Ecohealth Emerging Infectious DiseasesProposal Development Workshop
Angkor Century Hotel, Siem Reap, Cambodia
October 18-22, 2010

ECOHEALTH : Research to Policy Influence

Tata Naipospos
FAO ECTAD Lao PDR

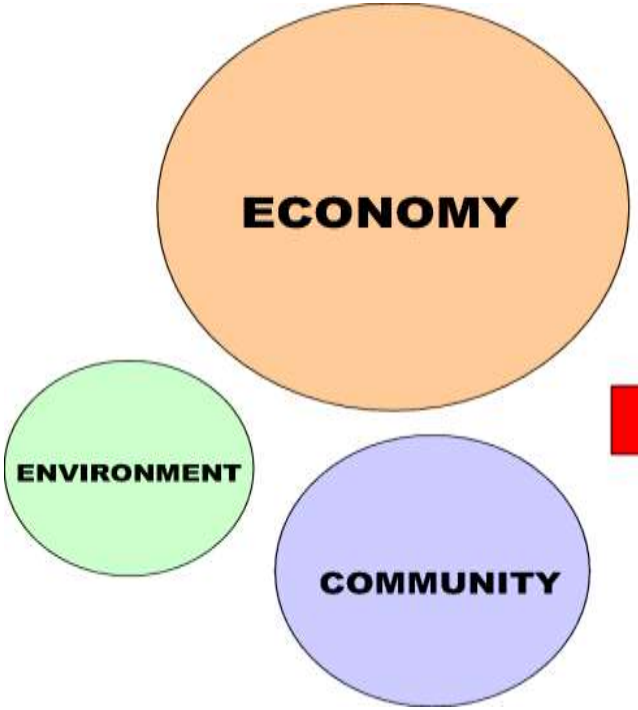
Ecosystem Approaches to Human Health

A trans-disciplinary and participatory research framework for human health in sustainable ecosystems

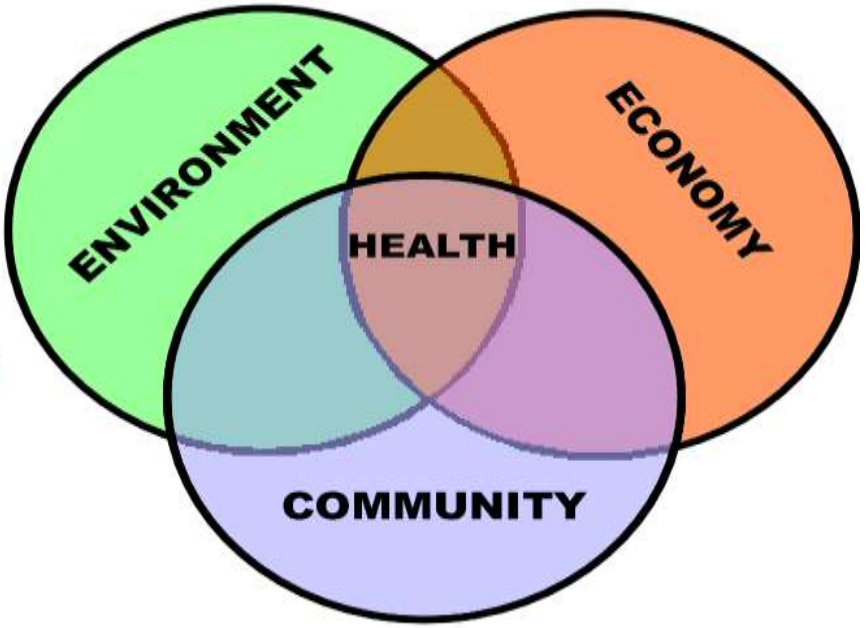
What does “ecosystem approach” mean?

