccination in Viet Nam and other countries with large duck populations.

While no new cases of HPAI in humans or domestic poultry have recently been reported in Thailand, the question of the vast duck population, acting as a host reservoir for the virus, needs to be urgently addressed to reduce the risk of HPAI in humans and poultry. In Cambodia, active surveillance programmes combined with conventional disease control measures are proposed to wipe out remaining pockets of infection. Given the small scale of HPAI problem, limited to smallholder backyard poultry sector, vaccination in Cambodia is not considered an option. A similar approach is proposed for neighbouring, landlocked Lao PDR, where the scale of the problem is even smaller. Eradicating the disease from these two countries will create a natural land barrier, limiting the chance of spreading HPAI between Thailand and Viet Nam.

While Indonesia has experienced widespread H5N1-infection, there have been no reported human avian influenza cases. The country has adopted a strategy of wide-scale vaccination in the predominantly commercial and backyard poultry sectors with variable success in reducing the incidence of the disease. However, the large scope of the HPAI problem in the vast smallholder poultry sector of this huge country requires a medium to long term strategy to progressively control the disease. Bali, Lombok, South Sulawesi, South Sumatra, Central Kalimantan and all of Java will be targeted by continuing vaccination, deploying OIE approved vaccines with strict post-vaccination monitoring, to progressively confine the disease to defined foci in Java and establishing disease-free compartments and zones.

Over the medium to long term (7-10 years), with the disease localized in foci in Viet Nam, Southern PR China and the island of Java, a more focused approach to HPAI control will be mounted to progressively eradicate the disease from the remaining compartments of infected domestic terrestrial poultry in the region. The medium-to-long-term strategy will consider all control measures, including vaccination, zoning and compartmentalization as defined in the OIE Terrestrial Animal Health Code. For the long term success of this strategy, restructuring of the poultry sectors in the region will need to be seriously considered.

Pakistan is infected with HPAI caused by H7 and H9 strains. The disease is currently a veterinary problem only. A medium to long term strategy, deploying good quality vaccines, post-vaccination monitoring combined with the use of conventional HPAI control measures will be necessary given the extensive nature of the country's farming systems and the lack of adequate disease surveillance and control infrastructure.

To prevent the threat of HPAI from spreading to avian influenza-free countries, the long-term strategy supports the development of active surveillance programmes and emergency preparedness plans for non-infected, at-risk countries in Southeast Asia and South Asia. The application of OIE standards relating to the international trade of poultry and poultry products will further assist in preventing the spread of HPAI virus across continents.

Capacity building
Inadequate capacity in many Asian countries is the principal limiting factor for effectively and quickly stamping out and controlling infectious diseases. Thus the strategy suggests building a strong and sustainable human and physical resource capacity in the region, to respond in a more effective and timely manner in stamping out not only HPAI outbreaks but also other newly-emerging infectious zoonotic and transboundary animal diseases (TADs). Capacity building will be wide ranging and include all aspects of disease control as well as policy development and socio-economic impact analysis.

Strategic research
The global strategy recognizes that the dynamics of the current rapid spread and persistence of HPAI remain unclear. Therefore, the strategy will facilitate strategic research to investigate the epidemiology of avian influenza, evaluate the efficacy of vaccines in domestic ducks to reduce virus shedding in domestic duck reservoirs, and work in close collaboration with regional and international advanced research institutions (ARIs) to promote the development of improved vaccines and rapid diagnostic tests. Risk analysis of various poultry production systems and along marketing chains will be carried out to better target effective disease control. In the long term, given the changing nature of the AI viruses, the role of the complex interactions between the avian influenza virus, the hosts and the changing environment needs to be better understood. This should help in developing pro-active measures, such as readjustment of poultry industry in better tackling the emergence of new influenza viruses.

Implementation
Implementation will be at the national, regional and international levels. At the national level, well-defined country specific projects will be formulated, which will be underpinned by the formation of three sub-regional HPAI support units, located in Southeast Asia (SEA), East Asia (EA) and South Asia (SA), respectively. Through these units sub-regional disease diagnosis and surveillance and socio-economic and policy analysis networks will be established. These subregional networks will provide the lead in the development of harmonised technical standards and regional policies related to the management of live animal movement, compensation plans, capacity building, disease reporting requirements and long term planning to restructure poultry sectors.

At the international level, coordination of the national programmes and subregional networks will be under the umbrella of GF-TADs (global framework for the control of transboundary animal diseases), a joint FAO/OIE initiative. The international coordination will provide technical backstopping to the subregional networks and national programmes, promote international cooperation, and mobilize and coordinate resources for HPAI control. The regional coordination will also be supported by FAO's Regional Office for Asia and the Pacific (FAORAP, Bangkok), and the OIE regional office in Asia (Tokyo).

The global HPAI control and eradication programme will draw on the experience of other countries, and will be guided by FAO's experience of the Global Rinderpest Eradication Campaign (GREP) in successfully controlling and eradicating rinderpest in Asia.

Partners
The main partners in implementation of the strategy will be the infected and non-infected 'at risk countries', and the regional organisations (e.g. ASEAN and SAARC), all of which are committed to controlling transboundary animal and zoonotic diseases. Given the zoonotic nature of the HPAI, and the complex interface between farming systems, livestock trade, food

safety and public health, a strong international partnership among FAO, OIE and WHO will be continued. This partnership will promote joint epidemiological studies, harmonise contingency plans, and promote public awareness and share virus strains and other technical information. A number of other partners will be involved, important among these would be the private sector, NGOs and regional national agriculture extensions systems (NARES).

Resources

The implementation of the strategy will require over $100 million for the next three years to support the national, regional and international HPAI control programmes as outlined above.

1. INTRODUCTION AND BACKGROUND

1.1 Emerging transboundary zoonotic diseases pose a serious and continual threat to global economy and public health

Transboundary animal diseases (TADs), including those that are zoonotic, continue to give rise to widespread and important economic and social impacts in the increasingly globalizing world. With a large and growing volume of regional and international trade in livestock and livestock products and the rapid movement of large numbers of people across continents through air travel, several emerging infectious zoonotic diseases spread widely over large geographical regions. These have a wide-ranging impact on the livelihoods of farmers, regional and international trade, food safety, public health and international travel and tourism.

While the economic losses from TADs such as foot and mouth disease (FMD) and classical swine fever (CSF) in Europe have been well documented, it is the newly emerging zoonotic diseases that are causing increasing world-wide concern. The bovine spongiform encephalopathy (BSE; mad cow disease) crisis in Europe provides a disturbing example of a serious emerging zoonotic disease moving into new areas by means of trade flows of contaminated meat and bone meal. In 1999, a Nipah virus outbreak in Malaysia destroyed the swine industry while simultaneously creating massive public panic resulting from human fatalities. The 2003 Severe Acute Respiratory Syndrome (SARS) outbreak infected several hundred people in large parts of South and Southeast Asia and Canada. International travel and tourism were severely curtailed by the outbreak of SARS in Asia. The disease took over a year to be brought under control, costing the sub-region over $30 million. Over the last several decades an average of one newly emerging disease per year has been identified, of which 75% have been of the zoonotic type. Their transboundary nature highlights that no country can count itself exempt from such diseases.

It is also becoming increasingly apparent that many reservoirs of infection can be found in the developing world, in particular amongst the lower-income livestock farming segments; i.e. among the rural poor. This poses serious risks to the livestock sector, which is faced with a rapidly expanding demand for dietary animal protein in many developing countries, driven by growing urbanisation, increasing disposable income, and shifts from starch-based to protein-based foods. There are substantial opportunities for economic growth, particular in rural areas, to be fuelled by this process, widely termed “Livestock Revolution”. However, these opportunities are being threatened by emerging transboundary animal diseases, many of which are zoonotic in nature. Therefore the control of such trade-limiting diseases is becoming ever more important. The effective, sustained control of such animal diseases, leading to their eradication where feasible or at least to their exclusion from large livestock producing zones, is a prerequisite to meet the future global demand for safe and wholesome livestock products.

1.2 HPAI is the most recent transboundary zoonotic disease in Asia

The experience of the 2003 SARS outbreak in Asia has clearly underlined the need to strengthen capacity in disease surveillance, improve transparency in reporting, and improve regional collaboration and cooperation. Many Southeast Asian countries in the region found themselves unable to control the rapid spread of avian influenza that emerged in early 2004. The rapid spread of HPAI across Southeast Asia, which caused high mortality in its previously unexposed, highly susceptible commercial and smallholder poultry populations, came as a shock as it was realized that prevailing disease information systems and the veterinary capacity to deal with the outbreaks were far from adequate to handle the scope of the emergency. Retrospective analysis clearly indicates that the disease was already present and had

been spreading undetected in parts of Southeast Asia since mid to late 2003. Avian influenza once present only in PR China and Hong Kong, has now become a major problem for all of Southeast Asia, and poses a serious threat not only to this sub-region but also to the rest of the world.

The two FAO/OIE regional meetings on HPAI, (Bangkok, February 2004 and in Ho Chi Minh City, February 2005) held in collaboration with WHO and the participating countries, and the first meeting of the GF-TADs Steering Committee for Asia (Tokyo, March 2005) acknowledged and appreciated the prompt response by FAO and the international community in mobilizing emergency funds and technical support to tackle the regional crisis. While significant progress has been made, the meetings also recognized that far more resources are needed and more targeted efforts need to be made to curtail the spread of the disease. The dynamics of the transmission and spread of HPAI remain poorly understood and regional veterinary capacity inadequately equipped to carry out the necessary comprehensive active surveillance and field mobilization programmes to implement more effective and timely biosecurity and other control measures. HPAI has significant and growing Public Goods implications that also affect the world beyond Southeast Asia. Strong political commitment at the national and international levels will be required to invest more resources in all aspects of disease control. Among a number of recommendations emerging from the Ho Chi Minh City meeting, the most important and significant one was the call for the development of a global strategy linked to comprehensive disease control plans, supported by substantial financial resources to tackle the HPAI problem country by country in a coordinated manner. In response, FAO and OIE, under the framework of GF-TADs (Appendix 1) and in collaboration with WHO, have taken the initiative to develop this global strategy for HPAI control.

2. WHY A GLOBAL STRATEGY?

The rationale for developing and implementing a global strategy for the control of HPAI is multiple. Key reasons include:

- **HPAI is a highly infectious and dynamically evolving disease** that spreads rapidly and widely across countries and continents.
- **HPAI is often zoonotic and transboundary in nature**, with the potential to cause a global human pandemic.
- **HPAI has emerged and spread rapidly** as a consequence of globalized markets**.**
- **HPAI impacts on the livelihoods of millions of people**, especially the rural poor.
- **HPAI threatens regional and international trade** and places the global poultry industry in the developed and developing worlds at risk.
- **HPAI results from low pathogenic avian influenza (LPAI),** which is present in wild birds in many parts of the world. All countries in the world are at risk of being infected unexpectedly.
- **HPAI outbreaks are beyond the scope and resources** of a single country or region to control.
- **Protecting global human health and well-being** is a responsibility of the international community.

Some of the above listed reasons are further elaborated below.

2.1 *Avian Influenza virus is constantly evolving with unpredictable results*

The HPAI viruses are of particular concern because they are very labile and undergo constant genetic change due to mutations and gene reassortment, resulting in ‘antigenic shifts’ that can have unpredictable results (see Appendix 2). In fact the generation of H5, H7 and H9 subtypes

in Asia and the evolution of the Z genotype of H5N1, which is currently causing much concern to human health, were the result of such genetic changes. The widespread circulation of the H5N1 in domestic ducks and terrestrial poultry has resulted into the selection of more aggressive Z genotype with a Z^+ strain infective to humans and spreading to Thailand, Viet Nam and more recently to Cambodia. While this is a clear and present threat to global poultry industry and public health, the constant and rapid evolution of the virus necessitates a global approach to controlling the disease.

The role of wildlife in the spread of avian influenza is still not clearly understood. While the gene pool of the avian influenza viruses is relatively benign in its natural wildlife population hosts, it can evolve rapidly after infecting and adapting to domestic poultry. Available evidence points towards factors such as the changing population size and structure of the poultry industry, the expansion of virus circulation from its traditional host range to domestic ducks and terrestrial poultry, and its wide geographical spread through trade in live-birds being the main reasons for concern.

2.2 *The risk of a human pandemic*

The H5N1 strain currently affecting several Asian countries has also proven highly fatal to humans. It is impossible to predict when the virus might reach an adaptive level to allow for human-to-human transmission, but as the virus progresses to an endemic state, its changing genetic composition increases the likelihood for it to become transmissible to humans. WHO estimates that should a pandemic occur, millions of people could die of the disease.

2.3 *The livelihoods of the rural poor are threatened*

The Asian region is home to two-thirds of the world's poor, with the great majority of these being represented by women and children. Despite remarkable progress in addressing extreme hunger and poverty the number of poor remains high. Some 80% of the poor live in rural areas and the vast majority of these people are still dependent on agriculture for their livelihood.

For poor households depending for their livelihood on poultry, HPAI has meant the loss of income and food security. A 2004 FAO survey found that in seriously affected areas of Indonesia, more than 20% of the permanent industrial and commercial farm workers lost their jobs, the demand for day-old chicks decreased by more than 40%, and the demand for poultry feed was reduced by up to 45%. In Viet Nam and Cambodia, the prices of non-poultry meats rose up to 30% when live-bird markets were disrupted by HPAI and remained high even after the poultry markets recovered, taking the purchase of poultry meat out of reach for low income consumers.

In Southeast Asia, the five newly infected countries with HPAI H5N1 (Cambodia, Indonesia, Lao PDR, Thailand and Viet Nam) show significant differences in living standards, economic prospects, per capita income and population size (Table 1). Lao PDR and Cambodia have the lowest per capita incomes in the region, whereas Thailand belongs to the group of newly industrializing countries. In Southeast Asia, over 4 million Cambodians, 7 million Indonesians, 2 million Laotians, 8 million Thais and 17 million Vietnamese live on less than one US dollar per day. The vast majority of the poor lives in rural areas and depends on mixed farming systems that include some level of poultry production. The total number of poor people in the affected countries dependent on poultry is estimated at between 136 -210 million (Table 2).

2.4 ***Economic impact and poultry trade are in jeopardy***

Over 140 million poultry were destroyed as the result of the 2003 and 2004 HPAI outbreaks in Asia. The direct and indirect economic impact, while still being evaluated, has reached billions of dollars. Trade in poultry at the domestic, regional and international levels has been severely affected. The total losses in GDP accruing from the damaged poultry sector in Asia amounted to $10 billion. If the direct health risk impact from avian influenza in birds is added to the overall negative impact problem on livestock and the drop in tourism, economic losses would be considerably higher, even if the human incidence of avian influenza were to remain limited. Details of economic impact in individual countries are given in Appendix 3.

2.5 ***Non-infected but at risk Asian countries***

While HPAI has spread rapidly in Southeast Asia, it is important to note that there are several countries in the region that are not infected but at risk. These include in Southeast Asia Brunei, Myanmar, Papua New Guinea, Philippines, Singapore and Timor Leste, in South Asia Bangladesh, Bhutan, India, Nepal and Sri Lanka, and in East Asia, Japan, Republic of Korea and People's Democratic Republic of Korea (These East Asian countries have been infected). Many of these countries have a rapidly expanding poultry industry combined with large and dense human populations. With limited veterinary infrastructure, outbreaks of HPAI in some of the poor non-infected countries would be devastating, particularly affecting over 400 million resource poor farmers.

2.6 ***Globalized markets have caused HPAI to spread rapidly***

The conditions for the emergence and local spread of HPAI have been exacerbated by the intensification and concentration of livestock production in areas of high-density human populations. The danger of international spread of HPAI has increased by the dynamics of regional and international trade and the movement of people. The possible role of wild migratory birds is not yet fully elucidated. These conditions apply not only to HPAI but also to other transboundary animal diseases. A global approach to avian influenza, therefore, will have relevance to strategic control of other livestock diseases, including zoonoses.

3. THE STRATEGY

The long-term strategy envisions a world with minimum threat and risk of highly pathogenic avian influenza in humans and in domestic poultry. The strategy should significantly reduce the risks of human pandemic.

3.1 Goal

The overall goal of the strategy is to progressively control and eradicate HPAI from the domestic poultry sector in Asia and the rest of the world, thereby minimizing the global threat of human pandemics, promoting viable poultry production, enhancing robust regional and international trade in poultry and poultry products, increasing safety of food and feeds, and improving the livelihoods of all poultry sector stakeholders, and especially the rural poor.

3.2 Guiding principles

The following broad guiding principles are used in developing a global vision for the control of HPAI:

- **Commitment**
  The control and eradication of HPAI from the domestic poultry sector is considered a global public good function, requiring strong national, regional and international commitment.

- **Multidisciplinary**
  HPAI control programmes require a multidisciplinary approach to integrate technical, social, political, policy and regulatory issues in addressing a complex problem.
- **Broad Collaboration**
  The global strategy is inclusive and will use a wide range of collaborators in addressing the problem.
- **Adaptable and knowledge based**
  The strategy will continually adjust itself to new information and technologies, respond to changing environments and new knowledge.
- **Pro-Poor**
  The strategy will take into account the interests of the livelihoods of the rural poor who are the most vulnerable.
- **Economically sustainable** encouraging equitable poultry sector growth conditions through a combination of activities that will benefit the poor as well as support market based economic growth.

3.3 Approach

The strategy will be based on a sound epidemiological approach to control HPAI in Asia, recognising that complete eradication will not be possible due to its presence in wild bird reservoirs. This approach will take into consideration the range of epidemiological scenarios that exist in different poultry production systems in the affected countries in Asia. The epidemiological scenarios range from a high incidence of disease with frequent outbreaks in poultry and humans, to a low frequency disease incidence with variable flock immunity, to sporadic disease outbreaks. A combination of appropriate disease control options (*FAO Position paper: Recommendations on the prevention, control and eradication of Highly Pathogenic Avian Influenza (HPAI) in Asia, September 2004* which received the approval and support of OIE, is available to control HPAI, depending on the stage different countries and farming systems have reached along this continuum of variable disease states (see figure 1). Current disease scenarios can be grouped under the following six categories:

1. <u>High disease incidence:</u>
   - high virus load
   - disease spreading in new areas and new human infections
   - little or no immunity in terrestrial poultry populations
   - carrier duck populations are a source of infection

2. <u>Medium to low disease incidence:</u>
   - high virus load
   - the disease not spreading to new areas
   - no human infections
   - disease endemic in smallholder poultry sector
   - variable flock immunity depending on vaccination efficacy and coverage
   - carrier duck reservoirs are a source of infection

3. <u>Low level of disease incidence:</u>
   - low virus load
   - highly susceptible poultry population
   - carrier ducks probably not important
   - low poultry density

4. Freedom from infection in certain compartments and zones:
    - low virus load
    - highly susceptible poultry population
    - disease incidence present in smallholder sector in certain areas
    - commercial poultry farms are HPAI-free
    - carrier duck population are a source of infection

5. Freedom from infection after stamping out:
    - highly susceptible, clean population of domestic poultry
    - at risk if disease re-introduced.
    - duck reservoir not important

6. Freedom from infection without history of HPAI infection:
    - highly susceptible, clean population of domestic population
    - high risk of HPAI in poultry and humans if disease introduced
    - ducks reservoirs not important

All countries with 'freedom from infection categories' (5 and 6) remain at risk. However, countries with weak disease control capacity are at a higher risk than those that have stronger capacity.

