FAO/ASTF Project: GCP/RAF/510/MUL:

Enhancing capacity/risk reduction of emerging Tilapia Lake Virus (TiLV) to African tilapia aquaculture: Intensive Training Course on TiLV

4-13 December 2018. Kisumu, Kenya

in cooperation with Kenya Marine Fisheries Research Institute (KMFRI) and Kenya Fisheries Service (KeFS)

Session 13. Emergency preparedness and response

Emergency preparedness and response and contingency plan as a component of AAHM and Biosecurity Strategy

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Food and Agriculture Organization of the United Nations

What does aquatic food security look like?

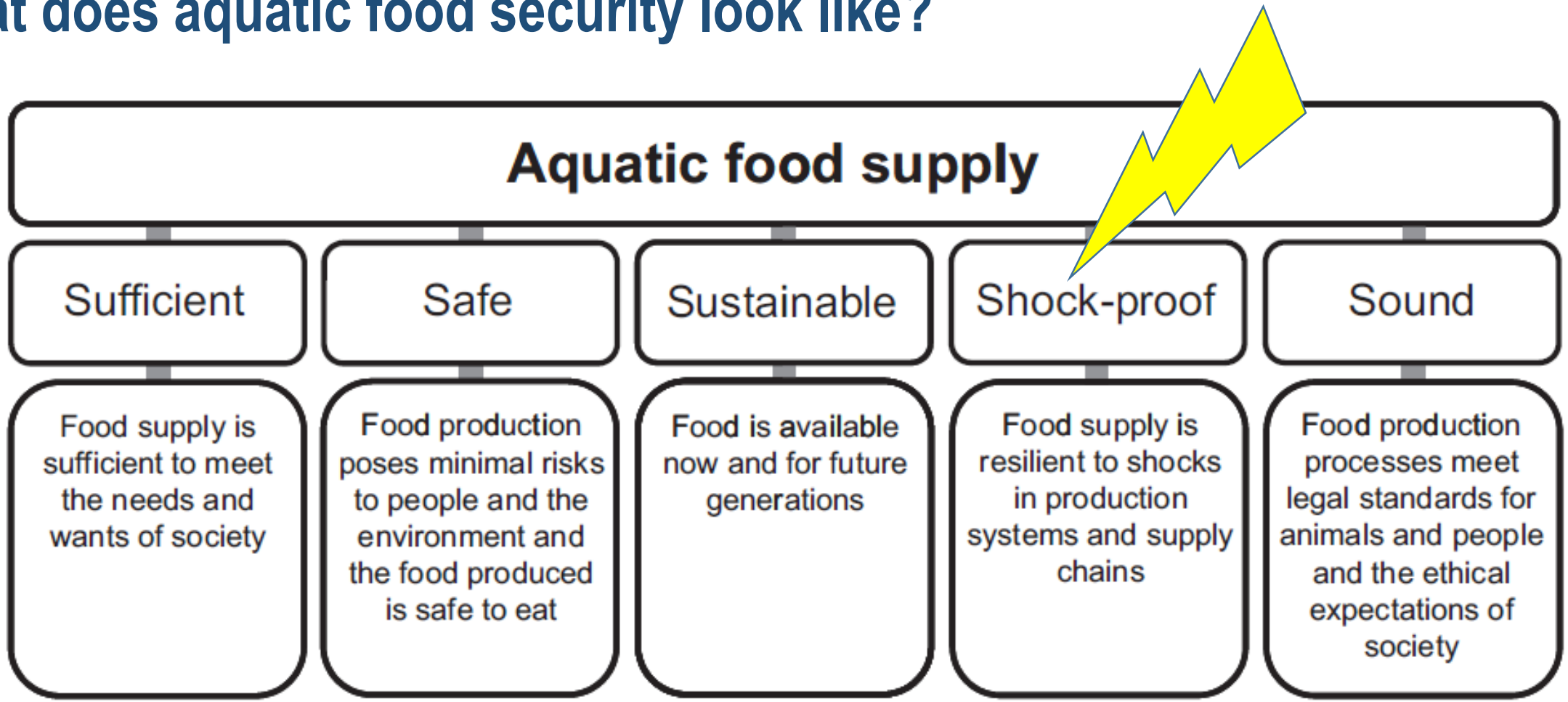
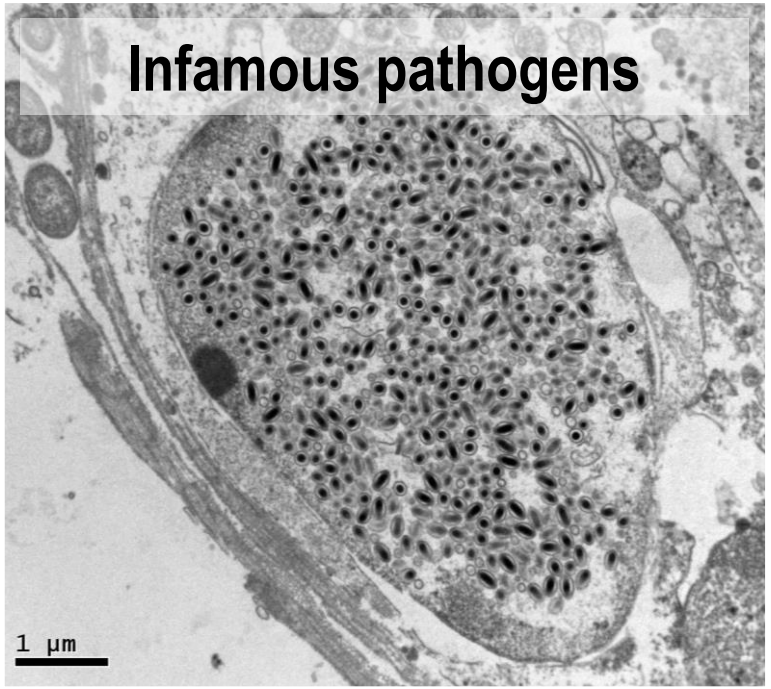


Figure 5 Five elements of a food supply which contribute to food security.