A “state of complete physical, mental and social well-being,and not merely the absence of disease or infirmity.” (WHO, 1948)

Classical Approach



Ecosystem Approach



Ecohealth approaches to research

- Generate new knowledge from the study of social & ecological interactions affecting ecosystem and human health
- Translate this knowledge into actions and policy for prevention and control of disease, and production of health

A twofold challenge:

- **Building discipline interfaces,**
- **Bridging science and community**

Making research matter

- Research to policy influence: research as a tool for change from the outset
- Bridging strategies along the entire process (vs the traditional dissemination approach)
- Scaling-up from local to larger constituencies

Action oriented participatory research

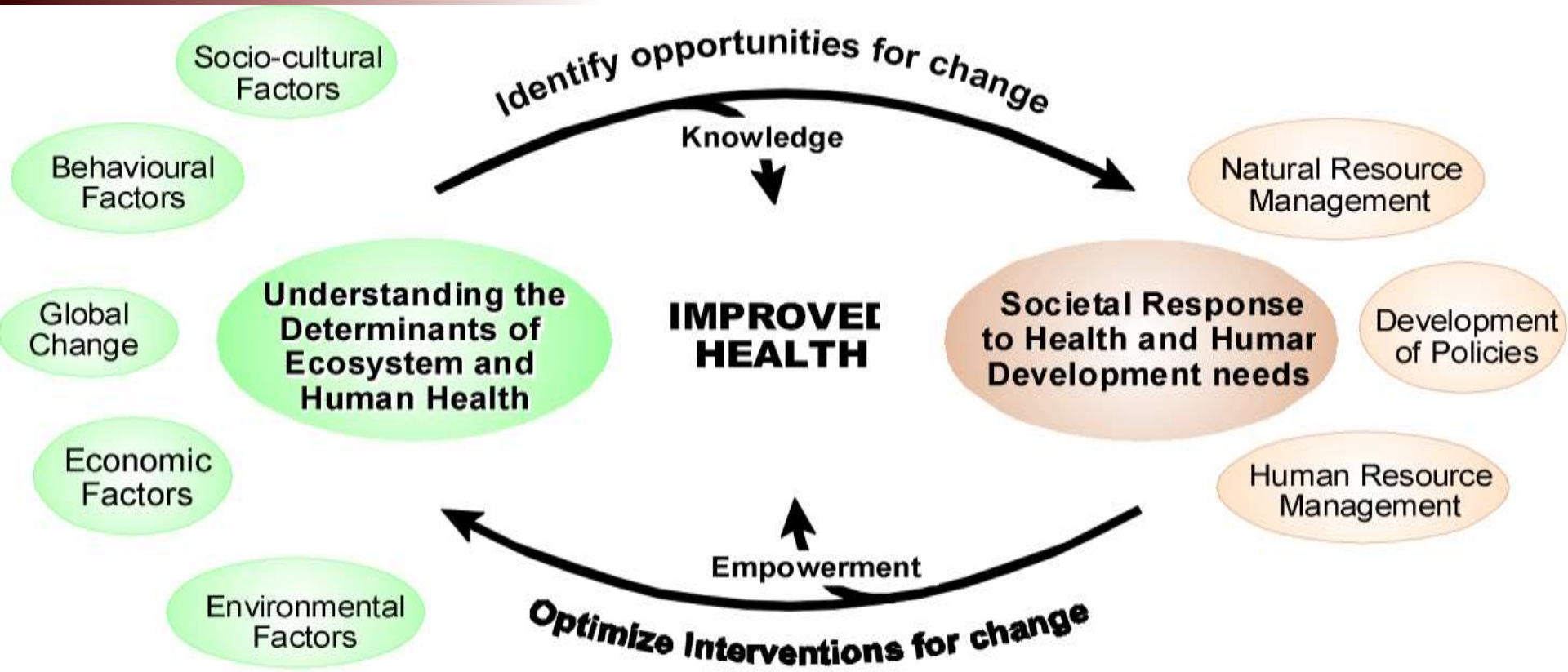


Fig. 4 : An Iterative Research Strategy for Improving Human Health Using a Participatory and Transdisciplinary Approach (Forget, 1997)