The objective of this approach is to progressively shift the majority of infected countries towards disease categories 4 (freedom from infection in defined compartments) and 5, while ensuring that the countries free of disease (categories 5 and 6) continue to remain free from HPAI (re)incursion. This would allow countries to conduct unrestricted and safe trade in poultry and poultry products in local, regional and international markets. Freedom from HPAI infection according to the six defined disease categories outlined above is a realistic, and an achievable goal for many countries.

To fulfill this objective, a stepwise and phased disease control programme with time-frames ranging from immediate to short term (1-3 years), short to medium term (4-6 years), and medium to long term (7-10 years) for each country is proposed. Given the great diversity of HPAI conditions in the target countries, these time frames will vary from country to country and will depend on a number of factors, such as the current disease situation, disease control options currently being undertaken, available disease control capacity, and in the long term, ability to maintain sustained vigilance and emergency preparedness.

The geographical focus of the strategy will include all infected (see Figure 2) and non-infected at risk countries of Asia. The H5N1-infected group will include Cambodia, PR China, Indonesia, Lao PDR, Thailand, Viet Nam in Southeast Asia. The H7/H9 infected country will include Pakistan, the only country infected with HPAI in South Asia. The non-infected at risk group of countries will include those that are free after having stamped out the disease (currently including DPR Korea, Hong Kong SAR, Japan, Malaysia, and Republic of Korea) and those that have never been infected (Brunei, Myanmar, Papua New Guinea, Singapore, Timor Leste and Philippines) in Southeast Asia and (Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka) in South Asia.

This overall phasing of control strategies will require progressive strengthening of capacity in risk-based disease surveillance and emergency preparedness, as the resources expended on disease control increase from categories 1, 2 and 3 to categories 4 and 5.

3.3.1 Infected countries in South East Asia

Several Southeast Asian countries are currently infected by the H5N1 strain. While the generally ecology of virus and host is similar in the Mekong countries, their disease patterns and epidemiology differ greatly. Therefore the strategy proposes different approaches, tailored to each country. The broad strategy proposed for each is presented below. More specific details will be provided following country-specific project formulation missions currently being organised by FAO.

3.3.1.1 ***Vietnam (H5N1)***

Vietnam has high-density poultry areas infected with H5N1, combined with human cases and fatalities. The disease is mainly concentrated within two areas, in the northern Red River valley and the southern Mekong delta, where large carrier duck populations act as a huge reservoir for infection. Vietnam has not adapted a vaccination policy but is considering this option, given the difficulty in controlling the endemic and the recurring nature of the disease.

In the short-to-immediate term, the objective in Vietnam will be to curtail the spread of H5N1 HPAI to humans by means of enhancing country-wide, risk-based targeted surveillance programme, aggressively stamping out new outbreaks, in combination with the application of strict biosecurity measures, movement control and strategic use of vaccination in densely populated terrestrial poultry areas and in ducks. Given the limited knowledge of the virus transmission dynamics and the efficacy of vaccinating ducks, epidemiological studies and vaccine efficacy evaluation is of high priority in Viet Nam. Applying these control measures will, in the medium- to long-term, push the disease into small, defined foci.

It is expected that Viet Nam would have significantly reduced disease incidence in poultry and humans by achieving a high level of flock immunity through vaccination within 4-6 years. Reaching this stage would present the opportunity for setting up disease-free compartments from which unrestricted, safe trade in poultry products could be achieved in 7-10 years time (category 4).

3.3.1.2 ***Cambodia and Lao PDR (H5N1)***

Both countries have had relatively limited H5N1 HPAI outbreaks, including some human cases and fatalities in Cambodia, mainly believed to be due to the low density of their poultry populations and predominantly backyard poultry sector. The virus load in the environment appears to be low. However, Cambodia has recently had human cases of avian influenza for the first time. Given the diffuse nature of the poultry population, surveillance has not determined the exact spread of the disease. Duck population does not seem to be a major problem in either of these two countries.

In the immediate to short term, active, risk-based surveillance programmes will be implemented and conventional approach of stamping out; biosecurity and movement control will be imposed on infected areas to progressively contain the disease in increasingly smaller foci in terrestrial poultry. In the medium to long term, Cambodia and Lao PR will have their surveillance strengthened with improved veterinary capacity, enhancing their ability to maintain disease-free zones on a sustainable basis.

Cambodia and Lao PDR are likely to be able to achieve disease-free status in large parts of the country (category 4), providing a significant land barrier between parts of Viet Nam and Thailand within 1-3 years time.

3.3.1.3 *Thailand (H5N1)*

Thailand's poultry sector has been affected by H5N1, and several human cases and fatalities have occurred. With increasingly stronger surveillance programmes and a large, export-oriented commercial poultry industry, Thailand has been able to more or less eradicate the disease from commercial terrestrial poultry. The disease now appears to be restricted to the smallholder sector in certain areas. However, carrier duck reservoirs remain a constant threat to re-infection.

Within the immediate to short term, the approach will be to build on Thailand's success in establishing disease-free compartments, to aggressively identify foci of infections in the smallholder farming system, and stamp out the disease with conventional disease control options. Vaccination may be considered in the domestic carrier ducks population as a means to reduce 'spill over' risk to the increasingly susceptible terrestrial poultry population. This approach will enable Thailand to establish disease free compartments and to re-establish its lucrative export market (the world's fourth largest) within 1-3 years time.

3.3.1.4 *PR China (H5N1)*

China has experienced HPAI infection well before the current crisis began in late 2003 and early 2004 and has had no reported human cases but has a vast duck population, which acts as a source of infection for terrestrial poultry. China is vaccinating domestic poultry and ducks in high-risk areas, using locally produced inactivated vaccines, as the principal method of controlling the disease, given the widespread nature of HPAI in the country. Vaccine efficacy in ducks appears to be good, with a reportedly significant reduction in virus shedding.

Within the immediate to medium-term (1-6 years) the current disease control strategies applied will be improved and consolidated. This will involve proactive, risk-based surveillance, stamping out, application of biosecurity measures, and strategic vaccination with well-defined good quality vaccines. Vaccination of terrestrial poultry will be linked with a well-structured post-vaccination surveillance programme to provide better information on the disease dynamics and the impact of increasing flock immunity in domestic poultry. Further field studies will be carried out to determine the impact of duck vaccination on the level and duration of virus shedding under field conditions.

In the medium- to long-term (4-6 years) the disease will be pushed back into well-defined areas. This will provide an opportunity for the country to establish disease free compartments to trade safely in poultry products (category 4) within 7-10 years.

3.3.1.5 *Indonesia (H5N1)*

The disease is widely spread across Indonesia, especially in the smallholder sector, but no human cases have yet been reported. Vaccination was introduced soon after the rapid spread of the disease to reduce massive losses. A number of locally produced and imported vaccines are being used. Vaccination appears to have reduced the high mortality experienced in early outbreaks, but the exact impact of vaccination has been difficult to determine due to limited post-vaccination monitoring. Indonesia also harbours a large duck population, raised under different farming systems. The role of ducks in the epidemiology of the disease is not fully

understood. Within the immediate to medium-term, Indonesia will be targeting systematically in the same manner as PR China. Vaccination of ducks may be considered but will depend on further characterization of this virus reservoir and its role in disease transmission. In the medium- to long-term, the disease will be pushed into defined foci in Java.

It is expected that in 1-6 years time, most of the islands (Bali, Kalimantan, Sulawesi, and Sumatra) will be free of HPAI and the disease will be confined to well defined foci on the island of Java (category 4). This will enable Indonesia to establish disease free compartments to trade safely in poultry products (category 4) within 7-10 years.

3.3.1.6 ***Pakistan (H7 and H9)***

Pakistan has mainly a veterinary problem due to HPAI caused by H7 and H9 strains. No human cases have been reported. However, H7 and H9 strains have been shown to present potential risks to humans as was shown in the Netherlands during the 2003 outbreaks. Given the proximity of Pakistan to other densely populated South Asian countries, the strategy also proposes assistance to controlling the disease using a medium- to long-term time frame, given the extensive nature of the farming systems and the lack of adequate disease surveillance and control infrastructure. Pakistan is expected to have HPAI-free domestic poultry compartments within 7-10 years

3.3.1.7 ***Non-infected countries***

These countries can be classified in two main groups, countries that have experienced HPAI but were able to stamp out the infection, and countries that have never been infected. Both groups remain at risk. Of the former group, countries such as Japan, Hong Kong SAR, Malaysia, Republic of Korea have been able to stamp out the disease successfully because of strong veterinary services, good surveillance programmes and adequate resources.

Of the group of countries that have never been infected, there are some countries (Brunei and Singapore) that have adequate resources to stamp out the disease, while most others do not have adequate human, physical and financial resources to deal with potential HPAI outbreaks. These countries include in Southeast Asia Myanmar, Papua New Guinea, Philippines and Timor Leste, in East Asia DPR Korea, and South Asia Bangladesh, Bhutan, Maldives, Nepal, and Sri Lanka. In order for these countries to prevent incursion and ensure that the disease does not get established, enhanced veterinary capacity, better surveillance programmes, well developed emergency preparedness plans and sufficient resources and expertise are needed to stamp out infection, should it occur. Therefore in the short to medium term the strategy will focus on these aspects. This entire phased approach will require increasingly strong capacity in risk-based disease surveillance and emergency preparedness, as disease control progresses from categories 1, 2 and 3 above to categories 4 and 5.

4. OPPORTUNITIES FOR CONTROLLING HPAI IN ASIA

4.1 Methodologies and technologies for the control of HPAI are available and accessible

4.1.1 Diagnostic tools for the identification of HPAI infection are well developed. Active, targeted surveillance following the diagnosis of HPAI infection, followed by at-source culling of infected birds and strict biosecurity measures, have been the mainstay for the control and eradication of the disease (Appendix 2). Diagnostic tests for the characterization of AI viruses are sensitive and well defined in the *OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (the Terrestrial Manual)*.

4.1.2 Disease investigation facilities capable of carrying out an array of diagnostic tests are present in the Region. Adequate diagnostic facilities exist in countries such as Thailand, PR China, Singapore, Malaysia, all of which can provide regional support to countries with fewer facilities. In addition, selected facilities in Indonesia have substantial diagnostic capacity, and a new HPAI Virus Reference Laboratory is under construction in Hanoi, Viet Nam. Through the SEA Regional Network on Diagnosis and Surveillance, Thailand has agreed to be the HPAI sub-regional diagnostic laboratory providing support to Cambodia and other countries.

4.1.3 Vaccines that are highly efficacious, safe and affordable are commercially available. Strategic use of vaccination, as part of the overall integrated strategy to control the disease, and with a clearly defined exit strategy using DIVA approach, has been successful in many instances to control the disease. More details on HPAI vaccines and vaccination can be found in relevant OIE *Terrestrial* Manual (see Appendix 4) and in the FAO Position Paper *Recommendations on the prevention, control and eradication of Highly Pathogenic Avian Influenza (HPAI) in Asia, September 2004,* (http://www.fao.org/ag/againfo/subjects/en/health/diseases-cards/27septrecomm.pdf) and in the Section on Considerations for National Strategies.

4.2 ***Control and eradication is feasible – learning from the success stories***

The tools, methodologies and approaches outlined above have been successfully used by many countries to control and eradicate HPAI infections in Europe (Italy and the Netherlands) and North America (Mexico, USA and Canada).

More recently, HPAI H5N1 outbreaks have been stamped out in Hong Kong SAR, Japan, Republic of Korea, DPR Korea and Malaysia. Thailand, after 14 difficult months, has made tremendous progress in controlling the disease through enhanced surveillance, strict biosecurity measures and culling of infected poultry. The disease has now been almost eradicated in the commercial poultry sector (sectors 1, 2 and 3, see Table 3) and probably pushed back into village poultry and free-ranging domestic ducks in the Central Plain. Most of these countries have the resources to deploy the necessary control measures and provide improved veterinary services and surveillance to support HPAI control. While these success stories provide encouragement that concerted efforts do in fact pay off in the control of avian influenza, they also clearly point to the high level of investment required to support HPAI control.

4.3 ***National and regional commitment to control HPAI is strong***

Without the necessary political and financial commitment by affected countries and regional organizations, HPAI will be very difficult to overcome. It has been highly encouraging to witness that affected and at-risk Asian countries have prioritized HPAI as the most important TAD that is currently threatening their livestock sectors. During the Ho Chi Minh City Regional Meeting, all affected and at risk countries made strong commitments to support long-term efforts to control the disease. The regional organizations such as ASEAN and SAARC have prioritized HPAI as a transboundary zoonotic disease of the highest significance. Recently ASEAN HPAI Task Force was endorsed at the ministerial level to start plans for the long-term control of HPAI. SAARC, with FAO/OIE collaboration, is currently considering a regional programme for the control of TADs.

4.4 ***International commitment to control HPAI is strong***

A joint FAO/OIE agreement (May 2004) to control transboundary animal diseases globally (GF-TADs) has been signed by both organisations and endorsed by all OIE Member Countries (Appendix 1). It has also been agreed that the HPAI crisis should be addressed under this initiative. Following the HPAI outbreaks, FAO and OIE have responded very rapidly in mobi-

lizing financial resources and technical support to control the disease (see Appendix 5). In the 15 months since the first outbreaks, country-specific support has been provided to all the infected countries and sub-regional networks. Centres have been established in the three sub-regions (EA, SEA and SA) and an Emergency Centre for the Control of Transboundary Animal Diseases (ECTAD) has been created in the Animal Health Service of FAO headquarters in Rome. FAO has a strong animal health capacity in its Regional Office in Bangkok (FAORAP), supporting ongoing regional and national TCP funded projects. FAO has been able to generate significant donor interest to support HPAI control. FAO, OIE and WHO have also organised joint regional meetings and international consultations to develop recommendations and guidelines for HPAI control.

The OIE/FAO Collaborating Centres and the World Reference Laboratories for avian influenza have actively supported efforts to control the ongoing crisis, and recently OIE and FAO have created the OIE-FAO Network of Expertise on avian influenza (OFFLU). Industrialized countries in Western Europe and North America as well as countries in Asia such as Japan, Korea, Australia and New Zealand have invested heavily in imposing strict measures to control transboundary animal diseases, but are also increasingly recognizing the fact that the source of many of these infections is in developing countries. In these countries, governments and the livestock farming communities have limited resources to control animal diseases. This recognition is leading the 'disease-free' countries to focus on controlling HPAI at source rather than building disease-free corridors.

4.5 *Greater awareness of policy issues for HPAI control*

The countries in Southeast Asia recognise the need for strengthening their regulatory policy frameworks to support formal intra-regional and global trade, and are realigning their veterinary regulations and policies to meet WTO/OIE standards. These mechanisms include quality and evaluation of Veterinary Services, animal quarantine, institutional reforms, introduction of OIE standards, guidelines and recommendations for trade in livestock and livestock products, certification for exports and designation of disease free zones and compartments. In addition, these countries support major poverty reduction goals and recognise that control of HPAI and other TADs will have a significant positive impact on increased livestock production, greater access to regional and world markets, and improved livelihoods for the rural poor in their countries.

5. CONSTRAINTS AND CHALLENGES TO HPAI CONTROL

There are many constraints to controlling HPAI, and these vary tremendously, and mainly depend on the country and the farming system. Key constraints are elaborated below.

5.1 *Inadequate veterinary services - a major weakness*

The veterinary services in several affected countries in Asia were inadequately equipped to deal with the scope, severity and rapid spread of the HPAI epidemics. As a result the disease has become endemic, especially in the smallholder poultry sector. This situation further complicates disease control programme in some countries as the well established methods of culling, biosecurity and movement control on their own may not be sufficient to control the disease.

The veterinary services of the member countries in the sub-region vary greatly in capability and resources. Many countries will require substantial financial resources to upgrade their capacity and train personnel to more effectively support their national programmes and participate actively in regional efforts to control HPAI. In several countries, the necessary policies to

establish common ground between public and private health service providers are unavailable to effectively support economically viable disease control for both smallholder farmers and small-scale processors and traders.

5.2 ***Biosecurity measures are difficult to implement***

One of the most important aspects of HPAI control and prevention is the application of biosecurity measures. The concept, requiring prevention of spread of virus from infected premises (bio-containment) and measures requiring the exclusion of infectious agents from uninfected premises (bio-exclusion), has been very difficult to practice in several countries in the affected region. Particularly, wherever the disease has become endemic and widely spread in the smallholder poultry sector and domestic ducks, standard biosecurity measures are less effective. The lack of capacity to practice even basic biosecurity measures is one of the most important reasons of persistence of the disease and its spread in the region.

5.3 ***More epidemiological expertise is needed***

It is vital that countries and regions are able to incorporate epidemiological studies linked to disease control programmes to generate quantitative and geo-referenced data on infection and transmission dynamics. Such information can provide a sound basis for the control and prevention of HPAI. However, in a number of countries in the region, epidemiological expertise remains weak, because modern epidemiological methodologies and tools are not available.

5.4 ***Inadequate disease information systems***

The importance of a harmonised disease information system linked to disease surveillance and epidemiology programmes in countries and regions is clearly recognised. The OIE animal disease information system requirements, the application of which is mandatory for OIE member countries, are now closely followed. FAO's national TCPs have also supported disease reporting systems in the region. However, this effort needs to be further strengthened and made sustainable to support long-term disease control programmes. There is also additional need to form a sub-regional network for the sharing and analysis of disease information coordinated through a sub-regionally based epidemiology support unit. Such infrastructure will be an important element in the control of HPAI.

5.5 ***Domestic ducks are an important H5N1 reservoir***

Over the last 15 months, several studies, including a retroactive analysis of the HPAI virus evolution and field evaluation of its spread in PR China, Viet Nam and Thailand have shown that domestic ducks have become an important reservoir host of the H5N1 virus. The nature of farming systems in some countries, where domestic ducks are moved in flocks over long distances from province to province to feed on harvested rice fields, plays a major role in the transmission and maintenance of the HPAI virus, and in compromising the traditional control measures of active surveillance, culling of infected flocks and imposition of biosecurity. This finding is of critical importance. Changing such practices would serve to significantly reduce the spread of HPAI transmission. Alternatively, targeted control and eradication of HPAI infection in domestic ducks, either by culling of infected animals and by introducing disease-free domestic ducks, or by strategic vaccination of domestic ducks, may cut that source of infection. These measures, combined with culling, biosecurity and vaccination of domestic poultry, where appropriate, may provide an important window of opportunity to control the disease in some countries and eventually progressively eradicate the virus from a variety of poultry production systems.

5.6 ***Disease has become endemic in several countries***

Implementing control measures in the predominantly smallholder poultry sector of Asia, which holds an estimated 60-70% of the poultry inventory in that region and in which the disease has dispersed widely, is a major challenge in the face of limited veterinary infrastructure. One of the continuing dangers of resurging HPAI outbreaks lies in the smallholder farming systems where the disease is most difficult to control. Smallholder animal producers have limited access to preventive treatment, information and advice, and access to training. It is now generally accepted that HPAI has become endemic in many parts of Indonesia, Viet Nam, Cambodia, Lao PDR and Thailand. There are also concerns that some genotypes of H5N1 strains might have adapted to backyard indigenous terrestrial poultry in the same way as observed in domestic ducks. Similar situation may also exist in Pakistan with the H7 and H9 strains. Such a situation will increase the complexity of controlling the disease particularly in the large section of backyard population of poultry in the affected countries.