Disease is the #1 issue in limiting yield, reducing profit and preventing investment



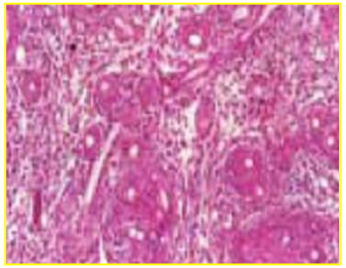
Emergence rate is high

Deficit in trained professionals/AH investment

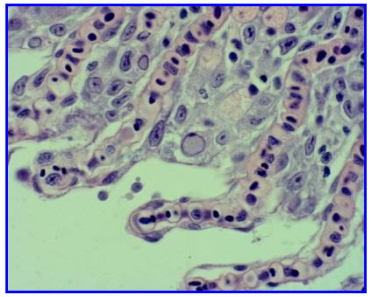
Dispersed industry. 90% in Asia

Examples of transboundary aquatic animal diseases (TAADs)

Epizootic ulcerative syndrome (EUS: infection with *Aphanomyces invadans* - fungi): affects both cultured and wild populations



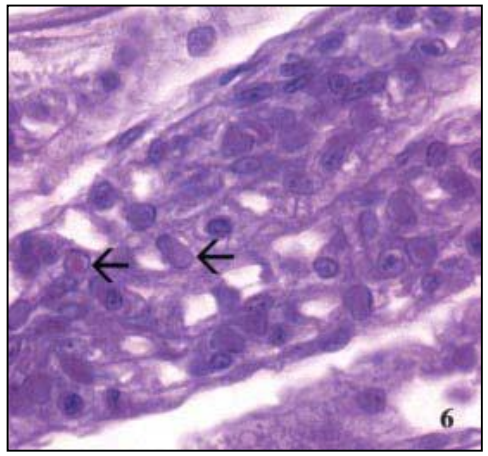
Koi herpesvirus (KHV): affects the important food fish common carp and high value ornamental koi carp



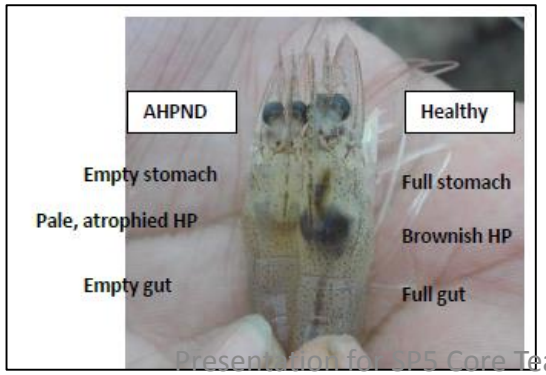
Examples of TAADs

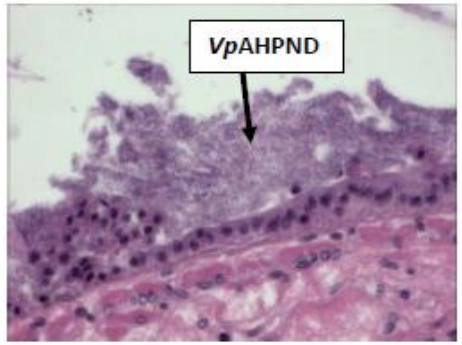
White spot disease (WSD): the most serious of all shrimp pathogens – caused by a virus

Source: APCM website



Acute hepatopancreatic necrosis disease (AHPND): most important non-viral disease of shrimp caused by a virulent *Vibrio parahaemolyticus*





Diseases in aquaculture: from largest aquaculture-related epizootics

Disease (observation in the field)	Diagnosis	Reporting /communication (national or OIE)	Containment (vaccine, treatment, husbandry)	Management (cost-effective)	Disease freedom	National and international confidence to the sector
EUS (1970s): fungi	1980s		?			
WSSV (1980s): virus	mid-1990s		?			
KHV (2000s): virus	mid-2000	OIE: 2006	?			
AHPND (2009): bacteria	2013	OIE: 2016	?			
TiLV (2009): virus	2014	Still being assessed	2018 ?			