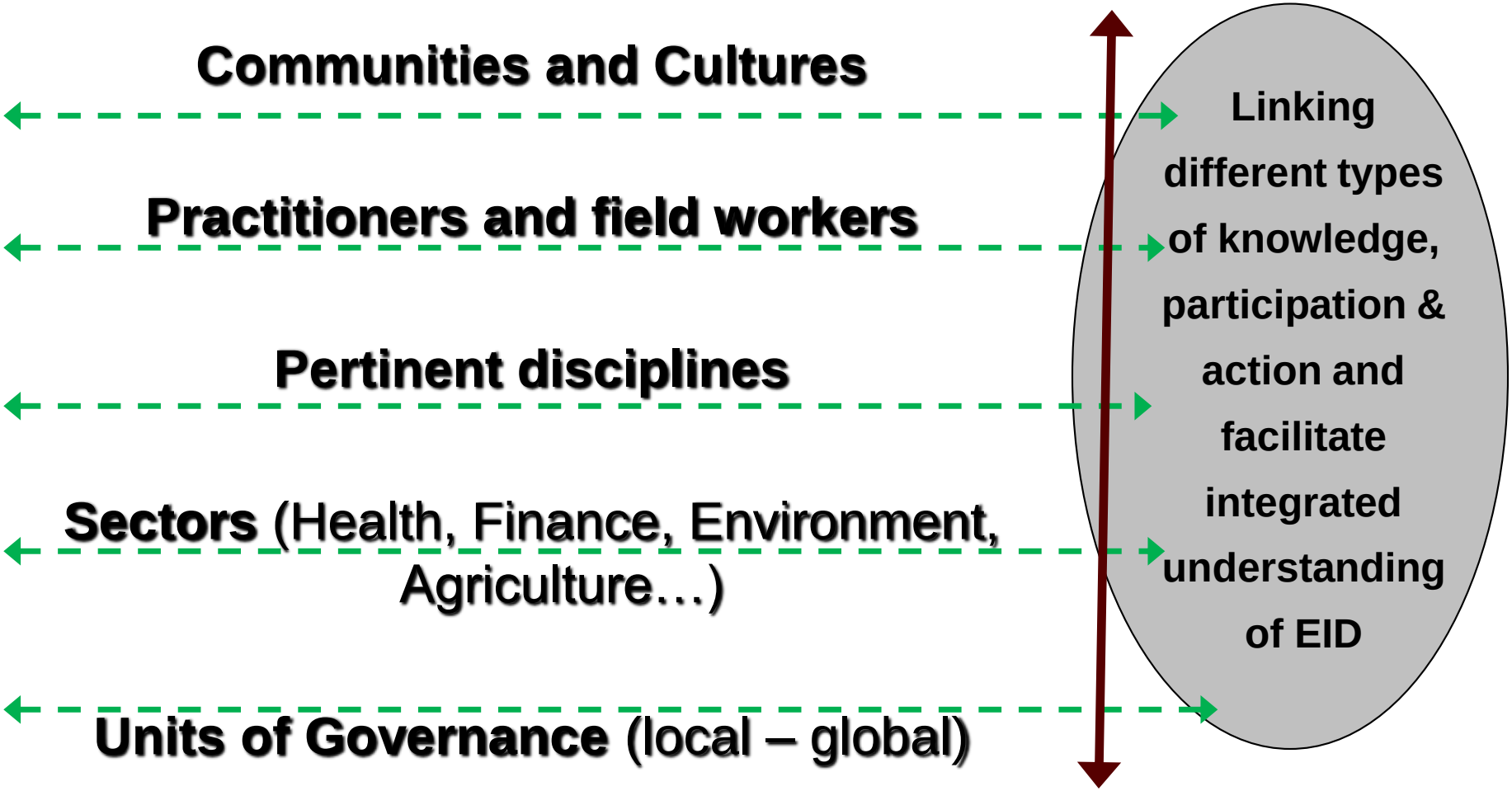
Ecosystems Approaches to Human Health

- focus on the **social and ecological contexts** that influence health and human well-being to understand the dynamics of health and environment