5.7 ***Wildlife reservoirs are a source of HPAI infection***

Epidemiological studies suggest that wild birds have likely played a role in the transmission of H5N1 viruses to domestic poultry. The capacity of wild birds to carry HPAI H5N1 viruses presents a major difficulty in applying biosecurity measure aiming at the avoidance of contacts between domestic poultry and wild birds. Eradication of the virus to prevent HPAI infection may not be completely achievable in certain farming systems.

5.7 ***Failure to base disease control planning on socio-economic impact assessment***

Formal economic impact assessments of HPAI control are essential to determine national economic and social intervention priorities. Such assessments should take into consideration trade issues, poverty reduction targets, veterinary and livestock development programmes, socio-economic impact and economic policies, and should have a pro-poor orientation. Such analysis is presently lacking, and therefore the targeting of disease control programmes through well developed policy frameworks remains largely empirical.

5.8 ***Weak linkages with public sector***

Weak linkages between technical and planning departments, between ministries of agriculture, human health and finance, hamper long term planning for infectious disease control. Given the zoonotic and transboundary nature of the disease, appropriate linkages and policies need to be in place among a number of ministries, and groups at the national (e.g. provincial, district, community and farmer levels), regional and international levels to enhance coordination of HPAI control.

5.9 ***Sustainable long- term regional coordination is badly needed***

Through FAO support and under the GF-TADs framework, sub-regional networks on diagnosis, surveillance, policy and economics have been established as the first regional coordination mechanism in the control of HPAI. Eventually, regional organizations such as ASEAN and ASEAN+3 (including PR China, Japan and Republic of Korea) and SAARC, would take the lead to manage such networks for long-term sustainability. Sufficient funding is essential for the long term sustainability of these coordinating efforts.

5.10 Financial resources remain inadequate

Over $18 million in donor funding, and significantly higher amounts from various governments of the affected countries, have been spent to mitigate the ongoing HPAI crisis. These financial resources have primarily focused on providing critically needed supplies, equipment, reagents and technical support. However, the ongoing crisis, the increasing spread of the disease and the increasing number of human cases, combined with evidence that the disease has

now become endemic in some countries, necessitates a long-term commitment of significantly higher levels of financial support if HPAI in Asia is to be controlled.

6. IMPLEMENTATION OF THE STRATEGY

The strategy will be implemented at three levels: national, regional and international. The main components for each of these levels, together with their associated activities, are presented in Appendix 7. Summaries of issues at each level of implementation are given below.

6.1 National level: Development of national HPAI control strategies and programmes

The cornerstone of the national strategies will be the development of country specific disease control plans that are consistent with the global strategy. To this end, FAO is currently assisting several countries to develop their own country specific disease control plans. A typical country specific project will adopt a task-force approach, guided by a national steering committee to support a comprehensive HPAI control programme. The function of the task force will be to coordinate and monitor disease control programme. The task force is expected to be lead by the department of veterinary services with strong linkages with ministries of health, planning and finance, extension services, community workers and NGOs. The national steering committee will comprise key decision makers and stakeholders and may include national experts, research institutes, NGOs and the private sector. Some of the specific issues for each of the target countries are outlined in Appendix 6. The strategy recognizes that the complete eradication of HPAI virus in Asia may not possible because of its presence in the wild bird population. Important areas of focus at national level are outlined below:

- Strengthen legal and institutional frameworks to create an enabling environment for supporting control of HPAI.
- Strengthen national veterinary services.
- Develop and implement effective HPAI control programmes.
- Prevent the introduction of HPAI in countries currently free from the disease.
- Provide socio-economic impact assessments on disease control strategies and, where necessary, provide an objective assessment of the impacts on different stakeholders.
- Prepare contingency and emergency preparedness plans for each country.
- Improve capacity at the national level in diagnosis, epidemiology, disease surveillance, and early detection and reporting and disease information systems.
- Strengthen links between technical and planning departments and between ministries of agriculture, human health and finance, to improve capacity for long-term strategic planning and response to emergency situations.

Further details on indicative activities are presented in Appendix 7.

Key issues common to all the countries that will be addressed in developing national control programmes are further discussed in the Section entitled Technical and Policy Considerations for national strategies'.

6.2 Regional level: Sub-regional Cooperation and Collaboration

The cornerstone of the regional strategy will be the establishment of strong and efficient regional coordination units constituted to ensure that the disease control plans are implemented in a systematic, coordinated and phased manner. These regional coordination units will support country-specific efforts to control HPAI. Three sub-regional HPAI support units are proposed for each of the three sub-regions of Southeast Asia, East Asia and South Asia. The focal points for these units are expected to be regional organizations such as ASEAN and SAARC. Through these units the two existing FAO/TCP-supported sub-regional networks on

disease surveillance and diagnosis and policy and economic impact assessment will be further strengthened and followed up. These networks will be coordinated, with technical backstopping from FAO (FAO AGAH and FAORAP), OIE and OFFLU, and are expected to serve the sub-regions by promoting open and transparent dialogues on improved disease information sharing, standardization and regulatory frameworks for the management of animal movement and the control of TADs, and adherence to OIE guidelines to facilitate regional trade. Such collaboration will also develop standardization and harmonization of HPAI diagnosis, surveillance and monitoring protocols and disease reporting, regional trade in livestock and livestock products, and HPAI emergency preparedness planning. Sub-regional collaboration will also address policy and regulatory issues related to the safe poultry production and trade. Other important issues that the regional networks will address will include:

- Institutionalized and inter-sectoral coordination
- Programme management
- Capacity in diagnosis, surveillance and epidemiology
- Capacity in policy and socio-economic impact assessment
- Public awareness
- Research and development

Indicative activities considered by the sub-regional support units are shown in Appendix 7.

6.3 International level: global coordination

The global nature of HPAI necessitates countries to engage in internationally agreed plans for the control of transboundary diseases. An international support facility to coordinate the implementation of the strategy is a prerequisite. It is proposed that such a facility will be based at the FAO headquarters, within the Animal Health Service (AGAH), and will operate under the GF-TADs mechanism, and the FAO/OIE agreed global initiative to control TADs. The main responsibility of such a facility will be to:

- forge partnerships among the three international organizations, FAO, OIE and WHO
- coordinate the subregional networks
- develop the Global Early Warning System (GLEWS) to enable better analysis of the emergence of new infectious diseases
- backstopping subregional networks through the OIE/FAO epidemiology collaborating centres, World Reference Laboratories, including OFFLU.
- play a strategic role in coordinating research in improved tools for HPAI control
- provide a global vision for HPAI control strategy, aong the lines of the Global Rinderpest Eradication Programme (GREP), a successful global animal disease eradication programme.
- mobilize and allocate resources for HPAI control and prevention through active donor liaison

Given the interface between animal and human disease, and the dimension of food safety, strengthening the partnership between FAO and WHO will be important. A number of common activities, such as disease information sharing, joint field investigations, epidemiological studies, sharing of virus strains, contingency planning and public awareness will be important. Such a partnership will also organise and conduct joint regional and international workshops and meetings, develop harmonized HPAI control strategies for poultry and humans and enhance cooperation among the various OIE/FAO and WHO collaborating centres and reference laboratories.

Indicative activities of the global coordination are shown in Appendix 7.

7. TECHNICAL AND POLICY CONSIDERATIONS FOR NATIONAL STRATEGIES

A number of technical and policy issues related to the development of national strategies are of importance. Several of these have been covered, but are worthy of attention in developing national strategies. These are elaborated below.

7.1 *Disease control options and strategies*

Country-based disease control strategies will be broadly based on the following options:

- Effective risk-based disease surveillance for early detection and reporting.
- Enhanced biosecurity of poultry farms.
- Control of movement of poultry and poultry products that may harbor virus, including controls at the interface of infected and uninfected areas.
- Rapid, humane culling of infected and 'at high risk' poultry and safe disposal of carcasses.
- Strategic vaccination.
- All of the above underpinned by appropriate financial supporting mechanisms including public and private sources.
- Changes to industry practices such as control of live bird markets and farm hygiene, to reduce risk
- Separation of poultry species into compartments.

In designing country-specific control measures, an approach using a combination of the above-listed measures will be deployed, depending on the situation of each country. The details of the above noted measures are set forth in the FAO's *Recommendations for the Control of HPAI.*

7.2 *Epidemiology-based control measures*

The lack of reliable epidemiological information, and the sound analysis thereof, has hampered the development of rational, targeted disease control measures in many countries. Thus well-structured epidemiological studies and surveillance programmes will be integrated with the disease control measures, which will be then adjusted and improved as new information becomes available.

The following country-specific risk-based surveillance strategies will be used:

- Identification of factors governing infection dynamics should complement simple case finding.
- Determination of disease transmission pathways along the production and market chains.
- Molecular characterization of HPAI virus strains from birds and animals to determine geographical locations and genetic changes.
- Evaluation of the level of human exposure in different circumstances to determine risks of human-to-human transmission.

Participatory methodologies involving farmer, paraveterinarians, and community workers, will be used extensively, given the fact the major control targets are the small-scale and semi-commercial poultry production systems 3 and 4 and 5 (Table 3). Surveillance programmes will be planned and implemented jointly with the public health personnel.

7.3 *Disease information systems*

A uniform disease information system will be introduced to member countries as part of their control programmes to provide better analytical capacity to enable them country to participate in disease information sharing within the region, thereby contributing towards progressive regional control and eradication. The system will be linked with rapid and standardized methods of routine analysis of surveillance data, which will demonstrate important changes in the H5N1 situation, and promptly supply this information to field personnel.

7.4 *Targeting the source*

In developing country-specific HPAI control strategies and programmes, the broad principle of targeting the disease at source of infection will be applied. This refers to predominantly the smallholder poultry sector and the domestic duck population, a major carrier host reservoir. Wild-birds are also implicated as reservoirs of disease, but the strategy does not address the eradication of avian influenza viruses in avian wildlife.

Eradication of the virus source from backyard poultry will be a difficult and long-term task, especially in poor countries with limited resources. With growing evidence that the survival of the virus in smallholder poultry is dependent on replenishment by carrier domestic ducks, strategically targeting virus eradication in domestic ducks may well be the best option for cutting off this source of infection. The strategy will therefore explore disease control options in domestic ducks, including restructuring of domestic duck farming systems to separate domestic ducks from terrestrial poultry, strategic culling of domestic ducks, and progressively enhancing flock immunity through vaccination to reduce virus shedding.

The short- to medium-term task of controlling the disease by reducing virus circulation in the industrial poultry production sector, large-scale breeder units, and medium to small-sized commercial units is feasible. Reducing virus loads in the smallholder commercial poultry sector significantly reduces the risk posed to humans, as available evidence suggests that humans become more frequently infected when and where the incidence of HPAI outbreaks in poultry remain high.

7.5 *Use of avian influenza vaccines*

FAO and OIE have made recommendations for the use of OIE-approved HPAI vaccines, and several such vaccines are commercially available. If used in accordance with FAO/OIE recommendations (*FAO Position Paper, September 2004*) and OIE Manual (see Appendix 4), these vaccines provide excellent protection against clinical disease in chickens by reducing mortality and production losses. Vaccination of poultry also reduces the virus pool contaminating the environment and thereby the risk of infection to poultry and humans. According to current OIE recommendations, HPAI-vaccinated poultry is not excluded from the export trade, although specific technical guidelines must be followed to ensure that the vaccine is being applied properly and monitored effectively.

The use of vaccination to control HPAI must go in tandem with strategic field surveillance and epidemiological studies to identify virus sources, selection of priority hot spots, imposition of transport bans, and post-vaccination monitoring. Zoning and ring vaccination are important tools, depending on the incidence of virus survival in carrier domestic duck populations. Whereas vaccination of commercial poultry farms can be carried out easily, vaccination of backyard, non-confined poultry poses significant logistical and technical problems. Domestic ducks probably react differently from terrestrial poultry to HPAI vaccination compared with poultry in that they might continue shed virus on challenge, and therefore remain poten-

tially infective. Serological monitoring using DIVA principle, and the use of sentinel domestic ducks and chickens are essential measures to monitor vaccinated domestic duck flocks.

Currently, PR China and Indonesia are the only countries in the Southeast Asia region using vaccination as part of their HPAI control strategy. Viet Nam has adopted a similar stand recently and other countries may follow soon. In countries practising vaccination, the vaccination strategy was adopted mainly because the disease had spread widely throughout the smallholder poultry sector, particularly in production systems 2, 3 and 4 (medium to low level of biosecurity) (Table 3), with very high animal mortality. Given the large scale of the infection and the limited capacity to mount large-scale surveillance, stamping out and biosecurity measures, vaccination was adopted as an important part of Indonesia's control strategy. There is good evidence to show that this approach has served to significantly reduce losses due to HPAI.

The global strategy will support the use of good quality HPAI vaccines produced according to OIE standards and implemented according to FAO/OIE guidelines. The strategy will also promote building capacity in vaccine quality control at the national level. The strategy will ensure that vaccines are used with a clearly defined objective and time-phased exit strategy, linked to strict post-vaccination surveillance and monitoring. The strategy will also work with the private sector to ensure that sufficient stocks of vaccines are available prior to launching the vaccination programme.

7.5.1 Vaccinating ducks – useful or questionable?

The successful use of HPAI vaccination in domestic duck populations would be a major step forward in controlling domestic duck-borne HPAI infective reservoirs; the suspected principal source of re-infection of terrestrial poultry. However, the HPAI disease syndrome takes a different course in domestic ducks from other poultry. Affected domestic ducks show lower morbidity and mortality than chickens but become virus shedders. Recent studies in Viet Nam indicate that close to 20% of asymptomatic domestic ducks in the Mekong Delta shed significant quantities of HPAI virus. The efficacy of currently available OIE approved vaccines in domestic ducks has not been clearly established and requires further epidemiological study and field trials. While preliminary studies in PR China suggest that some vaccines may be effective in domestic ducks, this claim urgently needs further evaluation. FAO, OIE and their partners will play an important role in coordinating the evaluation of the efficacy of the currently available H5 based poultry vaccines in domestic ducks. The outcome of the vaccine evaluation in domestic ducks will be of great importance, and would determine the future strategies for controlling virus shedding in reservoir hosts.

7.6 *Person safety issues*

Due to the highly infectious nature of the HPAI virus to humans, particularly H5N1, training of people in contact with live virus will be conducted. This will include field workers involved in identification of the disease, farm workers involved in culling, laboratory workers involved in virus isolation and diagnosis. Adequate resources will be allocated for biosafety hoods and appropriate personal protective clothing.

7.7 *Policy development provides the enabling environment*

In order to ensure that recommended disease control, prevention and eradication measures are implemented in a uniform way, the regulatory framework and a number of policy issues will be addressed. These are related to biosecurity, vaccination, control of animal movement, border control, culling and disposal of carcasses, compensation, restructuring of poultry industry,

compartmentalization and zoning, and regulations related to recreational activities related to poultry.

7.8 *Pro-poor disease control programmes*

Southeast Asia's smallholder sector comprises approximately 200 million poor people in the five countries (Cambodia, Indonesia, Lao PDR, Thailand and Viet Nam) that were most affected by HPAI. This group has little or no access to veterinary services. The strategy will particularly support these low-income groups by:

- Improving animal health services at village level by means of organising community based early warning networks, utilising the existing pool of paraveterinary village workers.
- Increasing farmers' general awareness through simple biosecurity guidelines on avian influenza control using publications in local language.
- Providing access to credit or microfinance as a tool for rehabilitation as an alternative to direct compensation, which some countries may not be able to afford.
- Developing farmers' groups and/or associations to help improve awareness and dissemination of information.

7.9 *Restructuring of the poultry sector*

Restructuring the poultry sector may be an important strategy to guard against the damaging effects of HPAI, but also one of the most complicated interventions to be undertaken requiring understanding of the whole socio-economic system. Restructuring requires different approaches in different countries by virtue of the differences in their poultry sector infrastructures, marketing characteristics, backyard versus commercial poultry production, and socio-economic impact. Restructuring should be seen as a gradual process, affecting the various segments of the sector in different ways and at different rates. Because of these variations, only the general principles that may be undertaken are outlined below:

- **Rationale** for restructuring should always be based on a well-defined socio-economic impact analysis, taking into account the interests of all stakeholders.
- **Government commitment** with full support from stakeholders is necessary and must follow a long-term strategy.
- **Livelihoods of smallholder poultry farmers**, who represent the majority of poultry in many HPAI-affected Asian countries, should be taken into account.
- **Market forces** should drive the restructuring strategy taking into account commercial and smallholder poultry producers.
- **Public and private sectors should collaborate and be transparent** in the implementation of restructuring strategies.
- **Restructuring should be an integral part of an overall disease control strategy**, that includes biosecurity, vaccination, zoning and/or compartmentalization, should follow OIE and FAO guidelines, and take into account issues of human and food safety.
- **Public awareness** should be promoted to gain support from producers, consumers, government agencies, private sector institutions and other stakeholders.

7.10 *Compartmentalization and zoning*

Given the current epidemiological situation of HPAI in various affected countries, complete eradication may not be achieved in the next 5-10 years. Therefore, compartmentalization and zoning concepts, as described in the OIE guidelines, will be an important tool in assisting the recovery of marketing opportunities for many affected countries. Thus, in considering disease

control strategies, progressive control will focus on developing disease-free compartments and zones, made safe from re-infection.

7.11 *Collaboration with stakeholders*

The multi-dimensional problems associated with HPAI infection necessitate collaboration from a wide range of stakeholders within each country. These include:

- Various ministries such as planning, finance, agriculture, health, road and transport, livestock departments, veterinary departments, national research institutions and diagnostic laboratories.
- NGOs, private sector (e.g. large poultry production companies, farmers' associations, veterinarians) and farmer involvement at the grass roots level.
- One of the most important linkages will be with the public health sector given the zoonotic nature of the disease. Disease control plans, surveillance programmes, and post-vaccination monitoring will be conducted jointly with the personnel from the departments of health, and the disease information and biological material will be shared.

7.12 *Capacity building*

The development of a strong, sustainable human resource base is one of the most important objectives of country-specific disease control strategies. In the region there is a great variation in capacity to deal with serious outbreaks of infectious disease, and therefore the capacity building needs to be tailored to specific circumstance prevailing in each country. Capacity will involve institutional strengthening and human and physical resource development. On the institutional side, training will be provided in various aspects of policy development and economic impact assessment to include poultry sector restructuring, compartmentalization and zoning, compensations and emergency preparedness planning. On the human resource side, training will be provided in all aspects of disease control from the national to the grassroots level. In the regard, training of paraveterinarians and other lay workers will be an important aspect to develop grass-roots level early disease detection network. At the technical level this will include disease detection, laboratory diagnosis, risk-based surveillance, risk analysis, vaccine quality control, vaccination delivery and monitoring, and biosecurity. On the physical resource side, laboratory diagnostic and surveillance capacity will be strengthened by upgrading equipment and disease information systems.

7.13 Applied research

While a range of methodologies and tools are available to control HPAI, there are a number of aspects of the diseases that are not clearly understood. A set of recommendations for research were recently made by the participants of the OIE/FAO International Scientific Conference on Avian Influenza, OIE Paris, France, 7–8 April 2005 (see Appendix 8). While many of these researchable issues are beyond the scope of this strategy, it is proposed some of these issues can be studied immediately and be linked with the national disease control plans. The key among these issues are:

- To elucidate the role of ducks and backyard indigenous poultry in maintenance and transmission of H5N1 to terrestrial domestic poultry.
- To determine the efficacy of HPAI vaccines in ducks, quails and indigenous backyard poultry.
- Assess the role of vaccination in reducing virus shedding in carrier birds.
- To determine the appropriate strains to be used in each country.