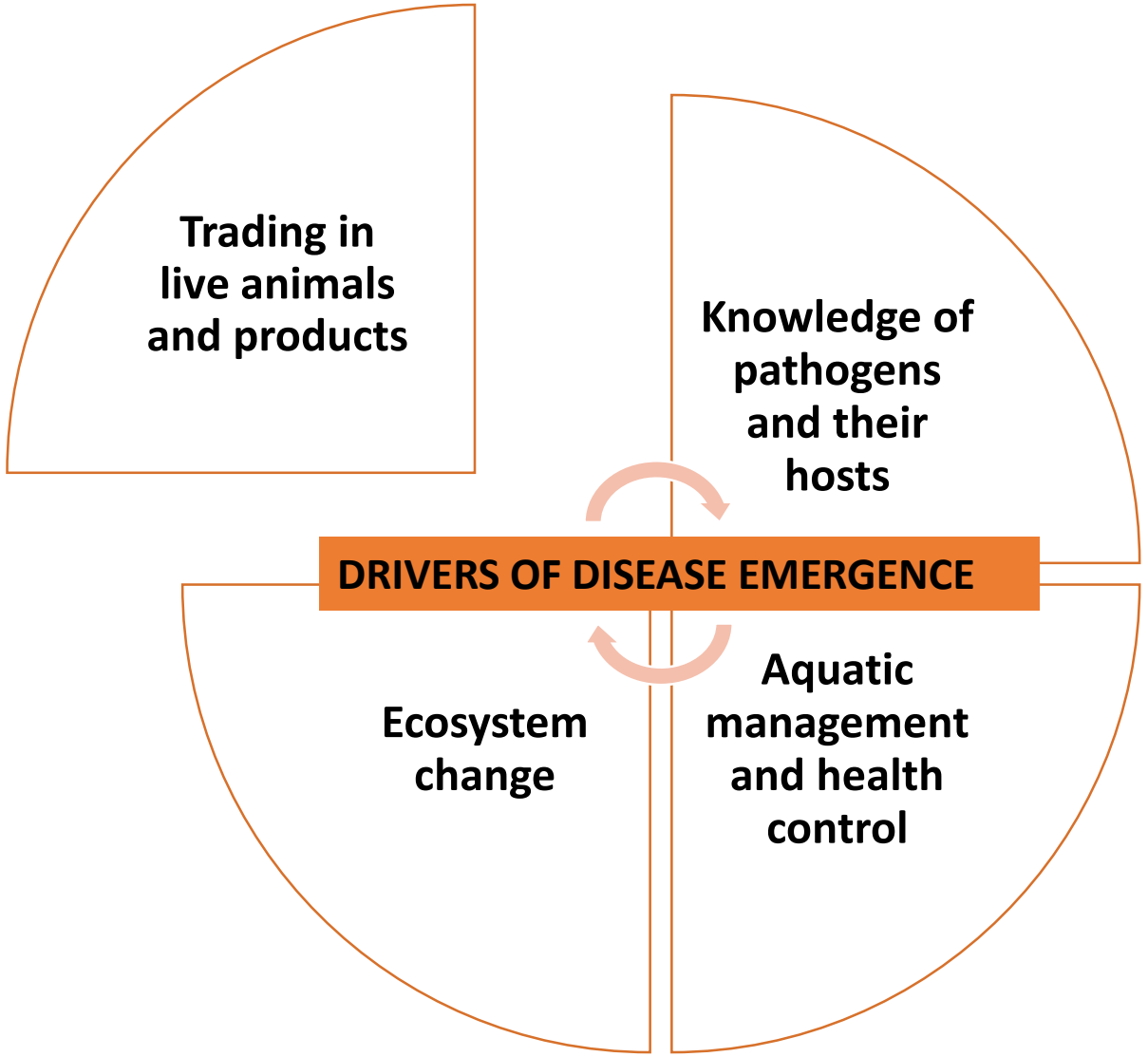
Long time lapse: years

$$$$ losses: production, market = livelihoods, export earnings, food supply
= socio-economic and environmental impacts

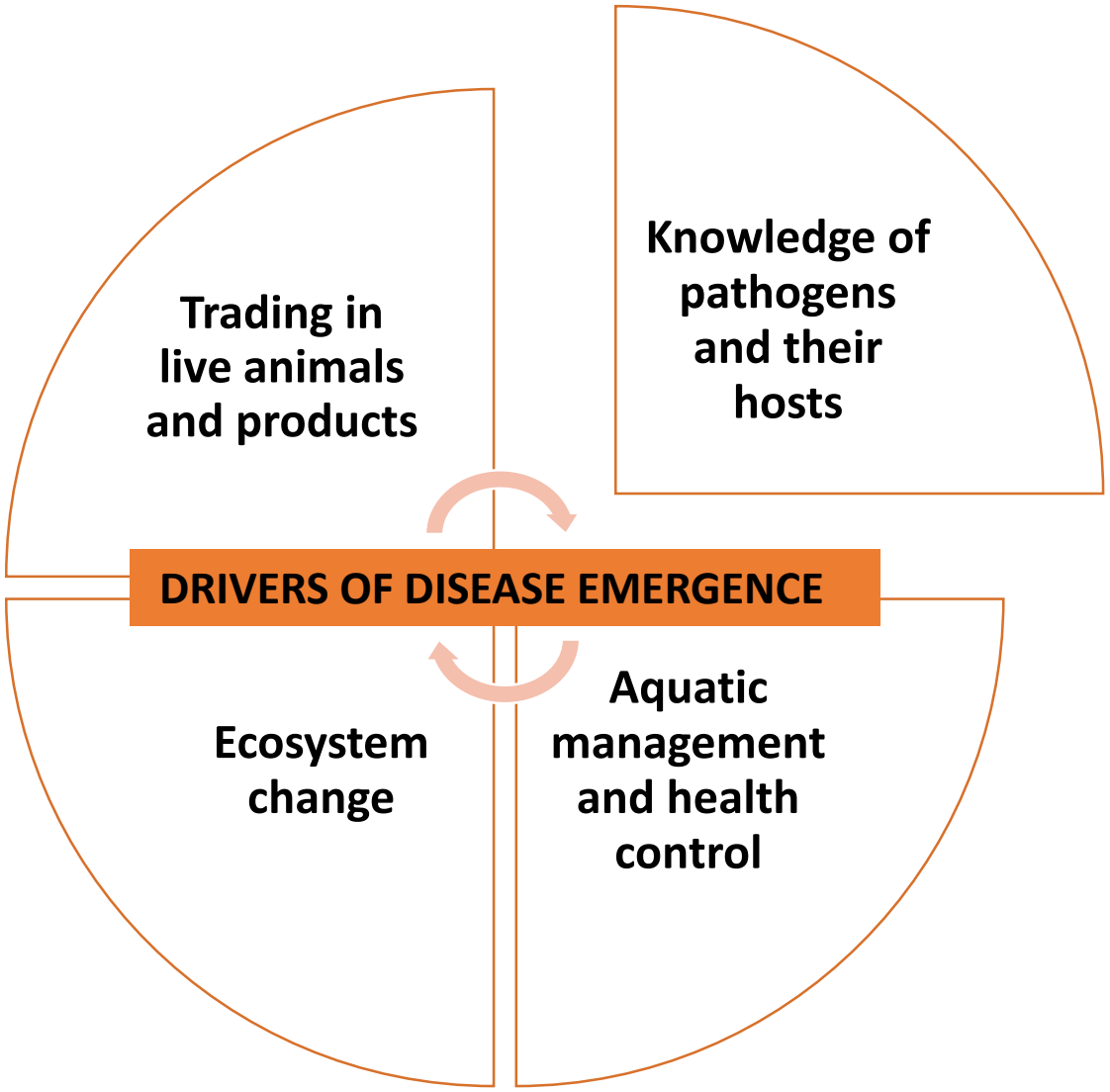
$$$ spent: producers/government/academe: biosecurity (policies, prevention, diagnosis, surveillance, containment, training/education, research, trade disputes, etc); compensation; alternatives)

Drivers of emergent disease in aquaculture

- Highly traded commodity (70% exposed to international trade)
- Hyper-diverse species range (>500) farmed compared to terrestrial systems
- Live animals (larvae, fry, adults) and their products (live, fresh, frozen) traded internationally
- Many species farmed outside of native range
- Invasive animals and pathogens can be traded with primary host
- Ornamental aquaculture trade is large and growing
- Some diversion to unintended usage (e.g. angling baits)