- use of **multi-stakeholder processes** for social learning and negotiated solutions

Multi-stakeholder processes

Horizontal and Vertical Integration



Parkes et al, (2005) 'All Hands on Deck' TD approaches to EID, *EcoHealth*

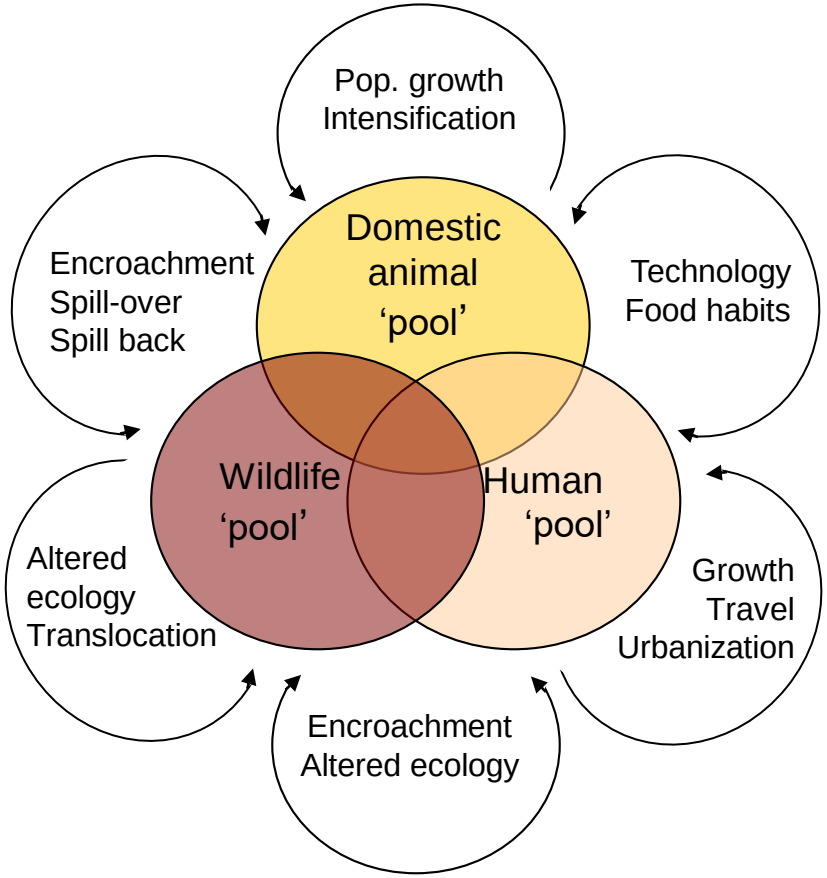
Linking across "knowledge perspective" and across "type of knowledge users"

Communities and cultures[1,2,5]	local (place-based) communities ↔ indigenous and ethnic communities ↔ occupational communities ↔ language communities.
Practitioners/ field workers[1,2,3,5]	clinicians (medical, veterinary, nurses) ↔ farmers ↔ field epidemiologists ↔ health officers (environmental health, health promotion) ↔ impact assessors ↔ resource managers (watershed, forest, rangeland, park management) ↔ non-government organisations and charities.
Disciplines[3,5] **pertinent to an SES-based understanding of EID**	anthropology↔ biology (botany, zoology..) ↔ biomedicine (molecular biology, cell biology…) ↔ ecology ↔ economics ↔ epidemiology ↔ ethics ↔ geography ↔ microbiology (parasitology, virology etc) ↔ political science ↔ sociology. Also 'inter-disciplines': development studies ↔ gender studies ↔ human ecology ↔ public health….
Sectors[3,4,5]	health↔ environment ↔ development↔ agriculture ↔ transport ↔ planning
Units of governance[3,4,5]	governmental ↔ non-governmental organisations at multiple scales (international, country, state/province, region, watershed, island, municipality, town, village….)