- To determine the role of pigs and other wild birds in transmission of H5N1 to domestic poultry.
- Identify major risk factors for transmission of HPAI to humans and domestic poultry.

It is expected that many of theses studies can be included in the national disease control plans and the disease control strategies revised and improved in light of new findings. China has had significant experience in the use of HPAI vaccines in ducks and domestic terrestrial poultry. This experience will be of great help in designing disease control strategies for other countries in the region.

8. OUTPUTS

Successful implementation of the strategy will result in the following major outputs:

- HPAI spread in humans and chickens will be contained.
- HPAI incidence in chickens will be progressively reduced.
- Progressive HPAI eradication in all commercial farming systems and zones will be achieved.
- Introduction or establishment of HPAI will be prevented in non-infected at risk countries.
- Emergency preparedness plans will be available for all countries in Asia.
- National, subregional policies on HPAI control will be available and implemented.
- Enhanced HPAI control capacity will be developed.
- Improved understanding of virus epidemiology will be available.
- Risk of human pandemic will be progressively minimized, and safe trade in poultry re-established.

9. IMPACTS

A successfully implemented strategy will directly impact the livelihoods of over 500 million poor Asian smallholder farmers, and contribute significantly to the achievement of the Millennium Development goals. It is expected that these outcomes will also impact positively in the poverty reduction of resource-poor smallholder farmers, in improved food safety for consumers, and in better market opportunities for poultry producers at all economic levels.

10. IMPLEMENTATION

Country specific activities will be technically supported and coordinated by the regional organizations ASEAN (SEA), ASEAN+3 (EA) and SAARC (SA). The diagnostic and surveillance and policy and impact assessment networks for each of the sub-regions will be run under the three regional organisations. The international HPAI support will be provided from FAO Headquarters in Rome, within the Animal Health Service (AGAH) in collaboration with OIE Headquarters in Paris. The main responsibility of the international support will be to deploy the obvious synergies between the three international organizations, FAO, OIE and WHO (see below) and the regional organisations.

11. MAJOR PARTNERS

The list of major partners is shown in Appendix 8.

11.1 Participating countries

The control of HPAI in Asia is a multidisciplinary exercise, addressing the complex interactions between technical, institutional, policy, political and socio-economic issues, all of which necessitate engagement of a large number of partners. The key players will be the HPAI-

infected countries in South East Asia (Cambodia, Lao PDR, Indonesia, Thailand and Viet Nam), East Asia (PR China), and South Asia (Pakistan) and the non-infected, 'at risk' countries to include in East Asia DPR Korea, Japan, Republic of Korea, in Southeast Asia Brunei, Malaysia, Myanmar, Papua New Guinea, Philippines, Singapore and Timor Leste, and in South Asia Bangladesh, Bhutan, India, Maldives, Nepal, Sri Lanka. These countries, as part of their respective sub-regional organizational networks, will form the core alliance to control HPAI in Asia. Each partner country has unique strengths and skills that will contribute in a complementary and synergistic manner to achieve the objectives of the programme.

11.2 Regional Organizations (ASEAN and SAARC)

Many of the participating countries are members of the two major inter-governmental organizations (ASEAN and SAARC) in Asia. These organizations are very important to the success of the implementation programme for HPAI as they have the mandate and authority to facilitate and conduct sub-regional activities related to trade and socio-economic development. All issues related to harmonization of standards, policies and cross border control and management of animal movement will be discussed and facilitated through these regional organizations. Those countries in Southeast Asia and East Asia that are not members of these two regional organisations will also be able to participate in regional activities directly through FAO and OIE under the umbrella of GF-TADs. It is also expected that the regional organizations will be flexible to include the non-member countries in the regional efforts to control HPAI for mutual benefit.

11.3 International Organizations (FAO, OIE and WHO)

FAO, OIE in collaboration with WHO will be directly involved in the broad coordination of the global strategy. They have the global mandate to address the issues of animal and zoonotic diseases.

FAO has a global mandate in animal health and production, particularly in the control of transboundary animal diseases, such as FMD and rinderpest eradication (GREP). FAO has also taken a lead in providing emergency funds for HPAI control in the affected countries (see Appendix 5). FAO has a regional office in Bangkok that provides technical backstopping for the Asian countries. FAO and OIE have established a formal partnership in tackling important transboundary animal diseases under the GF-TADs.

OIE has a mandate to set standards and norms, provide expertise and promote international solidarity for the control of animal diseases. It also plays a leading role in food safety of animal origin by collaborating with Codex Alimentarius committee. OIE has a regional representation for Asia in Tokyo.

WHO has a global mandate to control human diseases, and has a large network of country and regional offices in Asia. Given the global public health significance of HPAI, WHO will be an important partner in developing and implementing disease control strategies to ensure that both the human health and livestock industries are protected.

The international organizations will deploy the expertise of their collaborating centres and reference laboratories, internationally recognized in avian influenza, for specific inputs. In addition, the international organizations will establish partnerships with advanced research institutions.

11.4 National Agriculture Research and Extension Systems (NARES)

Some NARES in Asia have well-developed strengths in livestock health, and in the delivery of disease control programmes. They also have a strong field presence and therefore are natural partners in the activities proposed under the strategy. The Asia Pacific Association for Agriculture Research Institutes (APAARI), which provides a network of all the NARES in the sub-region is also involved in the coordination of agriculture research, may also be able to contribute, particularly in the context of delivery and dissemination of information and data.

A number of NGOs operate at the community level in the sub-region, particularly in delivering animal health technologies. When appropriate, partnerships will be formed with such NGOs.

11.5 Private Sector

Small-scale commercial farmers, large scale poultry producers and the livestock trade are closely interlinked and will play a role in the project planning and implementation stage as their participation and understanding of the poultry sector is important in achieving the objectives of the programme. A number of local and international commercial biological and pharmaceutical companies operate within the sub-region and provide veterinary services. Their role will be important in the context of communication, delivery and supply of standardized vaccines and diagnostics for the support of HPAI control.

12. REQUIRED INVESTMENT

Funding requirements to support the three levels of the global strategy are projected to amount to US$ 102 million over 3 years (Table 4). The budgets presented are indicative and will be subject to further revisions, subject to the inputs provided by each country during project formulation. Country-specific budget allocation has been categorized into Southeast Asia H5N1 infected (Cambodia, Lao PDR, Viet Nam and Indonesia), South Asia H7/H9-infected (Pakistan), and non-infected countries (Myanmar, Philippines, Papua New Guinea, Timor Leste, Bangladesh, Bhutan, India, Maldives, Sri Lanka). Of the total indicative budget, approximately 75% is allocated to country-specific activities, 22% to regional activities, and 3% to international activities such as coordination, global epidemiology analysis, tracking and early warning systems (see Table 4, pie chart). In addition, a small budget is proposed for the ECTAD programme of FAO and the tracking system of the OIE to verify non official information about the occurrence of animal diseases in the context of the OIE Early Warning System. These two items will constitute less than 3% of the total budget. Country-specific budget allocations were estimated on the basis of the scope of the HPAI problem, the actual need, and the current capacity to absorb the necessary resources. Proportional budget allocation for different activities at country level are presented in Tabe 4, pie chart. Of total budget, 65% will be earmarked for disease control (laboratory upgrading, field surveillance, biosecurity, vaccination), 25% for training and capacity building, 5% for institution building such as policy development and socio-economic impact assessment, and 5% to support public awareness programs.

13. RESOURCE MOBILIZATION

Since the outbreak of AI in late 2003 and early 2004 in South East Asia, FAO and a number of donors have provided emergency funds to support the control of HPAI. Over $18 million have been committed to various country specific and regional projects. Most of these emergency projects will be coming to an end by the middle to end of 2005.

FAO and OIE will seek additional donor funds to build on the ongoing efforts to provide medium to long-term support. A number of formal and informal discussions have taken place

with bilateral and multilateral donors and funding agencies. The donors that have shown strong interest in supporting the global strategy include EU, and the governments of Germany, Netherlands, Switzerland, Finland, Japan and USA (see Table 5).

As a priority, the strategy will seek funds for the five infected countries (Cambodia, Lao PDR, Indonesia and Viet Nam in SEA and Pakistan in SA) and 9 non-infected at risk countries (Myanmar and Philippines in South East Asia and Bangladesh, Bhutan, India, Maldives, Nepal, Sri Lanka in SA). All these countries urgently need funds for HPAI control and/or for surveillance and emergency preparedness. FAO is currently financing country specific formulation missions to develop full proposal in search of donor funding. Funding will also be sought for the regional support unit and a global facility given the regional and global significance of the HPAI problem.

Of the affected countries, the Governments of Malaysia, Thailand and PR China, while committed to regional coordination and cooperation, have already developed their country-specific country strategies and plans, and are not currently requesting financial support. In addition, Japan and Republic of Korea, who have eradicated the disease, will be part of the global strategy and members of the regional coordination, but will not require outside financial assistance.

13.1 *Source of Funds*

Currently, funding has been pledged by the Government of Germany to support countries such as Cambodia and Lao PDR. The Government of United States has indicated approximately $25 million to support the regional activities and will also consider supporting some countries. The countries likely to be supported are Pakistan and/or Viet Nam. The Government of Netherlands has provided seed money of $250,000 and technical support for project formulation for further funding. Indonesia is identified as the country most likely to receive funding from the Netherlands. The Government of Finland has also pledged to assist with yet an unspecified sum. Their target would be Indonesia. The EU could also consider supporting a mid to long term control programme for Asia.

TABLE 1 - COMPARISON OF THE FIVE TARGETED COUNTRIES FOR HPAI CONTROL

Countries	Human population			
	Millions	People/sq km	Per capita income (US$)	% in urban areas
Lao PDR	6	24	310	20
Cambodia	12	71	280	20
Indonesia	212	117	710	30
Viet Nam	81	247	430	25
Thailand	62	121	1980	40

TABLE 2 - ESTIMATED POPULATION ENGAGED IN BACKYARD POULTRY PRODUCTION

Countries	Human population			Rural people (millions) dealing with poultry under to assumptions	
	millions	Living in rural areas		60%	80%
		%	No. (millions)		
Lao PDR	6	80	4.8	2.9	3.8
Cambodia	12	80	9.6	5.8	7.7
Indonesia	212	70	148.4	89.0	119.0
Viet Nam	81	75	60.8	36.5	48.6
Thailand	62	60	37.2	22.3	29.7
Total	373		260.8	136.5	208.8

Source: World Development Report 2004

TABLE 3 - CHARACTERISTICS OF FOUR DIFFERENT POULTRY PRODUCTION SYSTEMS

Characteristics	**Poultry Production Systems**				
Parameter	**Industrial and Integrated Production**	**Commercial poultry production**		**Village or backyard Production**	
		Large Scale	**Small-Scale**	**Poultry**	**Domestic ducks**
Production System	**System 1**	**System 2**	**System 3**	**System 4**	**System 5**
Biosecurity	High	Medium	Low	Low	Low
Market outputs	Export and urban	Urban/rural	Live urban/rural	Rural	Rural/Urban
Dependence on market for inputs	High	High	High	Medium	High
Dependence on market access	High	High	High	Medium	Medium
Location	Near capital and major cities	Near capital and major cities	Smaller towns and rural areas	Outdoors	Outdoors
Type of confinement	Indoors	Indoors	Indoors/Part-time outdoors	Not confined	Not confined
Housing	Closed	Closed	Closed/Open	Minimal	None
Contact with other poultry	None	None	Yes		
Contact with domestic ducks	None	None	Yes	Yes	Yes
Contact with other domestic birds	None	None	Yes	Yes	Yes
Contact with wildlife	None	None	Yes	Yes	Yes
Veterinary services	Own Veterinarian	Pays for veterinary service	Pays for veterinary service	Irregular	Irregular
Source of medicine and vaccine	Market	Market	Market	Government, Market	Government, Market
Source of technical information	Company and associates	Sellers of inputs	Sellers of inputs	Govt. extension service	Govt. extension service
Source of financing	Banks and own	Banks and own	Banks and private	Private, occasionally Banks	Private, rarely Banks
Breed of poultry	Commercial	Commercial	Commercial/ Indigenous	Indigenous	Native
Food security of owner	High	High	High	Variable	High

TABLE 4: INDICATIVE BUDGET

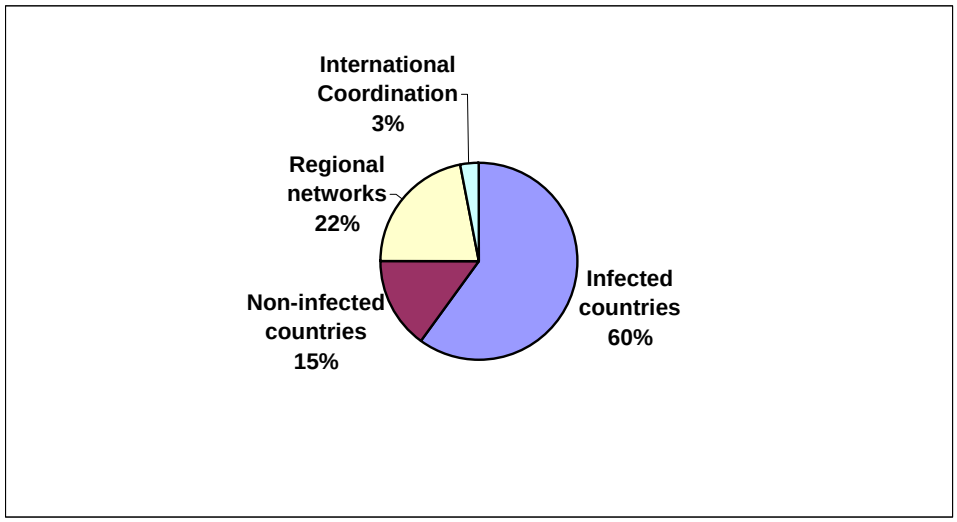
Country Specific Projects	US$/year (millions)	No. of years	TOTAL US$ (millions)	% of the TOTAL
South East Asia H5N1 infected				
Cambodia	1.5	3	4.5	4.4
Lao PDR	1	3	3	2.9
Viet Nam	8	3	24	23.4
Indonesia	7.5	3	22.5	22.0
			54	**52.7**
South Asia				
Pakistan H7/H9 infected	2.5	3	**7.5**	**7.3**
Non-infected countries				
Myanmar, Papua New Guinea, Philippines, Timor Leste	2.5	3	7.5	7.3
Bangladesh, Bhutan, India, Maldives, Sri Lanka	2.5	3	7.5	7.3
			15	**14.6**
Regional/Sub-regional Projects				
Diagnosis and Surveillance SEA	2	3	6	5.9
Diagnosis and Surveillance EA	2	3	6	5.9
Diagnosis and Surveillance SA	2	3	6	5.9
Policy and Economic impact for HPAI	1.5	3	4.5	4.4
			22.5	**22.0**
International Coordination				
GF TADs	1	3	3	2.9
Vaccine trials in ducks	0.5	1	0.5	0.5
			3.5	**3.4**
TOTAL	**34.5**		**102.5**	**100.0**

TABLE 4 cont..

ALLOCATION ACCORDING MAIN PRIORITIES

Priorities for HPAI control in Asia	No. of years	TOTAL US$ (millions)	% of TOTAL
1. H5N1 Countries	3	54	52.7
2. H7 infected countries	3	7.5	7.3
3. Non-infected countries at risk	3	15	14.6
4. Regional networks	3	22.5	22.0
5. International Coordination	3	3	2.9
6. Vaccine trials in ducks	1	0.5	0.5
TOTAL		**102.5**	**100.0**

Indicative budget for national, regional and international activities



Indicative budgets for country specific activities

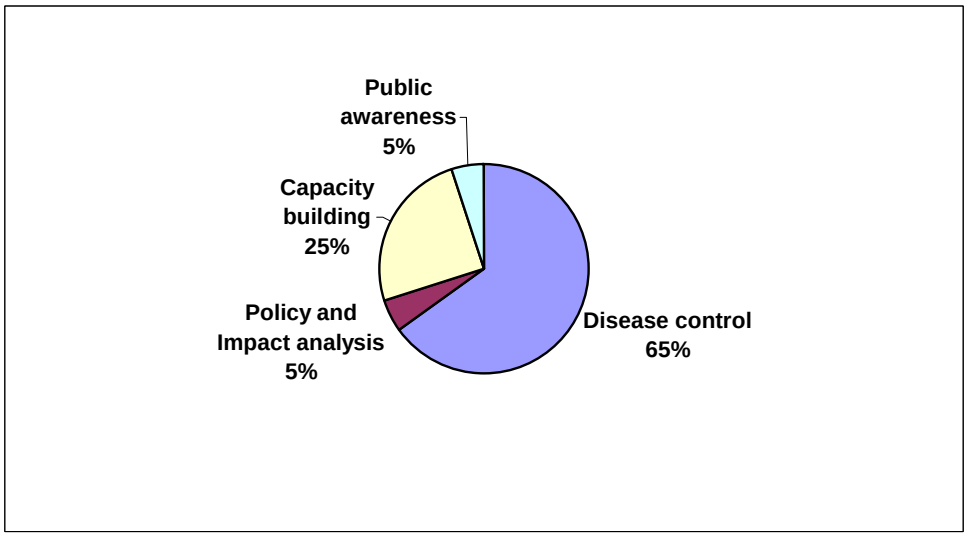


TABLE 5: INDICATIVE FINANCIAL SUPPORT FROM VARIOUS DONORS

Components of the Strategy	**Budget US$ (millions)**	**Donors and indications to support different components of global HPAI control programme**						
Country Specific Projects		**Ger-many**	**Swit-zer-land**	**Ja-pan**	**Finlan d**	**Nether -lands**	**EU**	**USAID**
South East Asia H5N1 infected								
Cambodia	4.5	x						
Lao PDR	3.0	x						
Viet Nam	24.0							x
Indonesia	22.5				x	x		
South Asia (H7 infected countries)								
Pakistan	7.5							x
Non-infected countries at risk								
Myanmar, Philippines, Papua New Guinea, Timor Leste	7.5							
Bangladesh, Bhutan, India, Maldives, Sri Lanka	7.5							
Regional/Sub-regional Networks								
Diagnosis and Surveillance SEA	6.0	x	x	x				x
Diagnosis and Surveillance EA	6.0	x	x	x				x
Diagnosis and Surveillance SA	6.0	x	x					x
Social, economic and policy analysis (3 sub regions)	4.5		x					x
International Coordination						x		
GF-TADs	3.0							
TOTAL	102.0							
Pledges US$ (millions)		6.5	TBD	2.7	TBD	0.25[a]	2.0[a]	25.0

[a] Seed money committed to design and development of full projects for further funding.
TBD = to be determined