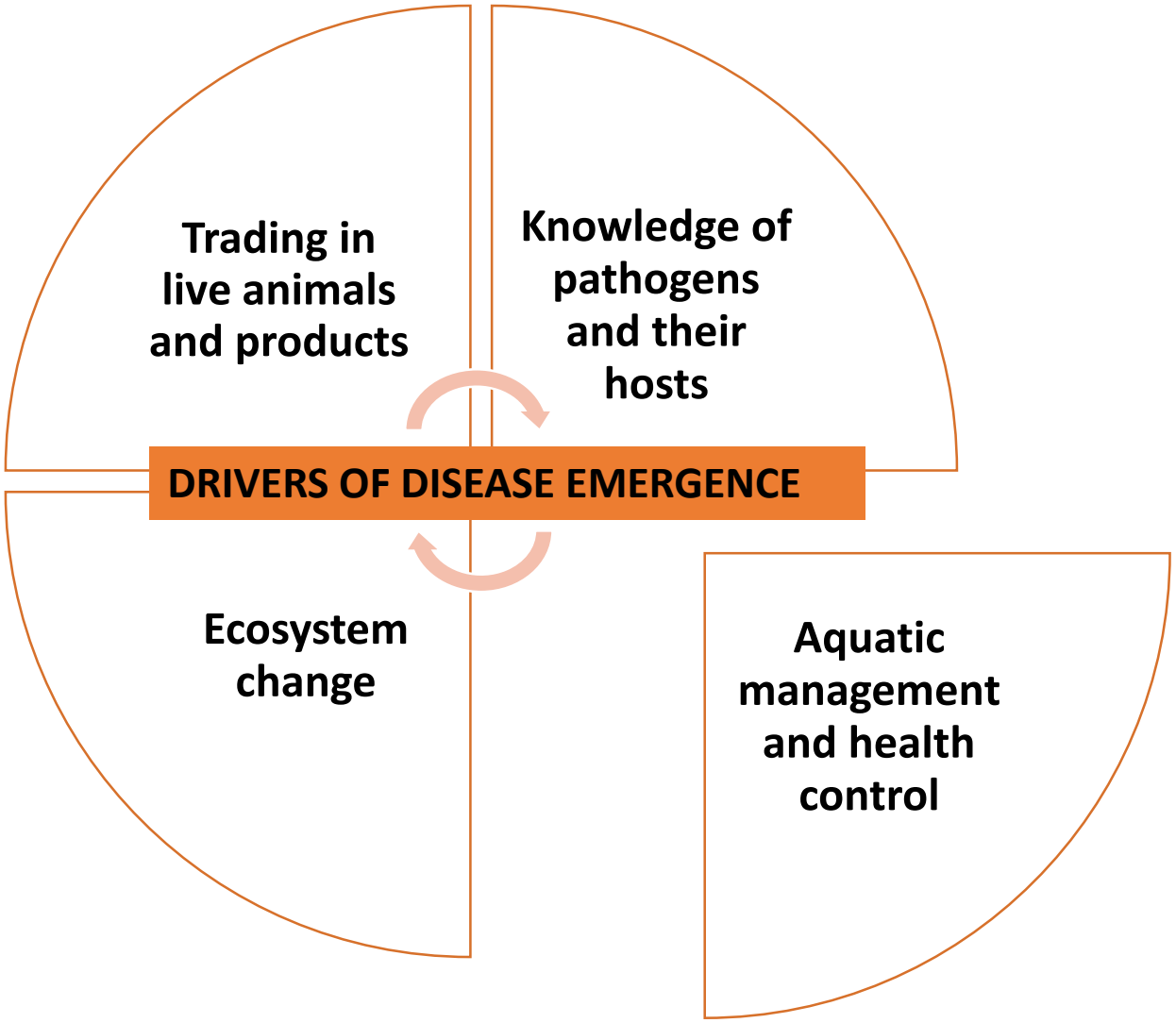


Drivers of emergent disease in aquaculture



- The unique aquatic medium
- Slow collective awareness of new threats
- Lack of basic pathogen data (e.g. transmission)
- Lack of basic host data (e.g. immunity, genetics)
- Diagnostics focussed on known/listed diseases
- Breeding strategies not in place for many species (e.g. SPF, SPR, selective breeding)
- Misuse of stock (e.g. SPF) in some cases
- Limited availability of vaccines (fish) and other credible control options (invertebrates)
- Societal barriers to innovative control/surveillance strategies (e.g. POND)
- Societal barriers to innovative genetics (e.g. GMO)

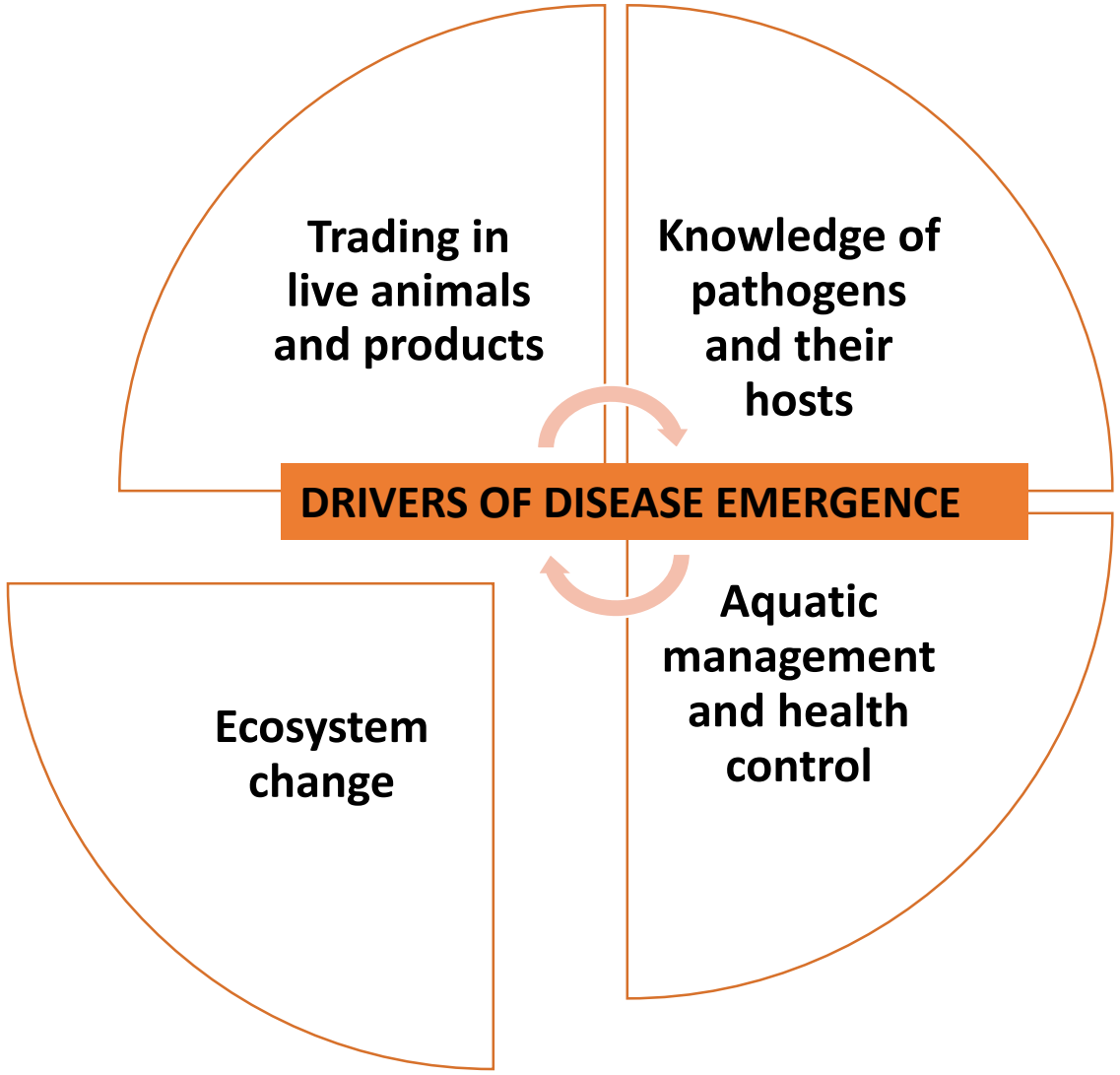
Drivers of emergent disease in aquaculture