Factors that caused the emergence and spread of the emerging zoonoses

Emerging zoonosis	Underlying driver of emergence	Underlying cause of spread	Seminal biodiversity science papers on these issues
H5N1 avian influenza	Expansion of livestock production	Wild bird migration, poultry trade, wild bird trade	(Hanselmann et al. 2004, Fergus et al. 2006)
West Nile virus	Globalization of travel and trade (emergence in USA); urbanization	Wild bird migration, changes to ecosystem during urbanization	(Ezenwa et al. 2006, Kilpatrick et al. 2006)
SARS	Wildlife trade	International travel	(Li and Li 1998, Bell et al. 2004)
Ebola virus	Logging, deforestation, bushmeat hunting	Urbanization, travel	(Fa et al. 2002, Brook et al. 2003, Milner-Gulland and Bennett 2003, Wolfe et al. 2005a)
Nipah virus	Wildlife-livestock interaction	Livestock trade	(Bengis et al. 2002, Fevre et al. 2006, Haydon et al. 2006)
Lyme Dise	Reforestation, urbanization, loss of predators, biodiversity changes	-	(Ostfeld and Keesing 2000, Liu et al. 2001, LoGiudice et al. 2003b, Foley et al. 2005)
HIV/AIDS	Expansion of bushmeat hunting	International travel	(Robinson and Bennett 2004, Wolfe et al. 2004, Wolfe et al. 2005b)

Pathogen reservoirs & risk factors



Adapted from Daszak et al. 2008

Vulnerability / Resilience

- Ageing population
- Social cohesion
- Migrant labour
- International interactions
- Public / media openness
- Political leadership
- General education
- Information dissemination
- Pathogen identification
- Vaccines & anti-virals
- Waste disposal
- etc.

Nicoll et al. 2009

ECOHEALTH response to challenge

Inherent interdependence of the health of humans, wildlife, and ecosystems, and that provides a ‘‘gathering place’’ for those exploring the perspectives, theories, and methodologies emerging at the interface between ecological and health sciences.

"In the case of almost every emerging disease, complex human changes to the environment drive emergence," (Peter Daszak, 2008)

CASE EXAMPLE: NIPAH VIRUS

The emergence of Nipah virus

- Nipah virus as a human pathogen highlights the numerous opportunities, as well as some of the obstacles, to linking across disciplines to understand systemic factors influencing EIDs.
- Nipah virus, first identified in northern Malaysia in 1998 is a highly virulent paramyxovirus, with case fatality rates ranging from 40%–70%.
- Economic losses in Malaysia were estimated at US $500 million (Lam, 2003).

Transmission of Nipah Virus

- Nipah virus was transmitted to humans through an intermediate host, pigs.
- In its initial outbreak over a 35-week period, the virus caused a severe febrile encephalitis in 265 patients, of whom 115 died.
- 93% of the patients worked in the pig rearing industry.
- Preceding the outbreak in humans was an outbreak of encephalitis and respiratory disease in pigs.

Social and ecological approaches

- Trans-disciplinary investigation team of medical, virology, ecology, zoology, botanical and even agronomy and molecular and genetic researchers
- Complex theory of Nipah's emergence:
  - The burning of over 12 million acres of virgin forest in Borneo and Sumatra in the fall of 1997 cast an extreme haze over a huge area of Southeast Asia for months.
  - That haze blocked sunlight, reducing the ability of trees to flower and bear fruit. This caused giant bats to travel great distances in search of sustenance.
  - They settled on fruit trees fertilized with the manure of pigs on huge Malaysian farms cut out of the forests where the so-called flying foxes (*Pteropus* species) roost.

Ecological theories of Nipah virus' emergence

- Fire haze from slash-and-burn agriculture negatively affected fruiting trees and led bats to seek out fruit trees planted around pig farms.
- The proximity of fruit trees and intensive pig farms allowed bats and pigs to come into close contact, which allowed spill-over of the Nipah virus from its reservoir host into domestic pigs, and then to humans.

Links between deforestation, fruit bats, and pig farming

Viewing from socio-ecological lens

- Factors range from:
  - global socio-economic pressures driving the development of intensive agriculture;
  - regional and local occupational trends leading farm laborers to seek employment on intensive pig farms; and
  - possibly increased contact between bats and humans due to suburban encroachment on bat habitat.