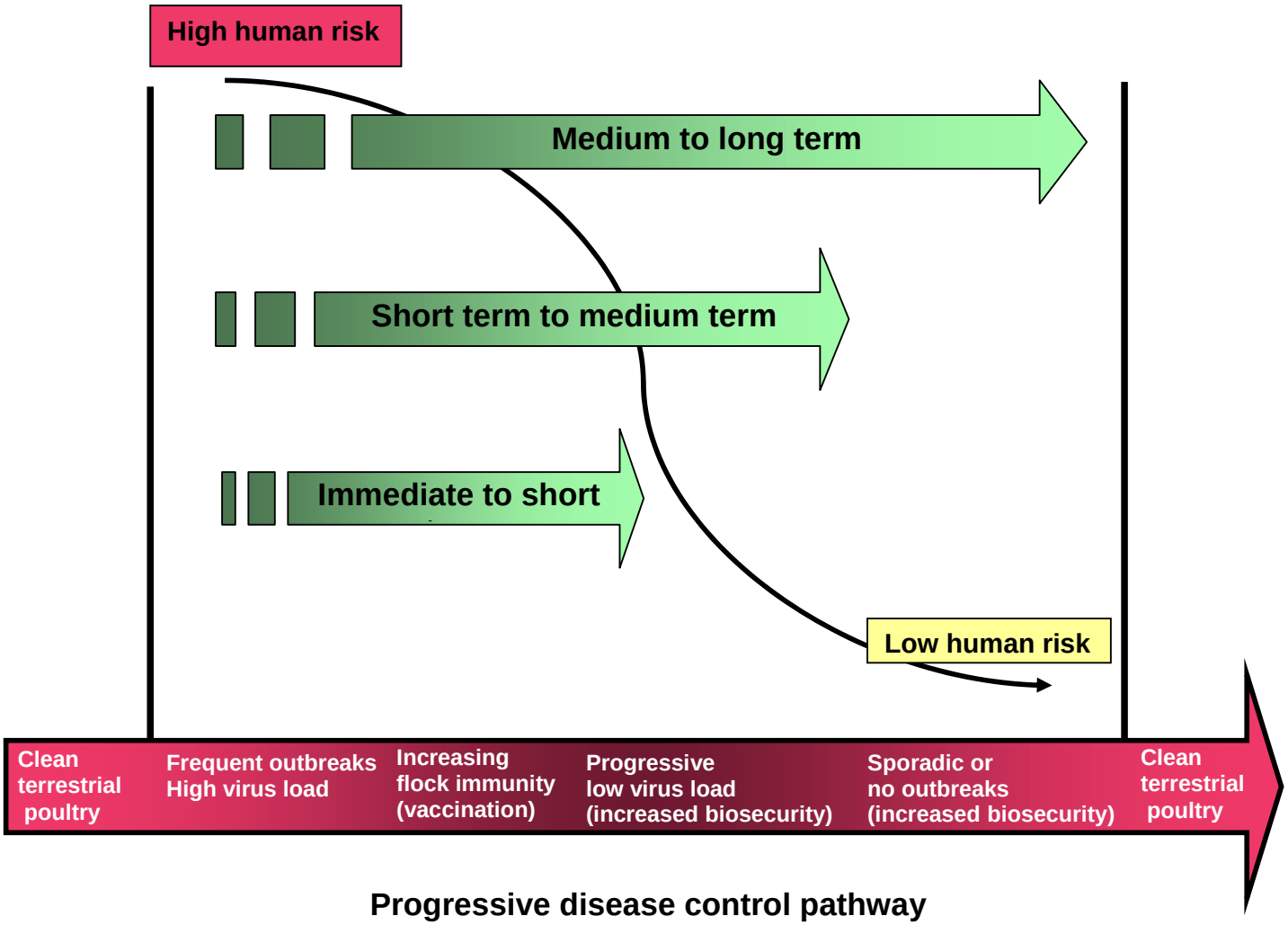
TABLE 6 - GLOBAL STRATEGY LOGFRAME

Design Summary	Performance Indicators/Targets	Monitoring Mechanisms	Assumptions and Risks
GOAL			
To control and eradicate the highly pathogenic H5N1 avian influenza in chickens in Asia.	• Improved regional/national policies and regulations adopted to control HPAI • Livestock products from some Asian countries certified for exports to OECD	• National livestock policy documents • Participatory poverty reports • Livestock trade data in FAO and WTO reports	
PURPOSE			
• Diminish the global threat of human pandemic, promote healthy poultry production, enhance a robust regional and international trade in poultry and poultry products, increase food safety, and improve the livelihoods of the poor small holder farmers.	• Regional coordination mechanism adopted by participating countries by 2005 • Animal morbidity and mortality decrease by 50% in selected target zones by 2008	• National livestock policy and disease outbreak reports • OIE and WHO regional reports on diseases • Donor review reports on HPAI	• Target countries remain committed to HPAI control under regionally • Donor support continues • No natural disasters occur
OUTPUTS			
• HPAI spread in humans and chickens contained. • HPAI incidence in chickens progressively reduced. • Strategic vaccination of ducks implemented with reduced virus shedding, and reduced incidence in chickens. • Progressive HPAI eradication in all commercial farming systems and zones achieved. • Introduction or establishment of HPAI prevented in non-infected at risk countries. • Emergency preparedness plans developed for all countries in Asia. • National, subregional policies on HPAI control developed and implemented • Enhanced HPAI control capacity developed. • Improved understanding of virus epidemiology. • Risk of human pandemic progressively minimized, and safe trade in poultry reestablished	• 2005 – 2008 • 2006 - 2010 • 2006 - 2015 • 2010 – 2015 • 2006 - 2007 • 2006 - 2007 • 2006 - 2015 • 2006 - 2015	• Quarterly technical, electronic and printed reports and newsletters from each national project. • Project website providing a platform for the regional HPAI information system • Consultant reports • Stakeholder and participant feedback • Project review report • AIDE news • OIE reports	• Affected and at risk countries committed to regional HPAI control • More advanced countries in Asia cooperate and assist those less advanced • Regional cooperation remains strong • Ready access to field sites available • HPAI vaccines in ducks are able to reduce virus shedding.

Design Summary	Performance Indicators/Targets	Monitoring Mechanisms	Assumptions and Risks
ACTIVITIES			
• Develop and implement national HPAI control programs for all infected countries. • Establish Regional Coordination Mechanism for HPAI control. • Establish Networks on diagnosis and surveillance, and policy and economic impact assessment. • Establish International Facility of HPAI control. • Evaluate vaccine efficacy in ducks • Study the epidemiology of HPAI • Revise HPAI control programs as necessary. • Provide training in HPAI control methods, including in diagnosis, surveillance, disease information, economic impact, project management. • Develop appropriate national and regional policies and regulations on HPAI control.	• Infected countries start implementing disease control programmes. • MOU signed by the member countries of the respective regional organizations • Coordinator for HPAI facility recruited. • Targeted disease control strategy developed based on epidemiological information and field vaccination trials in ducks. • National and regional labs established. • National teams (taskforce) of trained personnel involved in HPAI control. • Policies and regulations endorsed by member countries.	• Various reports as above • Official MOUs • 'Standards' document adopted by GMS countries • Regional Disease information reports through networks • Quarterly project reports • Implementing agencies progress reports • FAO's project review reports	• Appropriate experts recruited in time • Participating countries set up national project offices in time • Governments are politically committed to providing facilities and staff to support HPAI control. • Regional organizations participate in the HPAI control. • Funding is available
INPUTS			
• **Country HPAI projects** • **Regional HPAI Support Units** • **International HPAI Facility**	• $ 76,500,000 • $ 22.500,000 • $ 3,000,000 • **$** 102,000,000	Multi-donor funding committed following submission of detailed projects plans	Donors willing to fund a long term strategy to control HPAI

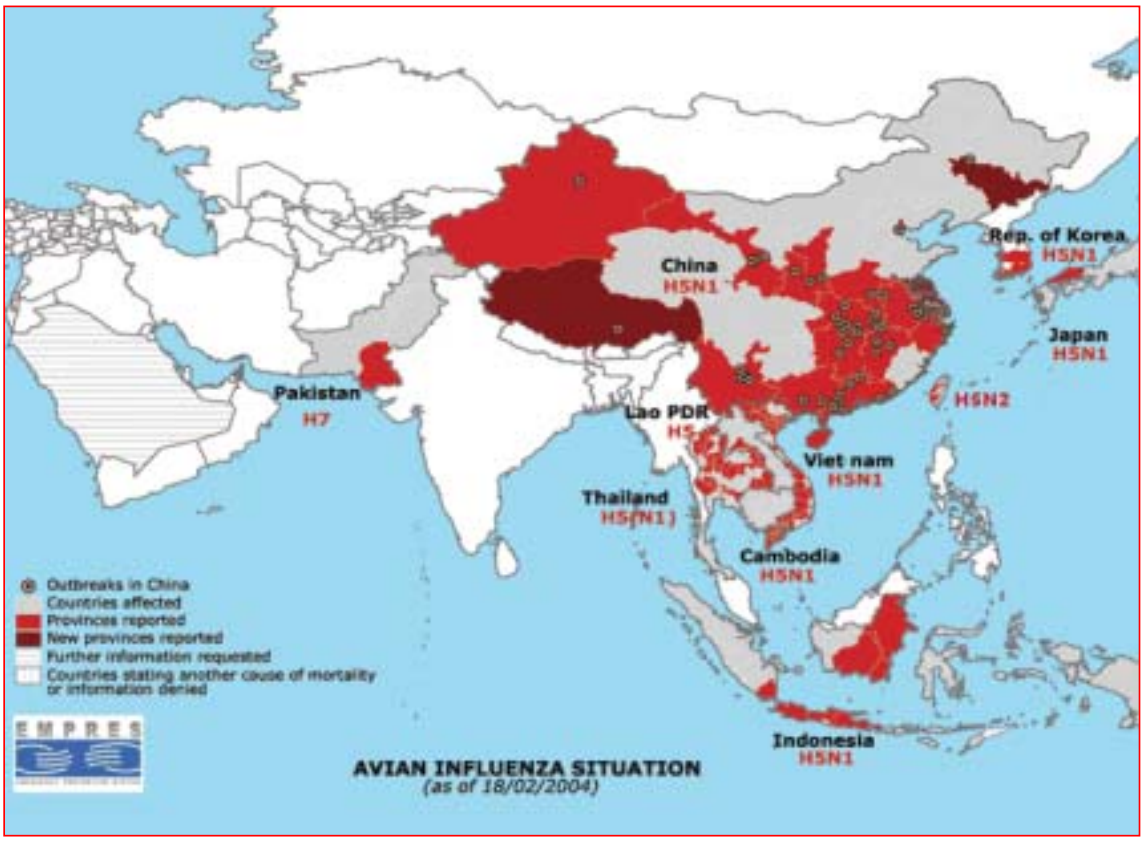
FIGURE 1

Conceptual framework for HPAI control in Asia



Progressive disease control pathway

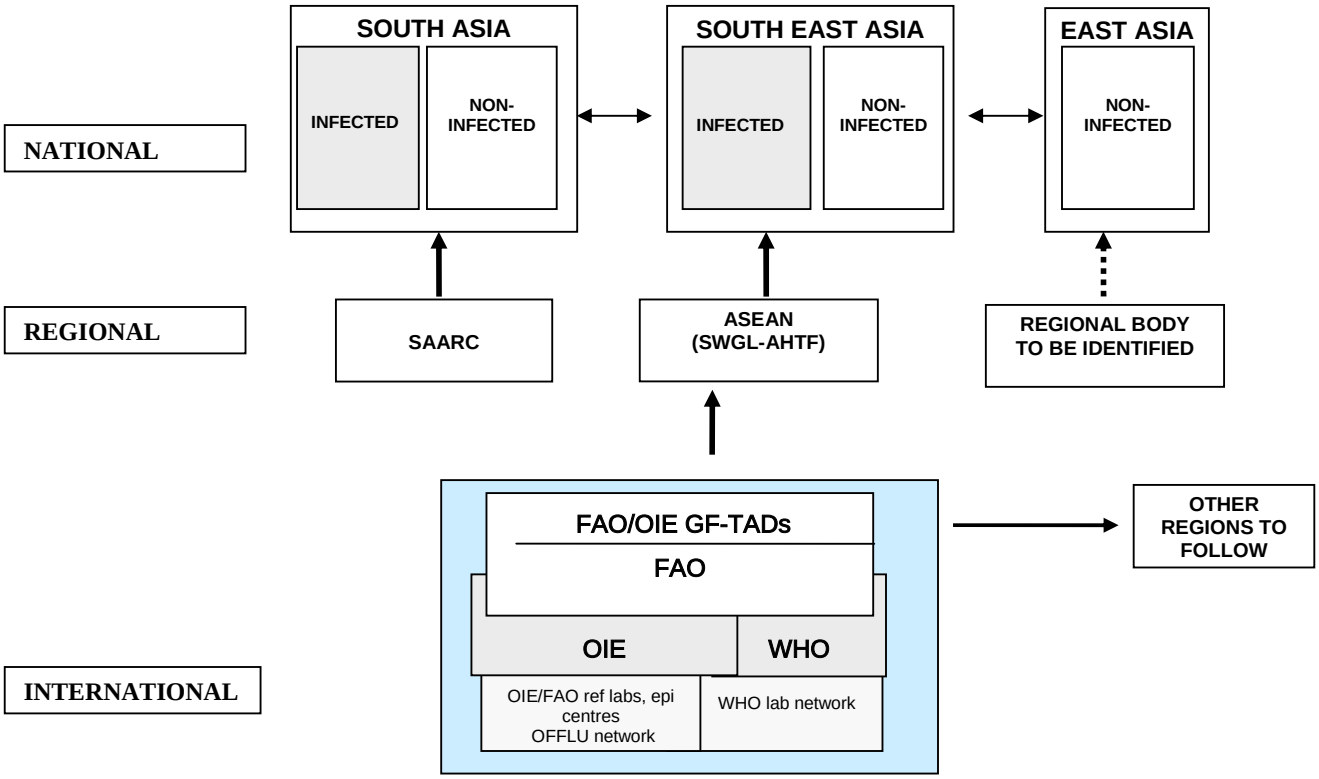
FIGURE 2 - HPAI SITUATION IN ASIA BETWEEN 2004 AND 2005



NUMBER OF HUMAN CASES AND FATALITIES (WHO 4 May 2005)

Country/ Territory	Total cases	Deaths
Cambodia	4	4
Thailand	17	12
Viet Nam	68	36
Total	**89**	**52**

FIGURE 3 - FRAMEWORK FOR IMPLEMENTATION



APPENDIX 1 - The Global Framework for the Progressive Control of Transboundary Animal Diseases (TADs)[1]

Executive Summary

The Global Framework for Progressive Control of Transboundary Animal Diseases (GF-TADs) is a joint FAO/OIE initiative, which combines the strengths of both organisations to achieve agreed common objectives. GF-TADs is a facilitating mechanism which will endeavour to empower regional alliances in the fight against transboundary animal diseases (TADs), to provide for capacity building and to assist in establishing programmes for the specific control of certain TADs based on regional priorities.

Devastating economic losses to livestock farmers the world over from major outbreaks of transboundary animal diseases (TADs) such as foot-and-mouth disease (FMD; 1997-2003), classical swine fever in the Caribbean and Europe (1996-2002), rinderpest in the Somali ecosystem (2001), peste des petits ruminants in India and Bangladesh, contagious bovine pleuropneumonia in Zambia, Angola, Namibia and Eritrea in 2000-2003, as well as Rift Valley fever in the Arabian Peninsula (2000) were the main stimulus for the initiative to create a Global Framework for Progressive Control Transboundary Animal Diseases. In early 2004, the reporting of Highly Pathogenic Avian Influenza (HPAI) virus throughout 10 Asian countries, with mortalities in exposed humans, underlines the pressing need for improvement of disease management at its inception before TADs spreads to devastating proportions and early detection, reporting and reaction. Several international fora and institutions have emphasised the need to prevent and control TADs due to their strong impact on livestock agriculture, trade and food security. The World Food Summit (1996), the International Committee of the World Organisation for Animal Health (OIE, 2002), the 31st Session of the FAO Conference (2001), and the World Food Summit: five years later (WFS:fyl, 2002) all recognised the widespread and increasing impact of epidemic animal diseases like FMD, and stressed the need to combine efforts to combat the disease at the national, regional and international level involving all relevant stakeholders. There is ample evidence from various studies that the spread of TADs will increase unless a concerted international action is put into place for effective prevention and progressive control, as currently shown in the HPAI outbreak that FAO, OIE, and WHO are attempting to contain

with their available resources. This conclusion is predominantly based on predictions of an unprecedented growth of the livestock sector and of the consumption of livestock products, particularly in TAD-endemic developing countries. The predicted livestock sector growth is expected to take place in tropical and sub-tropical zones, with trends towards larger farm units and more intensive, often industrial production, and with strong increase in trade of livestock and livestock products through informal and formal markets regionally and internationally. Even prior to the current HPAI crisis, FAO and OIE have examined the problem of transboundary animal diseases from the perspective of the complexity of environment, market access, food chain and human welfare, as well as considering the international public good goals of Social Equality, Sustainability of Natural Resources Use, and Veterinary Public Health. Thus the GF-TADs proposes the effective prevention and progressive control of major TADs as an

effective contribution to the achievement of the Millennium Development Goals by providing assistance and guidance to member countries through existing regional specialised organisations and their regional representation offices. To achieve this objective, it is suggested that focused efforts for the control of the major TADs must be at the source of infection and prior to the spread of the disease. The GF-TADs programme will be developed along four main thrusts:

- A regionally led mechanism, to operationally address and implement action against priority diseases as agreed by relevant stakeholders;
- The development of Regional and Global Early Warning Systems for major animal diseases;
- The enabling and application of research on TADs causing agents at the molecular and ecological levels for more effective strategic disease management and control; and,
- The completion of the Global Rinderpest Eradication Programme2 set for achieving global declaration of freedom by the year 2010.

1 Transboundary animal diseases are defined as: those that are of significant economic, trade and/or food security importance for a considerable number of countries; which can easily spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires cooperation between several countries.

The Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs)
Version approved as basic text the 24 May 2004 by FAO and OIE – page 4/38

The Outputs and Outcomes for the six-year programme (2004-2009) are:

- Country-based surveillance and disease reporting enhanced through capacity building of epidemiology units and of laboratory personnel.
- Concerted animal disease control programmes developed through the establishment of regional support units within ongoing regional specialised organisations and/or Regional Commissions. These regional support units will be in a position to assist in the direction of animal disease surveillance, and to provide mechanisms to meet specific regional needs.
- Regional and Global Early Warning Systems for TADs established with the collaboration of FAO, OIE and WHO, connected to regional epidemiological systems.
- Internationally verified global freedom from rinderpest - The Global Rinderpest Eradication Programme, GREP secured.
- Animal populations where primary endemic circulation of FMD and other selected TADs occur identified and characterised.
- International, regional, and national early response capacities for prompt and authoritative disease diagnosis and for targeted local disease control to limit the spread of new outbreaks of TADs established.
- Referral diagnostic and molecular biological capacity of OIE-FAO Reference Laboratories and Collaborating Centres strengthened and technology transfer provided to National Agricultural Research Systems (NARS), primarily through the established system of networks of national and Regional laboratories supported by the FAO/IAEA Joint Division and through North-South/South-South laboratory partnerships including the network of OIE-FAO reference laboratories.
- Assistance in the development of TAD research programmes provided through FAO and OIE Collaborating Centres and other advanced research institutes (ARIs) as appropriate.

2 Rinderpest – also known as cattle plague - once a disease that expanded from Mauritania to Indonesia and from Europe to southern Africa (with one outbreak each in Brazil and Australia) is now likely to be limited to a small primary endemic area known as the Somali pastoral ecosystem. Global eradication is planned for 2010. This major and unique undertaking of global eradication of an animal disease offers learning opportunity for good disease management practices in general.