- Multiple institutions involved in AHM. The Competent Authority?
- Inadequate or poorly implemented biosecurity measures/**low capacity for emergencies**
- Inconsistent or weak implementation of international standards etc
- Perceived low incentive to report on known and emergent diseases (trade)
- Weak regulatory framework and public-private sector partnership working
- Mismatch between research agenda and farmer/commodity sector needs
- Few national pathogen/host inventories

Drivers of emergent disease in aquaculture

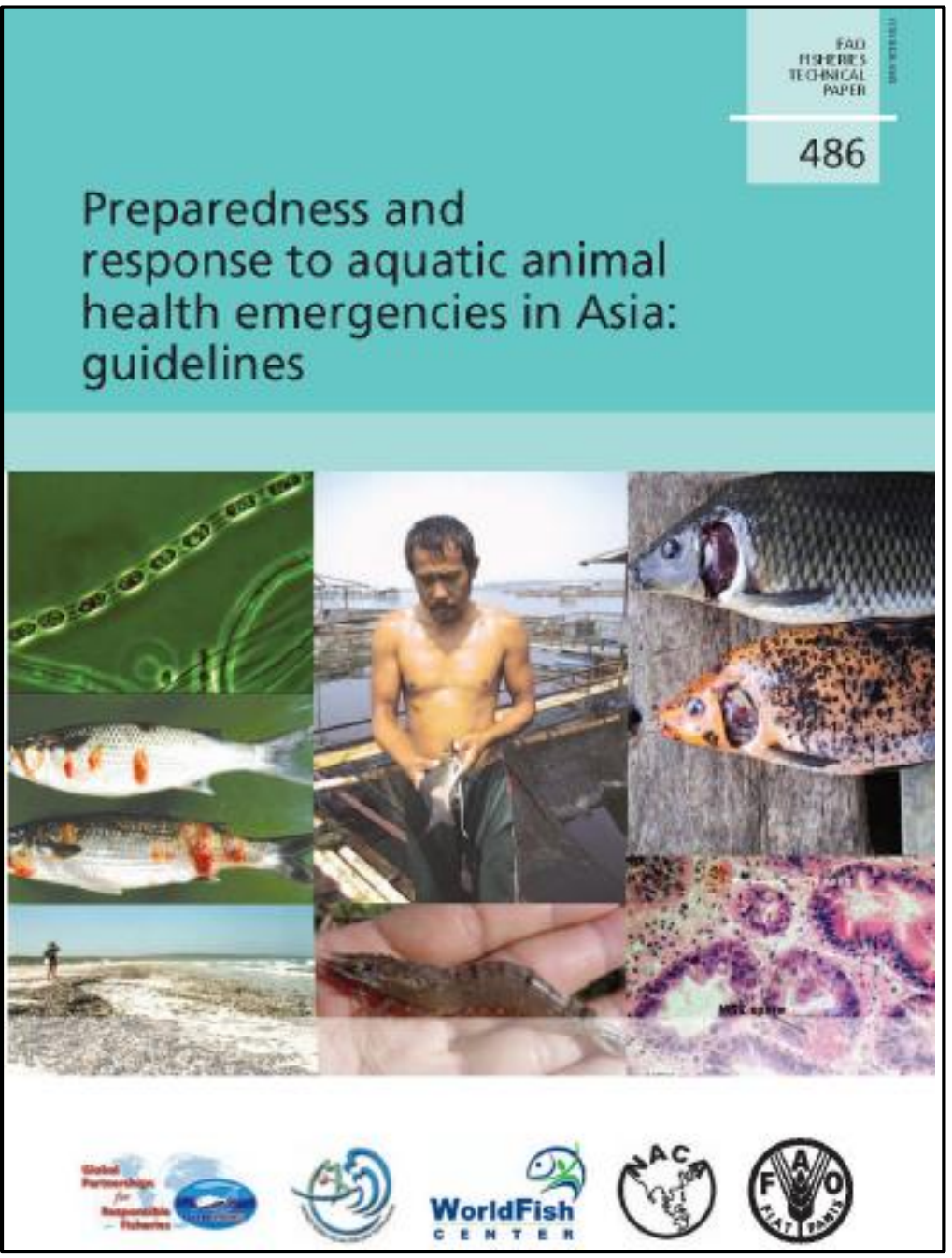
- Physico-chemical conditions in aquaculture are often sub-optimum for host
- Aquatic hosts are cold-blooded (highly responsive to stressors)
- Animals may be farmed outside of native/optimum range
- and, in waters in which they are naïve to native microbial hazards
- Aquatic medium is pathogen rich, diversity changes with environment conditions
- Pathogens evolve and spill-over and spill-back relative to wild populations
- Some hosts (e.g. crustaceans, molluscs) must calcify (susceptible to acid-base changes)



