UTF/077/ZAM: Technical Assistance to the Zambia Aquaculture Enterprise Development Project (ZAEDP)

Session 1: Introduction to the ZAEDP and Training/Workshop 4 Ps

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UTF/ZAM/077/ZAM: Technical Assistance to the Zambia Aquaculture Enterprise Development Project (ZAEDP)

- Overall objective: advancing the aquaculture subsector as a viable and inclusive business opportunity, through enhanced production and productivity, in order to improve the livelihoods of beneficiaries along the aquaculture value chain
- Funding: African Development Bank (loan)
- Duration: until June 2021

Expected outputs

- Feed quality assurance capacity increased
- Zambian finance institutions trained with respect to aquaculture and related risks
- Food safety programme established
- Aquatic animal health management improved
- National aquaculture statistics database established and capacity increased

Outline

- **Diseases in Aquaculture**
  - Current global aquatic animal disease situation
  - Factors, drivers and pathways to aquatic animal disease emergence
- **PMP/AB concepts and application**
  - What is PMP/AB
  - Different stages of PMP/AB
  - The Way Forward to PMP/AB
- **ZAEDP Output 4**

Pathogen/Disease Emergence in Aquaculture

Parasites
Bacteria
Virus Fungi

These pathogens affect all phases of production (hatchery, nursery, grow-out).

1970s

Gyrodactylus (salmon)
MBV (shrimp)
LCDV (tilapia)
EUS (many finfish)

1980s

ISA (salmon)
IPNV (tilapia)
Sea lice (salmon)
WSSV, HPV, IHHNV,
BP (shrimp)
NHP (shrimp)

1990s

YHV, TSV (shrimp)
Vibriosis: *Vibrio (harveyi, damsela, alginolyticus, vulnificus, penaeicida)* (shrimp)
KHV (carps/koi carp)

2000s

MoV, IMNV, CMNV, LSNV (shrimp)
AHPND (shrimp)
TiLV (tilapia)
VNN (tilapia and marine finfish)
EHP *Enterocytozoon hepatopenaei* (shrimp)

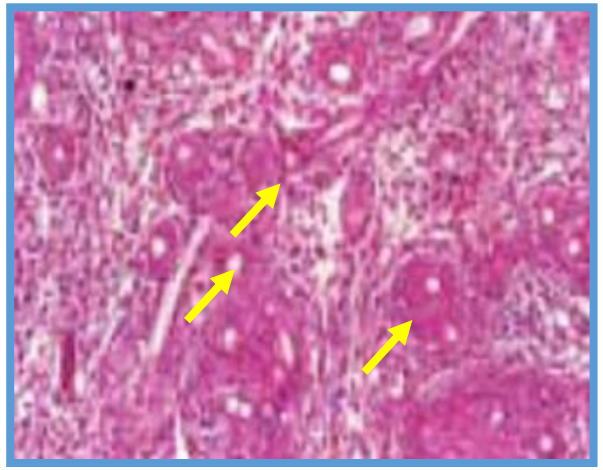
Future

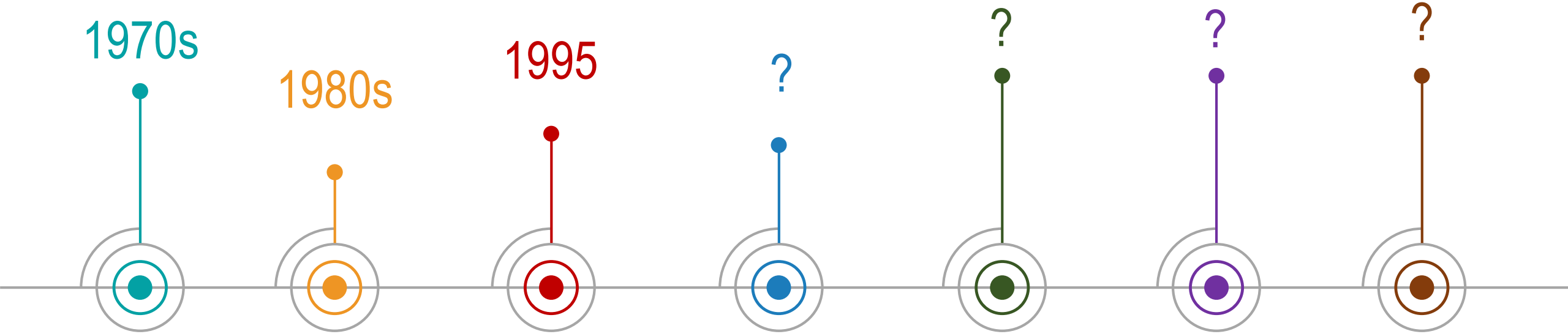
We expect more diseases (exotic, endemic, emerging) if no biosecurity actions are taken

Omar Elhassan (FIAA)