APPENDIX 2 - HPAI VIRUS IN ASIA: TECHNICAL INFORMATION

Highly Pathogenic Avian influenza (HPAI), also known as fowl plague, is a disease of birds causing huge morbidity and mortality. It is caused by infection with influenza A viruses of the family Orthomyxoviridae. Of the three influenza virus types (A, B and C), only the type A is responsible for fowl plague. Many bird species, including wild and aquatic birds have been known to be infected by influenza A viruses, but the majority of the virus isolates are of low pathogenicity for chickens and turkeys, the main birds of economic importance. Influenza A viruses have several subtypes classified on the basis of their haemaglutinin (H) and neuraminidase (N) antigens. At present 15 H subtypes and 9 N subtypes are recognised. The highly virulent viruses causing huge losses have only been associated with H5 and H7 subtypes. However, not all H5 and H7 subtypes are virulent. The virus is known to genetically evolve rapidly causing antigenic drift and the potential to generate new virulent subtypes. Recent epidemics of HPAI in South East Asia have demonstrated the rapidity with which it can spread and destroy the poultry industry. Over 100 million birds have been either killed or destroyed and a number of human beings have died of the disease. The virus has the potential to cause catastrophic human pandemics if it mutates into a form that transmits rapidly between humans. The HPAI has spread in vast areas of South East Asia and it will take a few years before the disease is eradicated in domestic poultry. In the meantime the disease will continue to pose a serious threat to commercial and smallholder poultry sector in the sub-region and a serious risk to those countries in the sub-region that are free of the disease.

Diagnosis

The virus can be identified by inoculating suspensions of infected material into embryonated fowl eggs. The allantoic fluid from inoculated eggs after an incubation period of 4-7 days can be tested for haemagglutinating activity. The presence of influenza A visors can be confirmed by immunodiffusion test between the isolated virus and an antiserum to the nucleocapsid or matrix antigen. Alternatively, an RT- PCR test can be used with appropriate set of primers to identify the virus. Influenza A virus can be sub-typed using mono-specific antisera prepared against the isolated antigens of each of the 15 H and 9 N subtypes in immunodiffusion tests. Alternatively isolated viruses can be subjected to haemagglutination and neuraminidase inhibition tests against a battery of polyclonal antisera covering all the subtypes. Since not all H5 and H7 viruses are virulent, the isolated virus can also be tested for pathogenicity through inoculation into susceptible birds. Serological tests such as AGID and ELISAs are also available to detect antibodies to influenza A type specific antigens.

Vaccines

Highly efficacious inactivated oil-emulsion vaccines as well as recombinant vaccine delivered through fowl pox virus against H5 and H7 subtypes are commercially available but are only recommended under exceptional and time-bound situations. For example, the international organisations recommended the use of inactivated vaccines against HPAI in the recent epidemics in countries where export was not a major priority and the disease had spread extensively into the smallholder poultry farming systems. The vaccine is currently used in some countries in conjunction with the application of culling and high biosecurity procedures to eradicate the disease.

Evolution of HPAI/H5N1 virus in East and Southeast Asia

Until the 2005 outbreak in Asia it was understood that to facilitate the emergence of HPAI, a population of susceptible avian hosts needs to be present in which LPAI viruses can multiply. This has been the case in all major outbreaks in Europe and the Americas, where a number of different strains of avian influenza have caused serious mortality.

However, the evolution of HPAI/H5N1 virus in East and Southeast Asia has taken a slightly different course. Retrospective analysis of disease outbreaks caused by the H5N1 strain show that the virus, first identified in wild geese in 1996 in Guangdong Province in PR China, adapted itself over a relatively short period to the domestic domestic duck population. The virus then spread rapidly in the large (660 million) domestic duck population in PR China, causing little or no disease symptoms. By 2004, it was estimated that infected waterfowl were excreting virus for as long as 17 days following infection, causing a huge contamination of the environment. This process is regarded as one of the key factors leading to the huge number of outbreaks in the Region.

While the gene pool of the avian influenza viruses is relatively benign in its natural wildlife host population, it tends to evolve rapidly into pathogenic strains in domestic poultry. Available evidence points at causal factors such as the changing population size and structure of poultry industry in response to increasing consumer demand, expansion of virus from its traditional host range to domestic ducks and terrestrial poultry, and the wide geographical spread through the live-bird trade. The widespread circulation of HPAI/H5N1 in domestic ducks and terrestrial poultry has resulted in the selection of a more aggressive Z genotype with the Z+ strain infective to humans spreading to Thailand, Viet Nam and more recently to Cambodia. This spill-over process into domes-

ticated poultry and humans presents a clear and present danger to the global poultry industry and public health. Therefore, the rapid evolution of the virus necessitates a comprehensive global approach linked to adequate capacity in disease surveillance, an early-warning response, for all countries affected, regionally and internationally.

The 1997 H5N1 outbreak in Hong Kong SAR, which killed 6 of the 18 people infected, originated from an H5N1 strain isolated from geese in 1996 in Guangdong Province. The virus has since been continually, and relatively rapidly, changing genetically and in its host range, particularly finding a niche in domestic ducks. This adaptation, together with the peculiar nature of farming system in the region is considered to have contributed significantly to increased HPAI cases.

The following chronological events based on disease outbreaks, and characterization of virus isolates from both normal and sick and dead birds prior to the explosive outbreaks and spread of the disease in Southeast Asia in 2004 serve to highlight the situation:

- The first detection of H5N1 virus occurred in geese in the Guangdong Province of PR China in 1996, hence the designation of the virus Geese/GD/96. No known precursor of this H5N1 has been detected but it is believed to have originated from low pathogenic avian influenza viruses circulation in PR China during that period.
- The H5N1 viruses have been found in farmed domestic ducks and live bird markets since 1997. The first evidence of H5N1 virus causing serious disease in both terrestrial poultry and human beings came from outbreaks that occurred in Hong Kong SAR during 1997. This genotype appears to have emerged from of reassortment of genes from several avian influenza viruses circulating in PR China at the time and included H9N2 and H6N1 viruses from quail and teal, respectively.
- Before the current crisis, outbreaks of disease due to H5N1 viruses have been few and limited to Hong Kong SAR (1997, 2001, 2002 and 2003).
- Between 1997 and 2003 a genetically heterogeneous population of H5N1 viruses emerged in domestic water fowl. While before 1999, HPAI viruses were rarely detected in domestic ducks, the genetic changes to viruses from this time onwards appear to have led to an expansion of host range to both domestic and wild waterfowls.
- Between 2001 and 2004 a genetically heterogeneous population of H5N1 viruses also emerged in terrestrial poultry in Southern PR China and Hong Kong SAR.
- During this period, the majority of the viruses detected and characterized belonged to the genotype that is now referred to as the ‘Z’ genotype, which has now become dominant in the region.
- Thus between 1996 and 2004, from among the vast genetic pool of avian influenza viruses in South and East Asia, a genetically heterogeneous population of highly pathogenic H5N1 influenza viruses has emerged that displays variable phenotypic characteristic, particularly in its infectivity and pathogenicity to domestic ducks.

APPENDIX 3 - ECONOMIC IMPACTS OF HPAI IN SOME SOUTH EAST ASIAN COUNTRIES

Thailand is the only poultry-producing country in the Region with a substantial regional and international export orientation. According to Oxford Economic Forecasting, in 2004, the total GDP losses accruing from poultry farm losses in Thailand, the fourth largest poultry-exporting country in the world prior to the HPAI outbreaks was $1.2 billion. Export bans on poultry have severely damaged the industry, together with its suppliers: hatcheries, feed mills farm workers and traders. Furthermore, Thailand has suffered substantial human fatalities. Thailand's veterinary services systems has risen to the enormous task of controlling the epidemic and is now in the process, through active surveillance and disease mapping, to identify hot spots for final eradication.

In **Viet Nam**, 58 out of 64 Provinces were affected by the first 2004 outbreak, and 17% of 261 million national flocks were destroyed. Direct losses were estimated to be over $200 million. The number of rural households directly involved in poultry production, predominantly carried out by women, has halved. The Government has been proactive in dealing with the outbreaks and has, supported by a World Bank emergency HPAI control project, begun to strengthen diagnostic and surveillance, prepare policy studies on compensation and poultry sector restructuring, instituted stringent biosecurity measures, and initiated a public awareness campaign. A multi-ministerial steering committee meets regularly in close coordination with WHO, the World Bank and other international organizations. However, consumer confidence in consuming poultry remains low and poultry prices have dropped, adding additional financial hardship on large and small-scale producers.

In **Indonesia** 15 out of 30 Provinces were affected with the destruction of some 16 million birds. Direct losses are estimated at over $170 million. The greatest loss was among the backyard village farmers, estimated at 30 million households keeping 200 million chickens. An estimated 23% of industrial and commercial farm workers lost their jobs and 40% of these were unable to find alternative employment. Given the small scale of problem in Cambodia and Lao PDR, where the commercial poultry sector is small, the economic damage was small.

Lao PDR and Cambodia have experience a relatively low incidence of HPAI/H1N1 outbreaks, although their smallholder sectors were hard hit and there have been fatalities in Cambodia. Weak veterinary services in both countries have failed to bring the infection under control and the disease has now become endemic, with sporadic outbreaks. Controlling or eradicating HPAI from both countries plays an important part in the overall strategy for Southeast Asia, as these countries form a natural boundary between Thailand and Viet Nam and southern PR China, thereby preventing transboundary progression.

Pakistan is the only infected country with HPAI in South Asia, and has had endemic problem with the HPAI/H7N3 strain for several years. The local poultry industry is geared predominantly to home consumption. Of the total population of 156 million, over 40 million people are poor, living predominantly in rural areas supported by subsistence farming system. While HPAI in Pakistan has not been directly linked with the outbreaks in Southeast Asia, it is important to note that the disease causes high mortality and poses a potential threat to its rapidly expanding livestock industry.

APPENDIX 4 – VACCINATION FOR HPAI

HPAI VACCINES *(Reproduced from the OIE manual)*

Experimental work has shown, for both LPAI and HPAI, that vaccination protects against clinical signs and mortality, reduces virus shedding, increases resistance to infection, protects from diverse field viruses within the same hemagglutinin subtype, protects from low and high challenge exposure, and reduces contact transmission of challenge virus (12, 16, 44, 50). However, the virus is still able to infect and replicate in clinically healthy vaccinated birds. In some countries, vaccines designed to contain or prevent HPAI are specifically banned or discouraged by government agencies because it has been considered that they may interfere with stamping-out control policies. However, most HPAI control regulations reserve the right to use vaccines in emergencies.

It is important that vaccination alone is not considered the solution to the control of HPAI or LPAI of H5 and H7 subtypes if eradication is the desired result. Without the application of monitoring systems, strict biosecurity and depopulation in the face of infection, there is the possibility that these viruses could become endemic in vaccinated poultry populations. Long-term circulation of the virus in a vaccinated population may result in both antigenic and genetic changes in the virus and this has been reported to have occurred in Mexico (26).

Live conventional influenza vaccines against any subtype are not recommended.

Conventional vaccines

Conventionally, vaccines that have been used against HPAI or LPAI have been prepared from infective allantoic fluid inactivated by beta-propiolactone or formalin and emulsified with mineral oil.

The existence of a large number of virus subtypes, together with the known variation of different strains within a subtype, pose serious problems when selecting strains to produce influenza vaccines, especially for LPAI. In addition, some isolates do not grow to a sufficiently high titre to produce adequately potent vaccines without costly prior concentration. While some vaccination strategies have been to produce autogenous vaccines, i.e. prepared from isolates specifically involved in an epizootic, others have been to use vaccines prepared from viruses possessing the same haemagglutinin subtype that yield high concentrations of antigen. In the USA, some standardisation of the latter has been carried out in that the Centre for Veterinary Biologics have propagated and hold influenza viruses of each subtype for use as seed virus in the preparation of inactivated vaccines (5).

Since the 1970s in the USA, there has been some use of inactivated vaccines produced under special licence on a commercial basis (21, 29, 34). These vaccines have been used primarily in turkeys against viruses that are not highly pathogenic, but which may cause serious problems, especially in exacerbating circumstances. Significant quantities of vaccine have been used (22, 29). Conventional vaccination against the prevailing strain of LPAI has also been used in Italy for a number of years (15). Vaccination against H9N2 infections has been used in Pakistan (32), Iran (54) and the People's Republic of China (27).

Inactivated vaccine was prepared from the LPAI virus of H7N3 subtype responsible for a series of outbreaks in turkeys in Utah in 1995 and used, with other measures, to bring the outbreaks under control (22). Similarly in Connecticut in 2003 vaccination of recovered hens and replacement pullets with a H7N2 or H7N3 vaccine was implemented following an outbreak of LPAI caused by an H7N2 virus (46).

Vaccination against HPAI of H5N2 subtype was used in Mexico following outbreaks in 1994–1995, and against H7N3 subtype in Pakistan (19, 26, 31) following outbreaks in 1995. In Mexico, the HPAI virus appeared to have been eradicated, but LPAI virus of H5N2 has continued to circulate, while in Pakistan HPAI viruses genetically close to the original HPAI virus were still being isolated in 2001 (51) and 2004. Following the outbreaks of HPAI caused by H5N1 virus in Hong Kong in 2002 (39), a vaccination policy was adopted there using an H5N2 vaccine. In 2004 the widespread outbreaks of HPAI H5N1 in some countries of South-East Asia resulted in vaccination being used in the People's Republic of China and Indonesia.

DIVA strategy for vaccination

A strategy that allows 'differentiation of infected from vaccinated animals' (DIVA), has been put forward as a possible solution to the eventual eradication of HPAI without involving mass culling of birds and the consequent economic damage that would do, especially in developing countries (17). A DIVA strategy allows the benefits of vaccination (less virus in the environment), but the ability to identify infected flocks would still allow the implementation of other control measures, including stamping out. Vaccines used in this strategy should allow distinction from field infections and this could be by a number of detection methods. For example, inactivated vaccines will not result in antibodies to nonstructural virus proteins, which could be detected in infected birds (52). Alternatively a heterologous virus with a neuraminidase (N) subtype different from the field virus or non-vaccinated sentinel birds could be used.

During the 1999–2001 outbreak in Italy, the HPAI H7N1 subtype was eradicated by stamping-out, but the LPAI H7N1 virus re-emerged. In order to supplement direct control measures, a DIVA strategy was developed based on the use of an inactivated oil emulsion vaccine containing the same H subtype as the field virus, but a different N, in this case H7N3. Vaccinated and naturally infected birds were differentiated using a serological test to detect specific anti-N antibodies (9, 10). The same strategy was used to control LPAI caused by H7N3 in Italy in 2002–2003 (8) in this case with an H7N1 vaccine. In both cases vaccination using the DIVA strategy resulted in eradication of the field virus.

In Italy both neuraminidase differentiation tests and non-vaccinated sentinel methods were used together.

Recombinant vaccines

Recombinant vaccines for AI viruses have been produced by inserting the gene coding for the influenza virus haemagglutinin into a live virus vector and using this recombinant virus to immunise poultry against AI, thereby producing protection equal to inactivated influenza vaccines. In addition to having the advantages of live vaccines, recombinant live vectored vaccines also enable the differentiation between infected and vaccinated birds, as, for example, they do not induce the production of antibodies against the nucleoprotein antigen that is common to all AI viruses. Therefore, only field-infected birds will exhibit antibodies to the agar gel precipitation test or ELISA directed towards the detection of influenza group A (nucleoprotein) antibodies. However, these vaccines have limitations in that they will not replicate or induce protective immunity in birds that have had field exposure to the vector, i.e. fowlpox or infectious laryngotracheitis viruses for currently available recombinant vaccines (28, 47). Equally in many areas existing antibodies to these viruses may be widespread (due to field exposure and vaccination) in the poultry population and the use of these vaccines is therefore limited to a population that is seronegative to the vector virus or, in the case of fowlpox recombinant vaccine, effective immunisation is elicited when given to 1-day-old chickens in the hatchery irrespective of the maternal fowlpox antibody status (3). In addition, the use of these vaccines is restricted to species in which the vector virus will replicate. To avoid interference with antibody, the vaccine should be administered to day-old chicks. For example, infectious laryngotracheitis virus will not replicate in turkeys, and as these birds are particularly important in the epidemiology of AI, the use of this vaccine is limited to areas in which turkeys are not present.

The use of recombinant vaccines is restricted to countries in which they are licensed and are legally available. The recombinant fowlpox-AI-H5 vaccine is licensed in El Salvador, Guatemala, Mexico and the USA (44).
Recombinant fowlpox virus vaccines containing H5 HA have been prepared and evaluated in field trials (7, 20, 35, 48), but the only field experience with this vaccine has been in Mexico, El Salvador and Guatemala where it has been used in the vaccination campaign against the H5N2 virus. Between 1995 and 2001, Mexico used more than 1.423 billion doses of inactivated H5N2 vaccine in their H5N2 control programme (55). In addition, Mexico, Guatemala and El Salvador have used over 800 million doses of the recombinant fowlpox-AI-H5 vaccine for control of H5N2 LPAI from 1997 to 2003 (45).

Other novel vaccines

A baculovirus-expression system has been used to produce recombinant H5 and H7 antigens for incorporation into vaccines (56).
DNA encoding H5 haemagglutinin has been evaluated as a potential vaccine in poultry (25).

APPENDIX 5 - CURRENT FAO AND OTHER DONOR EMERGENCY ASSISTANCE

Recipient countries (As of 12/05/05)

Cambodia

Donors	Amount (US$)	Description
FAO TCP	$387,075	TCP/CMB/3002 Emergency assistance for the control of avian influenza
ADB*	$91,940	Non-Trust Fund, under general coordination of FAO (for training, equipment and public awareness activities)
Australia	$50,000	AusAID through FAO Trust Fund (OSRO/CMB/402/AUL)
	$156,250	Strengthening surveillance and response capacities for Avian Influenza through WHO Cambodia
China	$50,000	Direct contribution to government (no details given)
France	$53,480	French Cooperation through FAO Trust Fund (OSRO/CMB/403/FRA)
Germany	$50,000	GTZ through FAO Trust Fund (OSRO/CMB/401/GER)
Japan	$56,000	Non-Trust Fund, grant assistance for grass-roots human security project for antiviral medicines & equipment
WHO	$3,000	PPE supplies/training, lab training for DAHPs investigating teams and Human Flu Vaccine purchase.