Policy influence

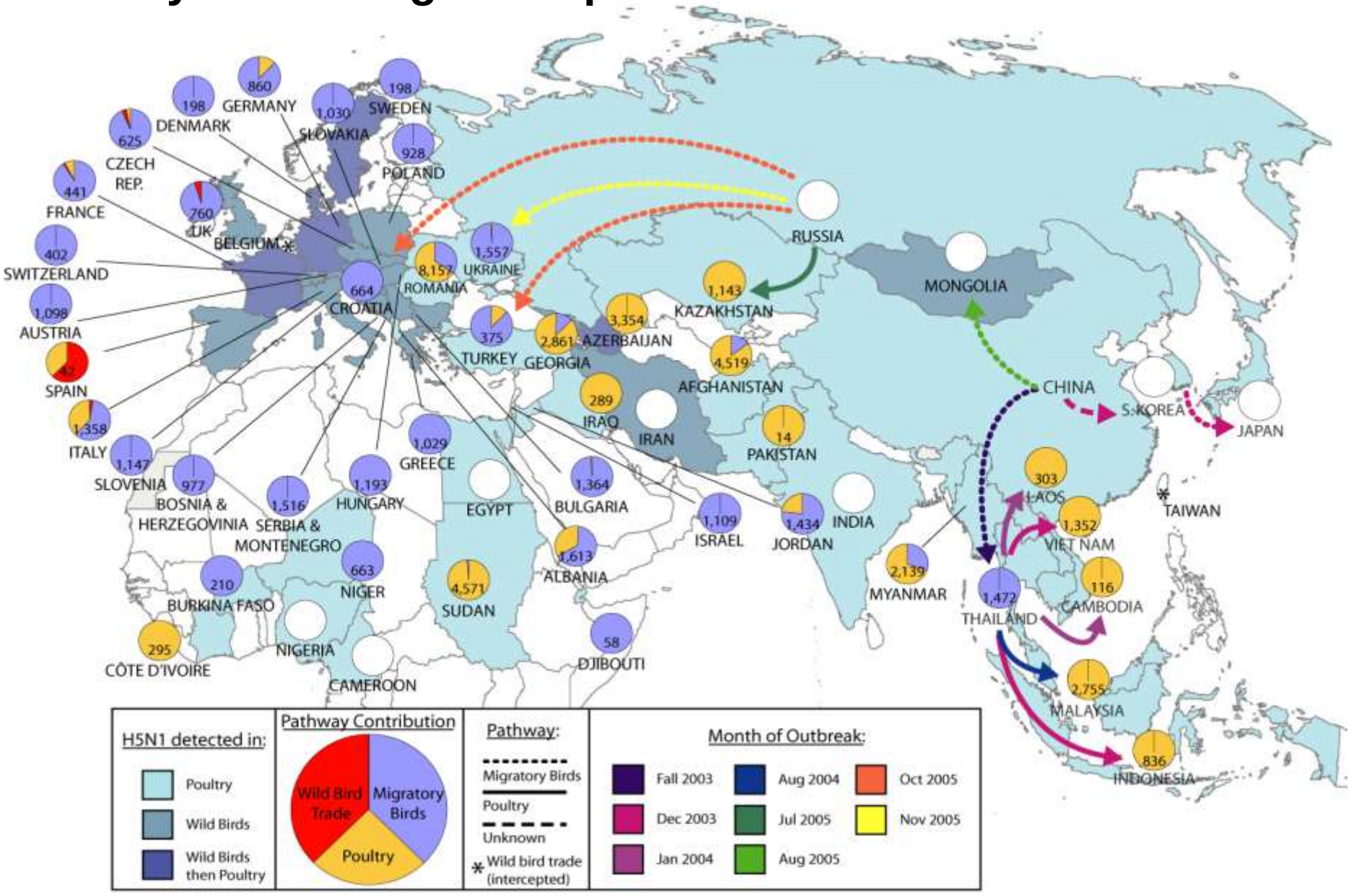
- Nipah Virus declared as notifiable disease
- Management and regulation of the pig industry
- Adopt code of practice by the pig industry
- Herd health monitoring and strict farm gate biosecurity
- Serological surveillance to demonstrate freedom of Nipah virus
- Management risk from wildlife reservoir