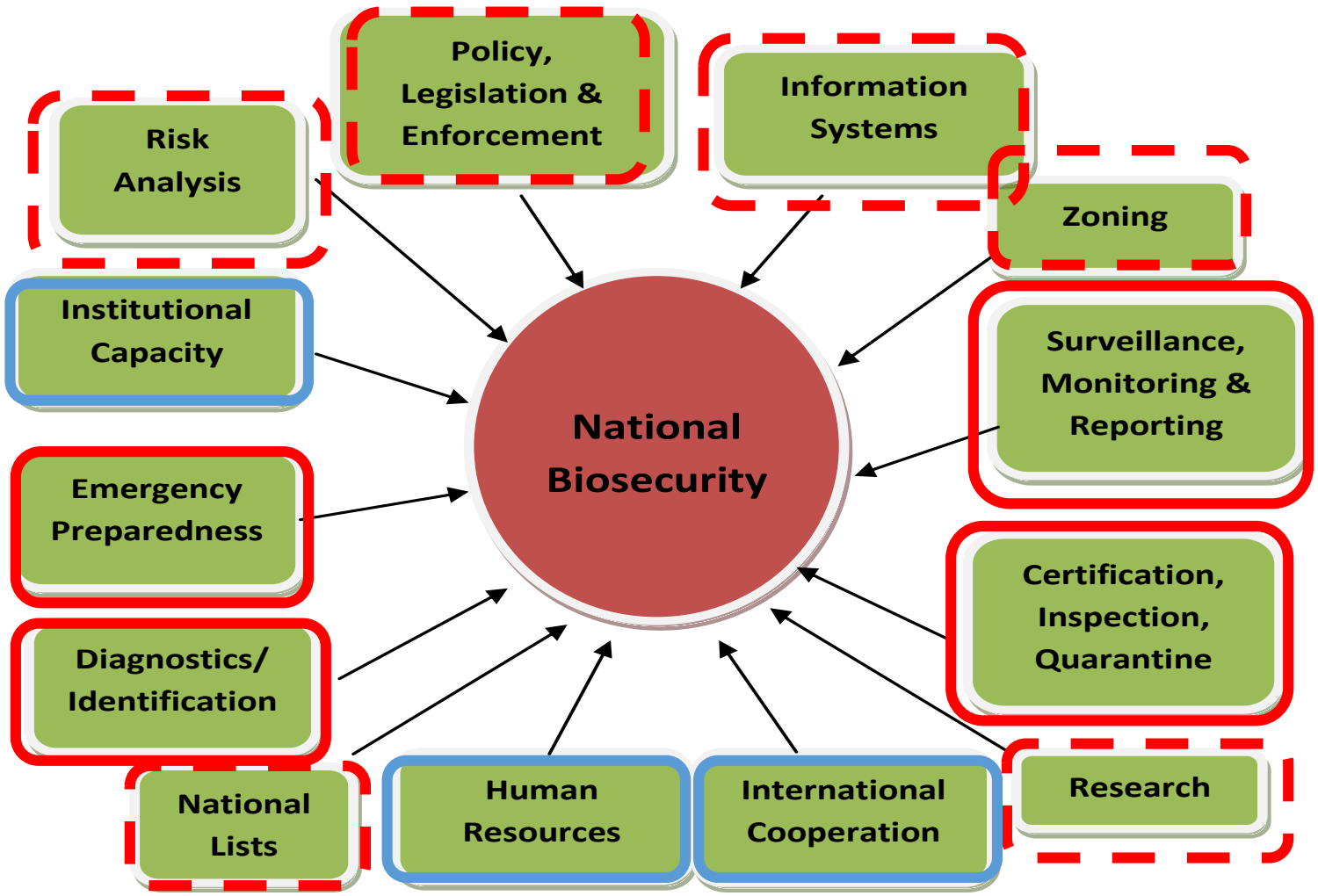
What can we do?

Before the disease or after

Prevention	?	Solution
Pro-active	vs	Reactive
<$$	vs	>$$$$$$$



National Aquatic Animal Health and Biosecurity Strategy



Emergency preparedness

- ability to **respond effectively** and in a **timely fashion** to disease emergencies (e.g. disease outbreaks, mass mortalities, fish kills).
- capability to deal with emergency disease situations requires:
  - a great deal of **planning and coordination** (including establishing operational, financial and legislative mechanisms) and
  - making available **required resources** (i.e. skilled personnel, essential equipment, advance emergency fund).

Objectives

- **prevent the incursion** of exotic pathogens and pests
- put in place a **rapid, well-organized** and **appropriate response** to an emergency disease incident
- have a **successful management of disease outbreaks**

As long as there is importation of live aquatic animals, the possibility of serious disease outbreaks due to **exotic** pathogens will exist.

Endemic diseases not properly addressed - will continuously affect production

How do you deal with 'emerging diseases' – these are **'known'** - affecting *new species* or spreading to *new geographical localities* or '**unknowns**'?

Elements of emergency response

- **National planning and coordination**
- **Operational capability**
  - Responsibility for aquatic animal disease emergencies
  - Aquatic animal disease contingency planning as a component of a National Disaster Plan
  - Legislation and enforcement
- **Early warning**
- **Early detection**
- **Risk analysis**
- **Disease surveillance**
- **Early response**
- **Contingency plans**
  - Technical plans: Control Centers Management Manual, Enterprise manual, Destruction manual, Disposal manual, Disease strategy manuals, Job descriptions
  - Surge support
  - Operational capability: Response management manuals, Diagnostic resources, Training resources, Awareness and education, Simulated response exercises
- **Recovery** from an emergency disease
  - Verification and international acceptance of disease freedom
  - Rehabilitation of farming and fishing communities
- **Staying free**

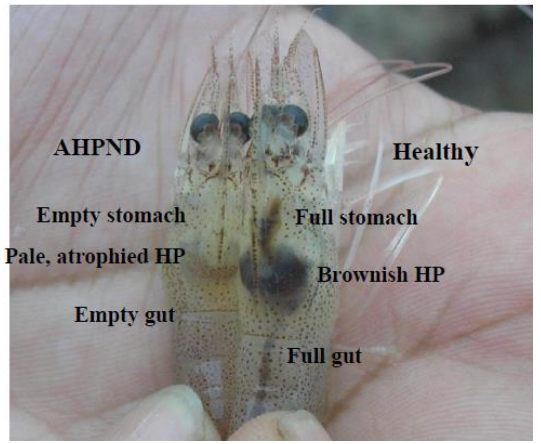
Early warning

- **What:** having **advance knowledge** of high-risk diseases likely to threaten national biosecurity before the pathogens actually enter national territory
- **How:** efffective early warning depends strongly on the responsible authority having **excellent awareness** of the current disease situation of the country's primary trading partners and on emerging aquatic animal diseases on a world-wide basis.
- **How**: **good communication** essential
  - trading partners
  - disease reports, databases
  - aquatic animal health professionals
  - scientific meetings, workshops, communication media
  - dialogue with stakeholders