China

Donor	Amount (US$)	Description
FAO TCP	$387,097	TCP/CPR/3004 Emergency assistance for the control of avian influenza

Indonesia

Donors	Amount (US$)	Description
FAO TCP	$388,170	TCP/INS/3001 Emergency assistance for the control of avian influenza
Australia	$2,597,657 (A$3,325,000)	Human health protection, antiviral supplies through WHO
		Provide training (2 virologists) in AAHL, Geelong, Australia
		- technical assistance, training, strengthening surveillance and response capacities through WHO Indonesia
		- dispatch 3 epidemiologists working with the Disease Investigation Center's staff members to assist the surveillance action plan - dispatch 1 virologist for bench training in DIC R-III, R-IV and R-VI (18 vets and assistants)
		- Provide training (2 field veterinarians) on HPAI in AVA, Singapore
China	$100,000	Vaccines, training, public awareness at off farm
Germany	$60,692	OSRO/INS/402/GER through FAO Trust Fund. Four trainings on clinical & gross pathology diagnosis (total 222 veterinarians)
Japan	$78,906	MAFF provided protective gear through grass roots aid fund
	$113,000	Public awareness campaign activities
	$10,000	Through JICA/Indonesia on diagnostic training (24 veterinarians)
Netherlands		May provide veterinary experts in support of FAO operations.
	€89,000	The cooperation plan HPAI Indonesia 2005 (development of coping strategy, Monitoring and surveillance)
USA		Support through the provision of laboratory analysis available in Atlanta
World Bank		- avian influenza workshop in Bengkulu - training for field officers & farmers on clinical signs, vaccination & biosecurity measures in Bengkulu (3 districts)

Lao PDR

Donors	Amount (US$)	Description
FAO TCP	$384,125	TCP/LAO/3001 Emergency assistance for the control of avian influenza
ADB	$50,000	Direct procurement of Personnel, Protective clothing and equipment
Australia		Through AusAID to invite two government veterinarian for training course
China	$50,000	Re-establishing poultry breeding farms
France	$53,000	For surveillance activities (OSRO/LAO/401/FRA)
Japan	$50,000	Through JICA
	$33,758	MoHLW through WHO
USA	$250,000	Direct contribution to WHO Regional Office (Manila)
WHO		Support for one veterinarian for a 2 month mission
	$11,050	In kind donation from WPRO

Pakistan

Donors	Amount	Description

	(US$)	
FAO TCP	$387,370	TCP/PAK/3002 Emergency assistance for the control of avian influenza
China	$50,000	For strengthening the diagnostic/samples analysis capacities of the national labs.

Thailand

Donor	Amount (US$)	Description
FAO		Technical advice of experts
Japan		Experts & standard Antigen/reagents to assist avian influenza typing/sub-typing.

Viet Nam

Donors	Amount (US$)	Description
FAO TCP	$387,979	TCP/VIE/3003 Emergency assistance for the control of avian influenza
ADB	$ 50,000	Protective gear
EC	$968,000	Protective clothing, lab equipment
Germany	$ 60,000	laboratory diagnostic equipment
Japan	$200,000	Tamiflu (anti-viral drug)
	$1.800.000	Japanese Social Development Fund (JSDF) to assist vulnerable households and strengthen community based early warning through the World Bank AIERP project
WHO		Unspecified in-kind support
World Bank	$170,000	Formulation mission for Avian Influenza Emergency Recovery Project
	$5,000,000	Avian Influenza Emergency Recovery Project (AIERP) for strengthening disease surveillance and diagnostic capacity; strengthening the poultry sector infrastructure to better cope with serious disease outbreaks; and safeguarding human health by improving public awareness and information
Denmark	nearly $130,000	Through DANIDA, in kind cooperation for avian influenza control in 14 provinces (sprayers, protective clothing, diagnostic kits for local veterinarians)
AFD		Assessment mission to support the HPAI situation in Viet Nam and to provide recommendations for short and long term by Agence Française de Développement (AFD), Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and Vétérinaires Sans Frontières (VSF) was funded by AFD
Republic of Korea	$30,000	to study measures to prevent and control bird flu

Regional

Donor	Amount (US$)	Description
Japan	$1,610,083	MoFA through FAO Trust Fund for CMP, INS, LAO and VIE (OSRO/RAS/401/JPN)
Australia	$781,250	Strengthening the operations of the WHO Global Outbreak Alert and Response Network
	$390,625 (A$500,000)	Experts in epidemiology, animal health, virology, laboratory and public health to address Avian Influenza outbreaks; equipment/consumables through WHO WPRO
	$117,188 (A$150,000)	Enabling technical support and the provision of essential supplies to address Avian Influenza (diagnostic kits and PPE) for East Timor, Thailand and Myanmar through WHO SEARO
	$273,438 (A$350,000)	Responding to the epidemiological and diagnostic needs arising from the Avian Influenza outbreak at Australian Animal Health Laboratory (AAHL), Geelong
	$507,813 (A$650,000)	ASEAN-Australia Development Cooperation Program (regional capacity building to deal with infectious disease outbreaks)
	$3,906,250 (A$5million)	Strengthening the regions ability to identify and respond to outbreaks of emerging and resurging zoonotic diseases through WHO WPRO, ASEAN Secretariat and DAFF
Germany	$6,605,020 (€5,000,000)	HPAI control in Viet Nam, Cambodia, Lao PDR, Thailand, Indonesia. Duration three years.
Netherlands	$ 250,000	for ECTAD (with additional in-kind expert assistance)
EU		€ ~5 million; wants country and regional strategies + country political commitment
FAO TCP	$384,231	TCP/RAS/3004 Emergency regional coordination assistance for control of avian influenza in southeast Asia
	$394,668	TCP/RAS/3006 Diagnostic Laboratory and Surveillance Network Coordination for Control and Prevention of Avian Influenza in Southeast Asia
	$395,502	TCP/RAS/3007 Diagnostic laboratory and surveillance network coordination for control and prevention of avian influenza in East Asia
FAO TCP (continued)	$394,444	TCP/RAS/3008 Diagnostic laboratory and surveillance network coordination for control and prevention of avian influenza in South Asia

FAO TCP (continued)	$394,444	TCP/RAS/3008 Diagnostic laboratory and surveillance network coordination for control and prevention of avian influenza in South Asia
	$398,307	TCP/RAS/3010 Emergency regional support for post-avian influenza rehabilitation
	$350,000	TCP/RAS/3014 Strengthening avian influenza control through improved transboundary animal disease information management system in Asia

EMPRES / Supra-Regional

Donor	Amount (US$)	Description
FAO TCP	$370,052	TCP/INT/3010 EMPRES Emergency Centre for Transboundary Animal Disease operations (ECTAD) – Coordination

* Asian Development Bank

APPENDIX 6 – COUNTRY PROFILES OF HPAI

H5N1 infected countries

Thailand has an advanced country strategy document and disease control plans. Although Thailand has not requested any financial support, it is an active member of the regional and international cooperation for the HPAI control. The country has made great strides in controlling the disease through continuous improvement in its infrastructure, diagnostics and surveillance capacity and has also provided regional support to other poorer countries in the region.

Thailand was, ahead of the HPAI crisis, the world's fourth largest poultry exporting country, and its strategy for the long term control of the disease is very much determined by its efforts for restoring its export opportunities. Thailand is also the country with the second largest number of human fatalities from HPAI. Strengthening human public health and public awareness therefore ranks high on Thailand's HPAI control agenda. Thailand's poultry sector is extremely diverse, ranging from vast, integrated layer and broiler farms with state of the art management and equipment, to small holder farming systems in the delta and highland zones. The intermingling of large domestic duck and rural poultry populations, together with commercial and backyard pig rearing, poses a continuous risk of HPAI spill-over.

Viet Nam has an advanced national strategy document which needs to be supported by detailed disease control programme, and is, to date, the only regional country that has designed an HPAI emergency recovery project financed by the World Bank/IDA, with technical support funding from FAO and the Japan Social Development Fund (JSDF). FAO has been supporting the Government of Viet Nam in developing this control programme. Viet Nam is also preparing strategy papers on national compensation policy, poultry sector restructuring, emergency preparedness, and is strengthening its veterinary services system. A newly built Virus Reference Laboratory will commence HPAI virus characterization work this year. With the highest number of human cases recorded so far, Viet Nam will continue to need external support. Current estimates are that the country will need approximately $7.5 million per year for three years to provide the necessary infrastructure and manpower to control and prevent the spread of the disease.

Cambodia and Lao PDR

Both countries are mountainous, with relatively low population and poultry densities. Veterinary services are weak, and challenged by difficult road and communication infrastructure. Both countries require significant assistance in strengthening their veterinary services, laboratory capacity, surveillance, human capacity building, and epidemiology and disease information systems. Both countries have predominantly smallholder farming systems, so that the impact of HPAI falls mainly on the rural poor. Cambodia has had three human cases of HPAI in the latest (2005) wave of outbreak influenza. This has underlined the weakness in surveillance capability. Even though HPAI incidence in both countries is low and their poultry sectors largely subsistence-based, the control of HPAI is important in the overall regional strategy. By creating a disease-free buffer zone between Thailand and Viet Nam, future disease outbreaks in either Viet Nam or Thailand can be kept apart. Cross-border traffic between Cambodia and Viet Nam is known to introduce infected poultry, and border controls need to be further strengthened.

Indonesia

The unfortunate impact of the tsunami late 2004 has forced the country to divert its focus on this immediate human disaster. However, the country needs urgently to develop its national disease control strategy and control programme.

Some features typifying the HPAI outbreaks indicate that the H5N1 strain does not seem to be genetically linked to the other such strains isolated in the SEA region. The disease has spread widely in many islands, mainly to southern Sumatra and Sulawesi, Java and Bali. A potential advantage is that the many islands of Indonesia's archipelago form natural barriers to the spread of disease, even though trans-island traffic is voluminous and not always well guarded. Furthermore, the recently completed decentralisation of Indonesia's Districts and Subdistrict levels from the Central Government, allowing the former to set policy and manage public sector budget independently from Jakarta, has fragmented the national-provincial flow of disease information and their control programmes. This institutional constraint hampers effective, rapid alert and response.
Indonesia's smallholder farming system, predominantly typified by sector 4 and 5 poultry systems, has made it difficult to apply effective culling and biosecurity measures. This has induced the country to undertake mass vaccination to control the high-mortality disease in the smallholder farming systems. While the disease incidence has been brought down substantially, major gaps remain in the understanding of the epidemiology of HPAI in the country. Recent molecular analysis of the various strains of H5N1 would provide further aid in disease control planning. Fortunately Indonesia has had no human cases of HPAI. The control of HPAI in Indonesia is also to assist in eliminating/reducing the HPAI threat to the Australian continent, Malaysia and the the Philippines. Therefore, the control of the disease in the country is of strategic regional importance.

Countries with H7, H9 virus
Pakistan has been affected by the H7 and H9 strains of the avian influenza virus for a number of years. The disease outbreaks reported in the country last year appear unrelated to the simultaneous H5N1 related outbreaks in Southeast Asia. However, the country is threatened by an equally highly pathogenic avian influenza virus strain H7N3. While the disease is presently under control, Pakistan will require additional assistance in strengthening its diagnostic capacity, and vaccine production facilities. Country strategy and detailed control plans still need to be developed.

Non-infected but at risk countries
Currently the non-infected at risk countries can be divided into countries that were previously infected but have stamped out the disease, and those that have never been infected. The former group of countries includes Hong Kong SAR, Japan, Malaysia, and Republic of Korea. The success of their stamping out of the disease was greatly dependent on the availability of adequate financial resources and ability to provide good veterinary infrastructure to implement biosecurity measures and surveillance programmes. Recently DPR Korea, previously never infected has HPAI outbreaks due to H7 strain in three well-managed farms. The disease has now been stamped out but the situation in the smallholder sector requires further clarification.

Of the countries that have been never infected include in Southeast Asia (Malaysia, Myanmar, and Philippines) and South Asia (Bangladesh, Bhutan, India, Maldives, Nepal, and Sri Lanka). Many of these countries do not have the necessary financial resources and the level of veterinary services to support stamping out policy and maintain high level of surveillance to either prevent the introduction and establishment of infection.

Thus, resources will be targeted to these countries to improve active risk-based surveillance programmes, better emergency preparedness plans and facilities to stamp out the disease.

The strategy will also ensure that the direct disease control efforts will be enhanced by the development of appropriate national and regional policies on management and restriction of live animal movement, compensation of removed stock, disease reporting requirements and long term planning to readjust poultry systems and industry in the Region so as to prevent any further risks of HPAI.

APPENDIX 7 - KEY COMPONENTS OF THE STRATEGY

Strengthening AI control measures	• Surveillance and investigation • Diagnosis • Vaccination • Culling and carcass disposal • Information system • Emergency preparedness • Socio-economic analysis
Policy development	• Legal framework • Restructuring • Compartmentalization and zoning • Movement and trading • Compensation and credit • Regulation for recreational activities related to poultry
Public awareness and education	• Biosecurity • Human health
International coordination	
Program management	
Establishment linkage with human health sector	
Participation of private sector	
Strengthening veterinary services	
Research and development	

INDICATIVE ACTIVITIES AT THREE DIFFERENT LEVELS OF STRATEGY IMPLEMENTATION

National projects
• Policy framework to support control • Strategic vaccination • Veterinary capacity building • Programme management training • Socio-economic impact • Risk-based surveillance programmes • Eradication at source of infection • Epidemiology-driven disease control • Policy/protocol/SOPs when seropositive results occur. • Private sector involvement. • National disease information systems to network regional concerns. • Poultry sector restructuring. 1. Each country is encouraged to think of how its poultry sector should go in 5-10 years time. Questions like: Poultry profile – commercial vs smallholder, how many companies are in-

volved?

2. Should countries define their restructuring policies/mechanisms depending on the poultry sector they have?
   a. Some countries have a significant duck population spread over rice paddy fields.
   b. Some countries have a big commercial poultry production sector that influences government policy
   c. Still there are countries with a large scavenging poultry population with no export markets at all.
3. If restructuring is pursued, what assistance or incentives can government give to raisers to undertake this. This will depend on the country vision on their poultry industry.
4. Restructuring schemes: licensing poultry enterprises for a certain time period, decreasing production of ducks by halting hatching, relocating the poultry farms to areas with less poultry population density , separating the poultry population from pig farms thru good biosecurity measures.
5. While the production systems of countries are of the mixed type, the concept of separating the poultry population from pig farms as well as from duck farms should be considered without drastically disrupting social systems.

- Community-based early warning networks.

Regional/Sub-regional level

- Sound disease control programmes for SEA, EA and SA Regions.
- Sub-regional training disease in diagnosis, epidemiology and disease information.
- Regional policy and regulatory framework harmonization.
- Capacity building in socio-economic impact assessment
- Strengthening regional networking.
- Strategic and technical exchange meetings.
- Information collecting and sharing information.

Regional Network - Disease diagnosis and surveillance

- Strengthen diagnostic capacity of regional laboratories
- Build epidemiology capacity to strengthen science-based disease detection.
- Establish epidemiology information exchange networks.
- Develop collaboration between technical centers of OIE, FAO and WHO.
- Facilitate sharing and exchange of virus strains with WHO
- Strengthen veterinary public health services.
- Develop regional communication strategy to support effective implementation of the HPAI control programmes.

Regional Network - Policy and socio-economic impact assessment

- Information sharing between national policy makers, analysts and economist.
- Policy and legislation development
- Socio-economic impact analysis on livelihoods and human health.
- Trade impact and poultry sector issues, such as zoning, compartmentalization, vaccination, export, movement bans.

Policy issues in disease control

- Developing and legislating national HPAI control policies.
- Legalising and controlling vaccination in ducks and other domestic poultry.
- Zoning and compartmentalization to create disease-free zones
- Biosecurity measures in the transport and marketing of poultry.
- Biosecurity and transport control in and around live-poultry markets
- Developing equitable compensation policies (direct or indirect).

- Methods for the humane destruction of poultry and disposal of carcasses.
- Regional disease information sharing.
- Socio-economic impact assessments of HPAI control policies

Indicative activities in capacity building

- Veterinary capacity building.
- Programme management training of supervisory project staff.
- Training community-based disease early warning workers at the village level.
- Engage private poultry sector in providing services to smallholders.
- Awareness training in regulatory, public health and biosecurity measures.
- Project sustainability through long term funding based on results

International Collaboration

- Strengthen linkages among FAO, OIE and WHO in developing HPAI control plans.
- Develop partnerships with other international centres and organizations.
- Coordinate the subregional networks.
- Develop global disease intelligence to support control strategies.
- Monitor trends in global, regional and local poultry markets and their impact on disease control strategies.
- Consolidate international information on HPAI and other TADs.
- Advise and share information with member countries.
- Mobilise donor support.
- Communicate with donors, countries at risk and organizations
- Coordinate strategic research with other international agencies and advanced research institutions to support HPAI control.
- Backstop the regional networks with information, advice and consultation.

APPENDIX 8

OIE/FAO International Scientific Conference on Avian Influenza, OIE Paris, France, 7–8 April 2005

RECOMMENDATIONS

CONSIDERING THAT:

1. Preventing the spread of pathogens through international trade in animals and animal products is one of the primary missions of the World Organisation for Animal Health (OIE). This is accomplished by establishing and updating international standards and guidelines that prevent spread of pathogens while avoiding unjustified sanitary barriers,

2. The OIE works in close association with FAO in helping countries implement such standards and guidelines,

3. The FAO has as its foremost mission to alleviate poverty through the promotion of sustainable agricultural production, food security and safe and wholesome food products on the market places, and response to crises caused by animal diseases including zoonoses. This is particularly relevant to the FAO priority programme EMPRES (Emergency Prevention System for the Prevention of Plant and Animal Pests and Diseases), and specifically to the Emergency Centre for Transboundary Animal Diseases (ECTAD),

4. The OIE standards for terrestrial animals are contained in the *Terrestrial Animal Health Code* (the *Terrestrial Code*) and the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* (the *Terrestrial Manual*),

5. The collection, analysis and dissemination of veterinary scientific information is also one of the main missions of the OIE. Comprehensive analysis of agro-ecological factors, production parameters, and demographics, including animal census, as done at FAO provides additional understanding in disease occurrences and offers opportunities to develop strategic intervention measures,

6. The standards developed by the OIE are recognised as international standards for animal health and zoonoses by the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) of the World Trade Organization (WTO); and serves as a partner with the FAO/WHO Codex Alimentarius on animal production food safety. Implementation of these standards by Member Countries also has benefits for public health (including food safety) and improvement of animal production,

7. Infectious animal diseases and zoonoses such as highly pathogenic avian influenza (HPAI) represent a major constraint to efficient poultry production and regional and international exchanges, present a threat to the livelihood of farmers especially in developing countries, to public health, and to national economies,

8. During the past few years, the world has witnessed the emergence of a severe avian influenza epidemic that has had a major impact on animal health and the potential for serious human health outcomes. This has severely affected the economies of developed as well as developing countries,

9. FAO emergency implementation of some 19 projects at national, regional, and supra-regional level for HPAI prevention, control, and eradication is recognised and has improved the current outlook, with the publication of Guiding Principles for Surveillance and Recommendations taking into account OIE standards, supported by WHO and the donor community,

10. Recent research has confirmed that certain aquatic birds (particularly domestic ducks) can act as reservoirs of infection for HPAI H5N1 with or without clinical signs and are capable of excreting viruses in the environment,

11. Many of the countries infected or threatened by AI are under-resourced and lack the capacity of Veterinary Services for an effective early detection and response to the epidemic in poultry,

12. New scientific and technological knowledge for the prevention and control of AI will contribute to the development of safer and more efficacious measures for the final control and eradication of the disease,

13. For ethical reasons, it is no longer considered acceptable to control and eradicate diseases mainly by applying mass killing of animals,

14. Safe and effective vaccines , if used appropriately, can help improve animal health, public health, animal welfare, and agricultural sustainability; to protect the environment, maintain biodiversity, and protect consumers of animal products,

15. The OIE, has incorporated wherever possible into its standards and guidelines the most up-to-date scientific knowledge on the use of appropriate diagnostic tests, and disease prevention and control methods including vaccination, and has reviewed, commented, and endorsed the FAO Recommendations for the Control of HPAI in Asia,

16. Recent scientific advances in the diagnostic field, in particular the possibility to differentiate vaccinated animals from infected animals, have been recently incorporated into the *Terrestrial Manual.* Their implications have either already been reflected in the review of the *Terrestrial Code* for disease control using appropriate vaccination and for recovery of disease free status after occurrence of a disease,

17. The Conference has provided an opportunity for the exchange of the latest scientific information at the global level that will, at the same time, assist in the evaluation and improvement of the current OIE standards and FAO guidelines for better control of avian influenza and safety of regional and international trade of poultry and poultry products, implementation of strategies, and requirements for effective disease management,
18. For this event, the OIE/FAO have acted in collaboration with WHO, with which a long and valuable tradition for confronting zoonotic diseases exists,
19. There is a need to harmonise communication on risk assessment and risk management,
20. FAO has underlined the links and risks between farming systems, market chains, socio-economic status, and epidemiology of HPAI in Asia, indicating that multidisciplinary approaches are required to adequately tackle the epidemic in poultry and prevent infection spread to humans,
21. It is necessary to protect human health by controlling the disease as a matter of priority at source, i.e. on farms and markets. It is essential to provide national and international support for the improvement of the efficiency of Veterinary Services for that purpose,
22. Long-term prevention and control of AI need to be compatible with social, economic and technical considerations,
23. Effective AI prevention and control require actions from local, national, regional, and international levels,
24. The recently renewed agreement between OIE and FAO has led to synergistic approaches to fight transboundary animal diseases, particularly through the joint initiative GF-TADs,
25. Research into better tools (diagnostics, vaccines, anti-virals, adjuvants, disinfectants, for instance) and virus dynamics (excretion, pathogenesis, virulence genes) will assist in developing control strategies and prevention measures, better epidemiological studies in the country where the disease prevails.
26. The role of wild birds in spread of HPAI H5N1 viruses remains unresolved. Circumstantial evidence suggests limited local infection of resident wild birds, but transfer of H5N1 HPAI viruses outside the outbreak zones by migratory birds has not been substantiated.