CASE EXAMPLE: HPAI H5N1

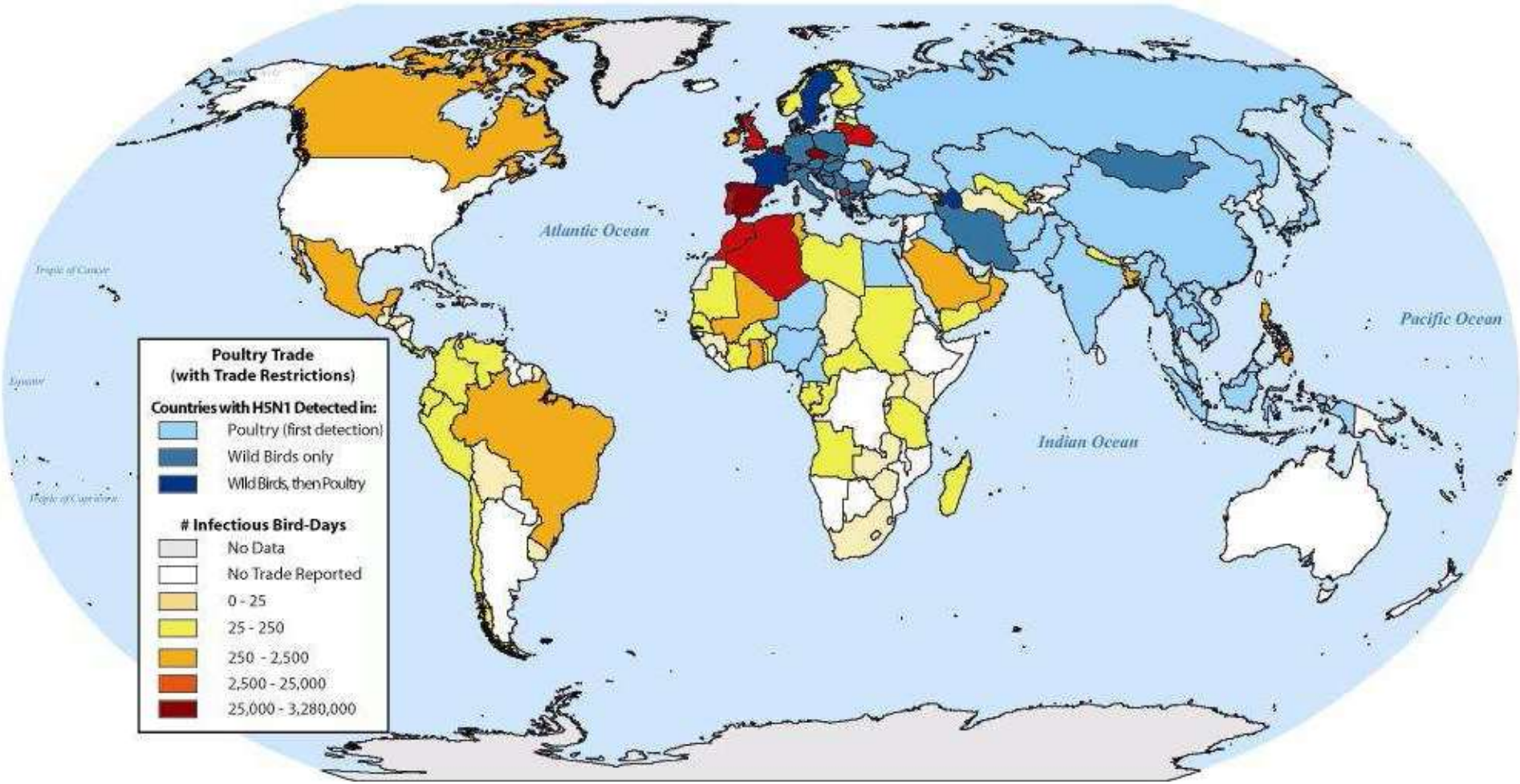
The emergence of HPAI

- H5N1 avian influenza and other emerging zoonoses are a significant global threat to public health.
- The key factors driving their emergence are:
  - environmental changes that affect wildlife population dynamics and behaviour, and
  - demographic changes that affect contact with people.
- The causes of emergence are the interactions among livestock (poultry), people, and wild birds with global spread due to migratory birds, poultry trade, and the trade in wild birds as pets.

Analysis of the global spread of H5N1 avian influenza



Predicting future spread H5N1



The expansion of poultry production is only half the story of H5N1 emergence

- Over the last three decades, there has been a significant growth in poultry production in Asian countries

Trends in Chicken Production in Asia (units: Millions of birds)

Country	1970	1993	1998
India	138	320	375
Pakistan	31	130	223
Bangladesh	42	124	138
Thailand	59	106	170
Taiwan	15	89	-
Korea	223	335	303

Source: Sugiyama, Michio, et al "Development of Livestock Sector in Asia: An Analysis of Present Situation Livestock Sector and Its Importance in Future Development"

Complex system

- Commercial and backyard farms common—often in close proximity to human populations
- Massive increases in poultry production in recent decades resulting in high poultry densities, unhygienic conditions, and insufficient regulatory capacity
- General lack of good biosecurity (to prevent disease introduction/spread) on many farms and in live bird markets
- Markets facilitate disease spread by bringing together different types of birds (and other animals) from different areas/countries
- Legal (and illegal) poultry transport common in/outside of countries
- Preference for local slaughter of poultry, including at home

Social and ecological changes

- Caused by a combination of changes to the environment (e.g. land use change, agricultural changes, biodiversity loss), to demography (e.g. urbanization, international travel) and human behaviour (e.g. changes in medical science, human migration).
- Carried by domestic or wild animal reservoirs.

Socio-ecological approach