NACA TiLV Disease Advisory	OIE TiLV Disease Card	FAO GIEWs Special Alert	World Fish FAQ on TiLV	Scientific literature	Social media and others

Early detection

- ***What:*** detection of an **emerging disease** situation within a country's national territory within the ***shortest time frame possible***
- ***Purpose:*** to ensure detection of **the introduction** of, or **sudden increase in the incidence** of, any disease of aquatic animals that has the potential of developing to epizootic proportions and/or causing serious socio-economic consequences.
- ***Scope:*** all initiatives that lead to **improved awareness and knowledge** of the *distribution and behavior of disease outbreaks* (and of infection) and that allow **forecasting** of the source and **evolution** of the disease outbreaks and the monitoring of the **effectiveness** of disease control campaigns.



Key components of a national early detection system

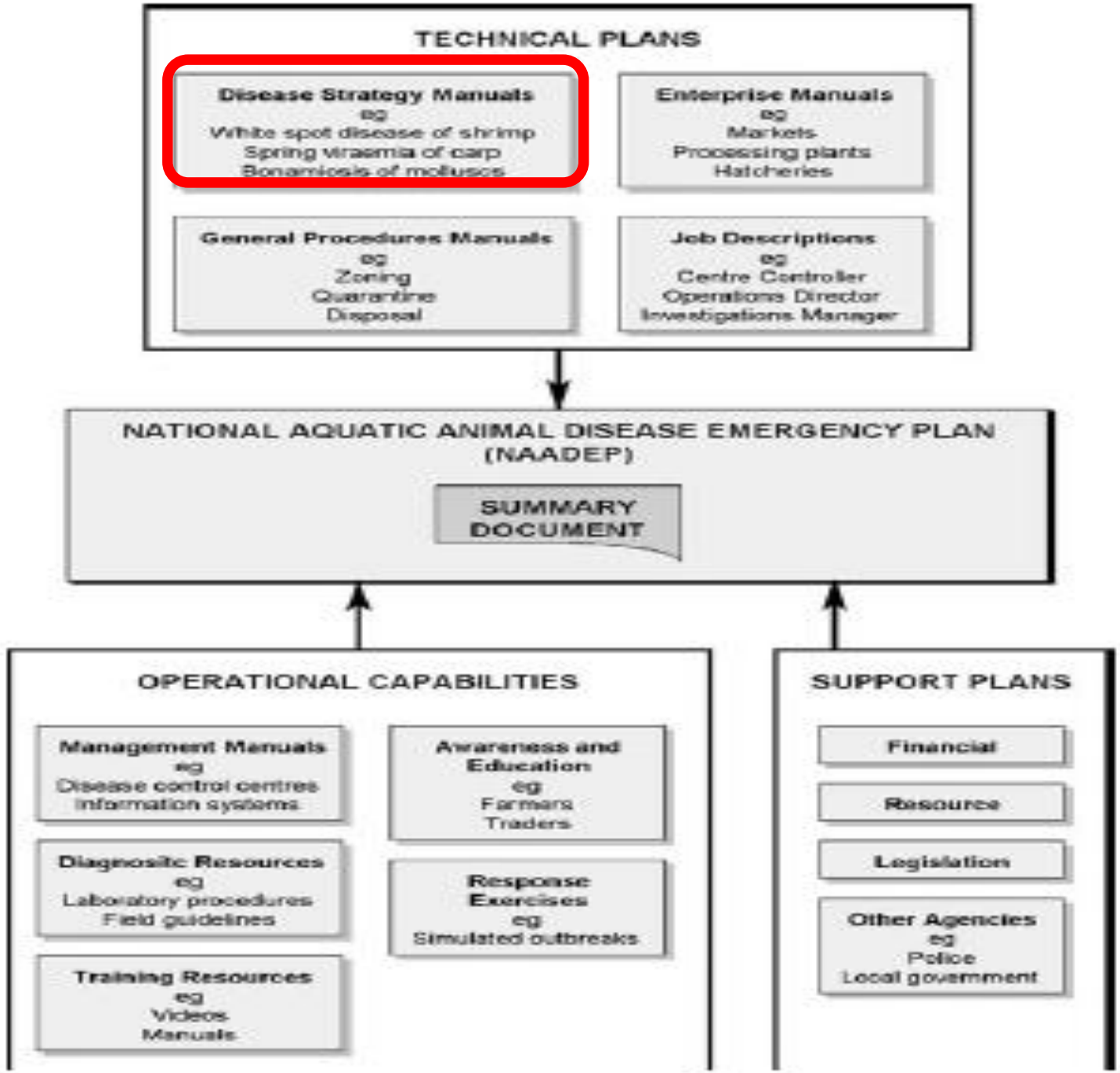
- Broad awareness of characteristic signs of diseases (exotic, endemic, emerging)
- Experienced veterinarians and/or aquatic animal health professionals trained in recognizing and reporting suspicious disease occurrence
- Ability of CA to undertake rapid and effective disease investigation
- Access of CA to expertise and laboratory facilities that are able to diagnose and differentiate exotic, endemic, emerging diseases

Early response (1)

- ***What****:* all actions targeted at rapid and effective containment (and possibly elimination) of an emergency outbreak
- ***Why:*** prevent it from spreading and becoming an uncontrollable epizootic
- ***How:*** depends on many factors; disease scenario
- Control options: **eradication**, containment, mitigation
  - **Eradication**: elimination of pathogen from affected population or from the country – including sub-clinical infections - the highest level of response but may not be possible; not always possible!
    - Disease well established prior to initial detection (early detection failed)
    - Intermediate or carrier hosts unknown
    - Source of infection unknown

Early response (2)