CONFERENCE ATTENDEES OF THE OIE/FAO INTERNATIONAL SCIENTIFIC CONFERENCE ON AVIAN INFLUENZA RECOMMEND THE FOLLOWING:

Session 1: Ecology and Epidemiology

1. To prevent the spread of AI viruses to unaffected area/countries from infected area/countries.
2. Country/regional specific studies should be conducted to establish the ecology and epidemiology of the AI virus in reservoir and spill-over species of poultry for the purpose of developing control programmes to stop virus cycling and re-infection.
3. Surveillance and epidemiological studies in migratory and resident wild birds should be conducted to assess the role of wild birds in the maintenance and dissemination of HPAI viruses.
4. Develop sustainable risk-based surveillance programmes for poultry for early identification of AI virus transfer from reservoir species to agricultural systems in order to know if and which AI viruses are present in poultry and develop rapid mitigation and elimination strategies, if required.
5. Encourage national laboratories to join multi-national and international laboratory networks to share AI virus isolates, data and expertise in order to understand AI virus ecology and develop effective control strategies.
6. Support pathogenesis studies in alternatively farmed birds (e.g. ostriches, waterfowl, pheasants, etc.), including an assessment of their role as intermediate hosts for transfer of AI viruses from wild birds to traditionally farmed poultry species, and their potential role for supporting mutation of H5 and H7 LPAI to HPAI viruses.

Session 2: Pathogenesis

1. Country authorities should be made aware of different clinical syndromes in different hosts caused by infection by HPAI viruses as atypical disease signs have been seen in infections with recent isolates.
2. Specific genes from virus isolates should be monitored for evidence of assortments and drift that may contribute to changes in virulence.
3. Surveillance of birds for the presence of H9N2 viruses with the potential to infect mammals should be done.
4. Consideration should be given to conduct monitoring of pigs at risk from infection with AI viruses with the potential to transmit to humans.
5. Investigate the pathogenesis and epidemiology of avian influenza viruses in different species of birds and mammals under the coordination of the joint OIE/FAO network with the support of the OIE/FAO Reference Laboratories for AI.
6. Specific research be conducted on AI surveillance and vaccination in farmed ducks.

Session 3: Human health implications

1 Further epidemiological studies at the human-animal interface as well as applied and basic research on H5N1 and other AI viruses with potential human health implication should be conducted urgently and by collaboration between the animal OIE/FAO network and the human WHO network.

2 Coordinated research programs must involve veterinary, public health and industry sectors. Safe and efficacious human and avian vaccines should be developed as a priority.

3 Veterinary and Public health services should work together to improve national, regional and global health security. Public health services should support the agriculture sector/veterinary services in order to control and eliminate the disease at source and to protect farmers and workers from animal infection in the most efficient and efficacious manner.

4 Veterinary and Public health services should strengthen joint activities for surveillance of AI at the human/animal interface. Animal virus isolates and sequence information should be swiftly exchanged between the international reference laboratories of OIE-FAO and those of WHO.

5 FAO, OIE and WHO should collaborate with their Member States in the development of appropriate strategies for effective inter-sectoral collaboration during and between crises associated with the emergence of zoonoses.

Session 4: Diagnostics

1. OIE/FAO assist countries in enhancing their veterinary infrastructures to meet the current and future needs for early detection, surveillance and control programmes for avian influenza.
2. OIE/FAO encourage countries/regions to develop a laboratory network that would facilitate the local testing of specimens to decrease turn-around time for diagnostic test results while increasing overall testing capacity. This network should be coordinated through the newly established OIE/FAO network (OFFLU) that could recommend appropriate testing methods, provide training to laboratory personnel, supply quality reagents, and collaborate with OIE/FAO Reference Laboratories.
3. OIE/FAO encourage development of training programmes for laboratory personnel to ensure that appropriate diagnostic tests are used, that test results are interpreted correctly, and that appropriate quality assurance programmes are being used.
4. OIE/FAO encourage development of rapid, sensitive, and cost-effective diagnostic tests that have been properly field validated according to OIE guidelines and appropriate for use in local laboratories involved in the diagnosis of avian influenza.
5. OIE/FAO develop a prototype Material Transfer Agreement (MTA) that could be used by laboratories to facilitate the transfer of viruses to reference laboratories for epidemiologic/research purposes.

Session 5: Control of AI (with focus on vaccination)

1. Infections with HPAI viruses be controlled at source, through implementation of risk reduction interventions, including improved biosecurity, stamping out, vaccination, and education awareness.

2. Donors should give priority to reinforce Veterinary Services and animal health infrastructures in countries infected or threaten by AI.

3. Vaccination should only be used in conjunction with monitoring of vaccinated flocks to ensure efficacy, proper use of the vaccine and absence of virus circulation.
4. Vaccines should comply with OIE standards and vaccination strategies should be consistent with guidelines developed by FAO, and of proven efficacy under experimental and local field conditions.
5. Vaccine delivery systems and vaccination campaigns should be carefully organised and monitored by Veterinary Services.
6. That, wherever appropriate, a surveillance system capable of differentiating infected from vaccinated birds (e.g DIVA) be applied (including use of sentinel birds when possible).
7. That surveillance programmes be defined before vaccination is introduced. Equally, an exit strategy has to be identified.
8. That strategies be developed and evaluated in statistically based field trials for the appropriate use of vaccination in different epidemiological scenarios throughout the world

Session 6: Improvement of Management Tools

1. A master plan be prepared for the control and prevention of HPAI in Asia, with regional and international coordination;
2. Adequate financial resources be invested to the control of HPAI in Asia, which is currently estimated at between 100 and 120 million USD over a 3–5 year period

3. The meeting strongly recommends that OIE and FAO implement activities of the joint global OIE/FAO network of expertise for avian influenza as soon as possible.

4. The existing FAO regional networks for surveillance and diagnosis be sustained in a long term run.

5. The FAO/OIE Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) initiatives be used as a foundation for the regional approach to the control and eradi-

cate AI. The mandates and missions of international and regional organizations be harmonized to avoid gaps and overlapping.

6. Strategies are needed for financing sustainable, concrete action at local level. This is likely to include support for restocking or compensation for losses and should also encompass education on safe poultry keeping and development of appropriate infrastructure and services.
7. National and regional strategies for AI prevention and control should include a careful assessment of the social and economic impact of proposed measures, including the impact on the wider rural economy of changes in the poultry sector. Options for long-term strategies for restructuring of the sectors be previously considered and the possible negative socio-economic impacts on small and medium holders be evaluated as well as the options and cost for mitigation strategies.
8. That, when a decision is made to kill infected or at-risk birds, birds should be humanely destroyed and disposed of along with dead poultry following OIE standards. In the case of HPAI infections, the birds should not be allowed to enter the human food chain or be fed directly or indirectly to other animals including zoo animals.
9. That the OIE International Committee adopts the proposed new surveillance guidelines on AI during the 73rd General Session.
10. That the efficacy of risk reduction and prevention procedures be monitored through targeted surveillance activities, including:
    - post-vaccination surveillance to measure efficacy of vaccination,
    - early identification of virus circulation,
    - monitoring of genetic drift and emergence of new strains
    - monitoring of reservoirs.
11. That the concept of compartmentalisation be recognised as an additional tool in the control of AI and in the facilitation of safe international trade, subject to the effective implementation of the relevant control measures.
12. That the OIE International Committee adopt the proposed revised *Terrestrial Code* chapter on AI that incorporates the concept of compartmentalisation and that provides risk-based recommendations for trade in live poultry, genetic material and products for human consumption. It also encourages transparency in disease reporting, by limiting trade consequences to situations of significant risk.
13. That the OIE and FAO continue to provide practical advice to Member Countries on the establishment and monitoring of compartments, through additional guidelines.
14. That OIE Member Countries implement the new OIE standards including surveillance guidelines for their surveillance and trade activities.
15. That the FAO, World Bank and other multilateral and bilateral donors should continue to provide assistance to further strengthen countries' compliance with international standards, including on quality of Veterinary Services.
16. That the OIE develop guidelines for AI virus inactivation in processed products.
17. That strategies be developed for financing sustainable, concrete action at local level, to include support for restocking or compensation for losses, to encompass education on safe poultry keeping and the development of appropriate infrastructure and services.
18. That the OIE designate prescribed tests for international trade where pre-movement testing is required by the *Terrestrial Code*.
19. That OIE/FAO Reference Laboratories collaborate to exchange virus isolates and develop internationally agreed standards for diagnostic testing. The exchange of virus isolates and other information such as sequence data between the OIE/FAO laboratory network and the WHO laboratory network is urged.

(Adopted by the OIE/FAO International Scientific Conference on Avian Influenza, 7–8 April 2005)

General Recommendations for the 73 General Session:

The OIE referred the scientific information generated and discussed at this international conference, as well as this Recommendation to the OIE Regional and relevant Specialist Commissions and request the endorsement by the OIE International Committee during the 73 General Session in May 2005.

APPENDIX 9 - KEY PARTNERS IN THE IMPLEMENTATION OF THE PROGRAMME

Asian Countries: Ministries of agriculture/departments for livestock development and/or animal health of each participating countries will be involved an active members of the strategy. They will have an important role in executing a number of country specific activities, particularly at the level of farmer and extension level training programs, epidemiological surveys, and contributing to the management and long term sustainability of disease surveillance, emergency preparedness and strong links with the regional coordination mechanism. They will also have an important responsibility to share and disseminate information in order to achieve control of HPAI at a regional level. Participating countries with more advanced economies have also pledged to support other countries in the region for them to be able to fully participate in the collective efforts to control HPAI regionally. All the countries in the sub-region have identified HPAI as a major priority and have committed to cooperate to tackle the HPAI problem. Majority of the countries are also members of the FAO's Animal Production and Health Commission of Asia and the Pacific Region with a common vision to control TADs.

The Association for Southeast Asian Nations (ASEAN): (www.aseansec.org) ASEAN, established in 1967 has Brunei Darussalam, Cambodia, Lao PDR, Myanmar, Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam as its members. The ASEAN region has a population of about 500 million, a total area of 4.5 million square kilometers, a combined gross domestic product of US$737 billion, and a total trade of US$ 720 billion. Its aims are: (i) to accelerate the economic growth, social progress and cultural development in the region through joint endeavours in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian nations, and (ii) to promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries in the region and adherence to the principles of the United Nations Charter. One of the major objectives of ASEAN is to promote economic cooperation within the region. Today, ASEAN economic cooperation covers the following areas: trade, investment, industry, services, finance, agriculture, forestry, energy, transportation and communication, intellectual property, small and medium enterprises, and tourism. ASEAN has a Sectoral Working Group on Livestock that advises on issues related to livestock development and trade. Currently, ASEAN has specifically created an Animal Health Trust Fund to tackle regionally the problem of transboundary animal diseases on a long-term sustainable way. Currently under this trust fund ASEAN conducts the South East Asia FMD control programme.

South Asian Association for Regional Cooperation (SAARC) (www.saarc.org), The SAARC comprises Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The organization was established by member countries in 1985 and is located in Katmandu, Nepal and is driven by the Integrated Programme of Action, which includes five agreed areas of cooperation (Agriculture, Rural Development; Telecommunication, Meteorology; and Health and Population). The main objectives of these are to a) promote the welfare of the peoples of South Asia and to improve their quality of life; b) to accelerate economic growth, social progress and cultural development in the region and to provide all individuals the opportunity to live in dignity and to realize their full potential; c) to promote and strengthen collective self-reliance among the countries of South Asia; d) to contribute to mutual trust, understanding and appreciation of on another's problems; e) to promote active collaboration and mutual assistance in the economic, social, cultural, technical and scientific fields; f) to strengthen cooperation with other developing countries; g) to strengthen cooperation among themselves in international forums on matters of common interests; and h) to cooperate with international and regional organizations with similar aims and purposes. These objectives are compatible and in harmony with the member countries and the two international partners (see below) identified for the programme. SAARC has seven Technical Committees: 1) Agriculture and Rural Development (including Livestock and Fisheries) – India, 2) Health and Population Activities (including nutrition and drug related issues) – Nepal, 3) Women, Youth and Children – Bangladesh, 4) Environment and Forestry – Bhutan, 5) Science and Technology, and Meteorology – Pakistan, 6) Human Resources Development (including Education, Skill Development, Arts, Culture & Sports) – Sri Lanka, 7) Transport (including Land, Water, Railway and Civil Aviation) – India. SAARC has already a strong experience in the establishment and conduct of regional centres. Currently under its umbrella there are five Regional Centres with the principal objective of promoting regional cooperation in several areas that include a) SAARC Agricultural Information Centre (SAIC), Dhaka b) SAARC Tuberculosis Centre (STC), Katmandu c) SAARC Documentation Centre (SDC), New Delhi, d) SAARC Meteorological Centre (SMRC), Dhaka, e) SAARC Human Resource Centre (SHRDC), Islamabad, f) SAARC Cultural Centre (Sri Lanka), g) SAARC Coastal Zone Management Centre (Maldives), h) SAARC Information Centre (Nepal). SAARC has a significant involvement in poverty alleviation in the region through several programmes. SAARC has also close linkages with several international and regional organization which include: European

Commission, UNCTAD, UNICEF, ESCAP, UNDP, UNDCP, further strengthened with additional agreements in pipeline with ASEAN, FAO, UNEP, UNFPA CIDA, WHO, UNIFEM, ADB; WB, UNAIDS, These linkages are being and UNIDO.

Food and Agriculture Organization (www.fao.org) of the United Nations was founded in 1945 with a mandate to raise levels of nutrition and standards of living, to improve agricultural productivity, and to better the condition of rural populations. FAO has strong multidisciplinary programs and a comprehensive knowledge base with respect to animal diseases and related disciplines (including food safety; agricultural and pro-poor livestock policy development; livestock, environment and development; commodity multisectoral investment programs; and management of medium-term plans). Under the aegis of EMPRES, the Global Rinderpest Eradication Program of FAO has achieved the eradication of Rinderpest in the whole of Asia. In response to repeated shocks of infectious livestock diseases, FAO has recently established an Emergency Centre for Transboundary Animal Diseases (ECTAD) within EMPRES to specifically support control of such diseases globally. Through its joint FAO-IAEA Division in Vienna, FAO has its own laboratories recognized by both WHO and OIE as a Collaborating Centre, and through the FAO-IAEA Coordinated Research Program FAO supports animal disease control in more than 70 countries, including those in the GMS. FAO has taken the global lead in the establishment of transboundary animal disease information systems. Furthermore, the Food Quality and Standards Service in FAO hosts the Secretariat of the Codex Alimentarius Commission, which sets international food standards, guidelines and recommendations. Thus FAO has strong expertise in other technical areas which are very relevant to this project – e.g. strengthening capacity in disease control, early warning and early reaction systems for TADs. FAO's Regional Office for Asia also hosts the APHCA, a regional commission. APHCA has an Executive Committee, which is represented by directors or commissioners of departments of livestock development of each member country. Member of APHCA have in their recent meeting (August 2003) identified the activities outlined in this programme as their priority.

Office International des Épizooties (OIE) (www.oie.int/eng/en_index.htm) is the world health organization for animal health. It is an intergovernmental organization with 169 member countries, each represented by the country's senior veterinary health official. OIE has four main objectives – to guarantee the transparency of animal disease status world-wide; to collect, analyse and disseminate veterinary scientific information; to provide expertise and promote international solidarity for the control of animal diseases; to guarantee the sanitary safety of world trade by developing sanitary rules for international trade in animals and animal products. OIE also plays a leading role in food safety of animal origin by collaborating with Codex Alimentarius Committee. OIE standards are recognized by the WTO as reference international sanitary rules. OIE has a Regional Representation for Asia in Tokyo. OIE has a network of reference laboratories and collaborating centres to provide scientific and technical assistance and expert advice on topics linked to disease surveillance and control. The labs provide various forms of support which include: making experts available, preparation and supply of diagnostic kits or reference reagents, practical work, training courses, workshops and organisation of scientific meetings.

FAO and OIE have signed (May 2004) an agreement to develop an initiative called GF-TADs (see Appendix 4) which will serve as a global umbrella fro the development of AI global strategy. They have also launched (April 2005) a Network of Expertise on avian inflenza (OFFLU) to conduct research on AI flu, provide expertise to the countries and Regional Organisations and improve the collaboration, particulalry in the exchange of HPAI virus strains between veterinary and human health research laboratories.

WHO: The World Health Organisation **(**www.aseansec.org) is the United Nation's specialised agency for health with a mission to attain the highest level of health for all peoples, particularly the poor and most vulnerable. A key focus of WHO is food safety. WHO, in collaboration with FAO, administers the Codex Alimentarius, the international food code by which food quality is measured. The WHO has also established global influenza programme, the oldest disease control programme at WHO with a major task to provide global influenza surveillance. The programme has a network of laboratories commissioned to study circulating influenza viruses, collected from around the world, and document changes in the viruses'genetic make-up. Today, the WHO Global Influenza Surveillance Network consists of 113 national influenza centres located in 84 countries, and four WHO collaborating centres for influenza reference and research, located in London (England), Atlanta (USA), Melbourne (Australia), and Tokyo (Japan). A fifth collaborating centre, located in Memphis, USA, performs specialized work on influenza viruses in animals. The WHO network has thus contributed greatly to the understanding of influenza epidemiology and assists manufacturers both by ensuring that influenza vaccines contain the most appropriate viruses and by providing them with high-yielding "seed" virus for vaccine production. WHO is also an important partner in the GF-TADs initiative and will share and pool resources to develop common disease information system with FAO and OIE to keep the international commu-

nity constantly alert to the threat of outbreaks of infectious diseases.

Donors: It is expected that this multidisciplianry regional programme with broad outputs related to the Millennium Development Goals will interest a number of both bilateral and multlateral donors active in the region. Key among these will be ADB, WB, EU, JICA, and governments specifically interested in reducing the global threat of diseases to humans and livestock, and reducing global poverty.