- requires a collaborative approach among the health, sociologist, economist, and biodiversity disciplines (e.g. ecologist, ornithologist).
- use ecological models to understand complex systems and make predictions about issues such as disease spread.

Setting global policy agenda for H5N1

- The global health community has focused firstly on vaccine development and the global availability of drugs, followed by efforts to prevent spread second.
- Policy strategy for H5N1 in the long term may require intervention at the point of wildlife-human contact, which is a common strategy to dealing with other zoonoses.
- This will be particularly important if H5N1 continues to spread and becomes endemic globally in wild bird populations.
- Need for a broader ecosystem-ecohealth approach to tackling H5N1.

Lesson learnt: recommendations

- Strengthen respond to outbreaks;
- Strengthen monitoring and surveillance networks that examine human and animal populations;
- Facilitate communication between detection and response networks;
- Facilitate cooperation across fields and disciplines, particularly veterinary health, public health, conservation, epidemiology, and wildlife studies;
- Increase the generation of field-based wildlife data through better surveillance of wild animal populations;
- Strengthen the public health capacities of vulnerable communities to treat infected animals and people; and
- Overcome institutional and legal barriers to effective and efficient cooperation across disciplines and levels of governance.

Policy influence

- Regulating live animal markets.
- Reducing risky cultural practices.
- Stemming the illegal trade in wildlife.
- Improving sanitation and living conditions in rural areas.
- Identifying conservation practices to reduce the potential for disease transfer.

Summary:

- The case examples of Nipah and H5N1 shown how research results has led to policies and technologies that enhance the live of communities in developing countries.
- The two cases has led to the expansion of policy capacity, broadening of the policy horizons and affect the policy regimes through ways of:
  - Improved knowledge about the disease/actors
  - Public involvement and public outreach
  - Impact on legislation

THANK YOU FOR YOUR ATTENTION