- Control options: eradication, **containment, mitigation**
  - **Containment:** containing the disease at specific compartments/zones; controls in place at infected compartments/zones in order to prevent the spread to uninfected populations
  - **Mitigation**: reducing the impacts (occurrence and severity) of the pathogen/disease through control measures at farm level or affected population
    - Stocks in infected zone
    - Vaccines, treatments, husbandry



Components of National Contingency Plan

National Aquatic Animal Disease Emergency Plan

- Technical plans
- Operational Capabilities
- Support Plans

Aquaculture is a very dynamic sector – site/location specific (no cut and paste)

+/- 500 species; systems, environment, management, small-scale producers, science

Aquatic animals require more attention in order to monitor their health

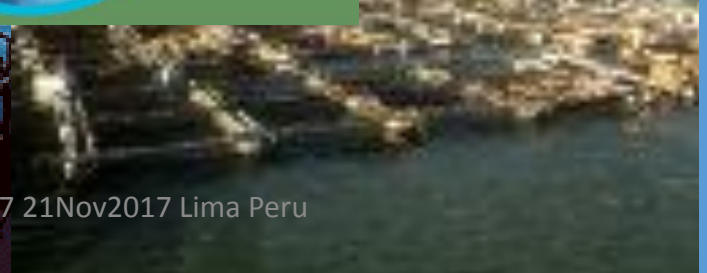
- **not readily visible except in tank holding conditions**
- **live in complex and dynamic environment**
- **feed consumption and mortalities are hidden under water**

Range of diseases are also varied

- **some disease with low or unknown specificity**
- **many with non-specific symptoms**

Complexity of aquatic systems makes distinction between health, sub-optimal performance and disease obscure

- **Diseases not caused by a single event**
- **End result of a series of linked events involving the interactions between the host, the environment and the presence of a pathogen (Snieszko, 1974).**



Spread of disease from either cultured fish to wild fish or vice-versa

- **presence of pathogen in both fish and water source;**
- **presence of susceptible host;**
- **viability, in terms of number and longevity, of pathogen in the environment;**
- **viable infection route.**

Emergency preparedness and response (EPRS) audit

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EPRS for managing aquatic animal disease outbreaks

- contingency planning arrangements that can minimize the impacts of serious aquatic animal disease outbreaks, whether at the national, subnational or farm level
- an effective EPR system ensures that there are pre-agreed protocols and resources in place to act quickly in responding to suspected outbreaks of emergency diseases.
- they established a clear structure for effective and rapid decision-making with clearly defined responsibilities and authority.

EPRS audit

- SECTION 1. General administration (17 questions)
- SECTION 2. Aquatic EPR System Elements (29 questions)
- SECTION 3. Operational Support Systems (7 questions)
- SECTION 4. Other information

Understanding
gives
us
hope!

EPRS audit

- **SECTION 1. General administration (17 questions): scope of responsibility and administrative structure**
  - **General**
  - **Communication**
  - **Risk analysis**
  - **Operational capacity/capability**
  - **Contingency plans**
  - **Personnel skills**
  - **Resource allocation**
  - **Legislation**
  - **Systems review and development**

EPRS audit

- SECTION 2. Aquatic EPR System Elements (29 questions): priority elements of OIE
  - Early warning
  - Early detection
  - Early response
- SECTION 3. Operational Support Systems (7 questions): broader support system
  - Legislation
  - Information management system
  - Communication system
  - Resources
- SECTION 4. Other information

Participating countries are encouraged to complete the EPRS audit questionnaire

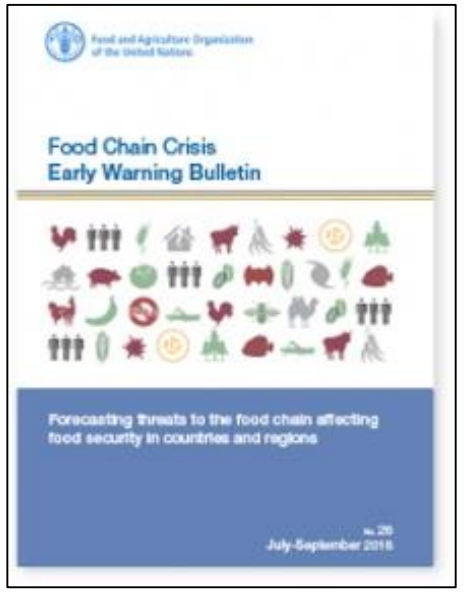
This will enable systematic collection of information that will allow systematic assessment

FAO efforts on EPRS

- TCP/VIE/3304
  - EPRS completed for Vietnam
  - Simulation exercise
- TCP/RER: Western Balkan countries (simulation exercise)
- TCP/INS/3304
  - EPR guidelines
- TCP/INT/3501 (IMNV): Brasil, China, Ecuador, Indonesia, Mexico, Thailand
  - EPRS completed for Indonesia, Thailand (report and analysis in press)
  - IMNV Disease Strategy Manual (in preparation)
- Disease Strategy Manuals
  - TCP/INT/3502 (AHPND)
  - TCP/INT/3501 (IMNV)
  - GCP/MUL/298 (TiLV)

FAO efforts on EPRS

- Capacity building on risk analysis
- GIEWs: Global Information and Early Warning System on Food and Agriculture
  - EUS (2009): first occurrence in Africa; still spreading….
  - TiLV (2017)
- Quarterly Early Warning Bulletin integrates information on threats to the food chain and food security for the three months ahead.
  - Collaboration between the Emergency Prevention System (EMPRES) for transboundary animal and plant pests and diseases and food safety threats, the Global Information and Early Warning System (GIEWS) and the Food Chain Crisis Management Framework (FCC). Data is provided by GIEWS and EMPRES.
  - Quarterly issue (in advance of the quarter)



Acute Hepatopancreatic Necrosis Disease Strategy Manual

Nature of the disease: aetiology, susceptible species and global distribution	**Epidemiology**: distribution, genotype, persistence of bacteria, reservoir hosts, transmission, risk factors, disease impacts
Diagnosis of disease: gross clinical signs; laboratory methods	**Principles of control and eradication**: methods of prevention & elimination; control, containment and eradication options; trade and industry considerations
Treatment and prevention: antibiotic, bacteriophage, probiotics, probiotics, SPF-stocks, shrimp immunity and vaccination	**Policy and rationale:** over-all policy; response options; improving knowledge and capability; framework for preparedness and response; social and economic effects; funding and compensation

Includes input from industry presentations during two international technical seminar on AHPND held in Panama (2015) and Bangkok (2016)