Diseases in Aquaculture

EUS: fungi/many finfish species





Diseases in Aquaculture

Photo credit: Dr D Lightner

WSSV: virus/shrimp

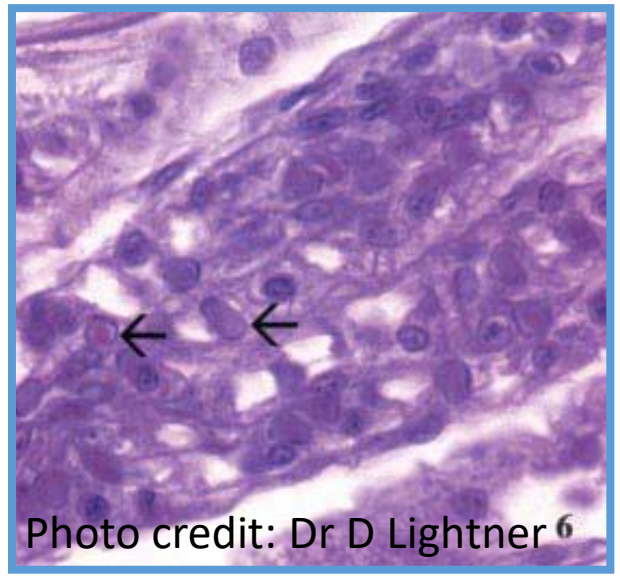


Photo credit: Dr D Lightner [6]

1980s — Disease (observation in the field)

Mid-1990s — Diagnosis

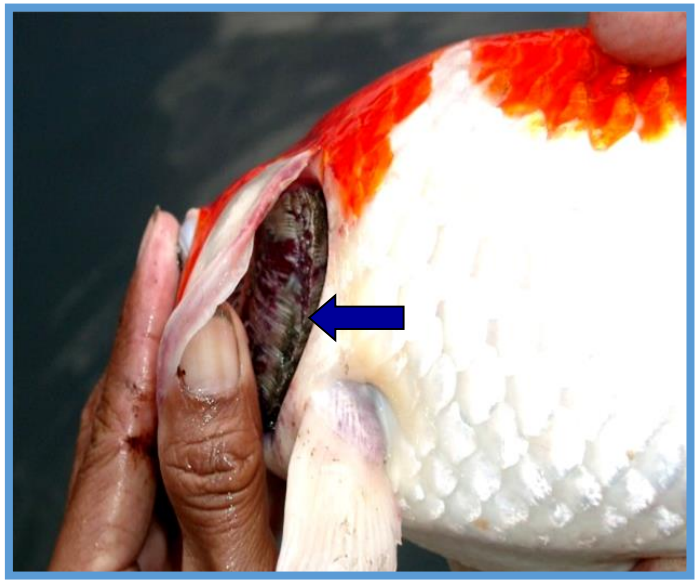
1997 — Adopted in OIE AAH Code

? — Containment (vaccine, treatment, husbandry)

? — Management (cost effective)

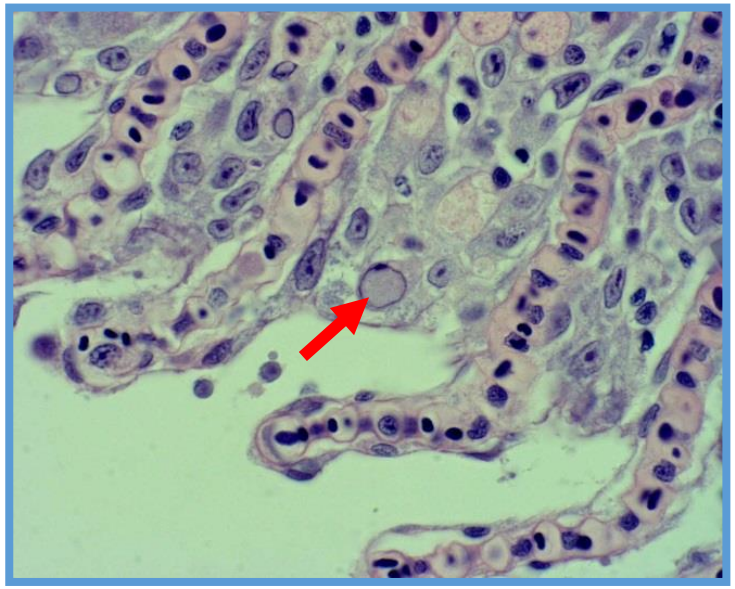
? — Disease Freedom

? — National and international confidence to the sector



Diseases in Aquaculture

KHV: virus/carp & koi carp



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Omar Elhassan (FIAA)

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Diseases in Aquaculture

TiLV: virus/tilapia

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

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

- Disease (observation in the field)
- Diagnosis
- Adopted in OIE AAH Code
- Containment (vaccine, treatment, husbandry)
- Management (cost effective)
- Disease Freedom
- National and international confidence to the sector

Omar Elhassan (FIAA)

WHAT can we do and **WHEN?**

Before the disease or after

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

Aquaculture Health Economics

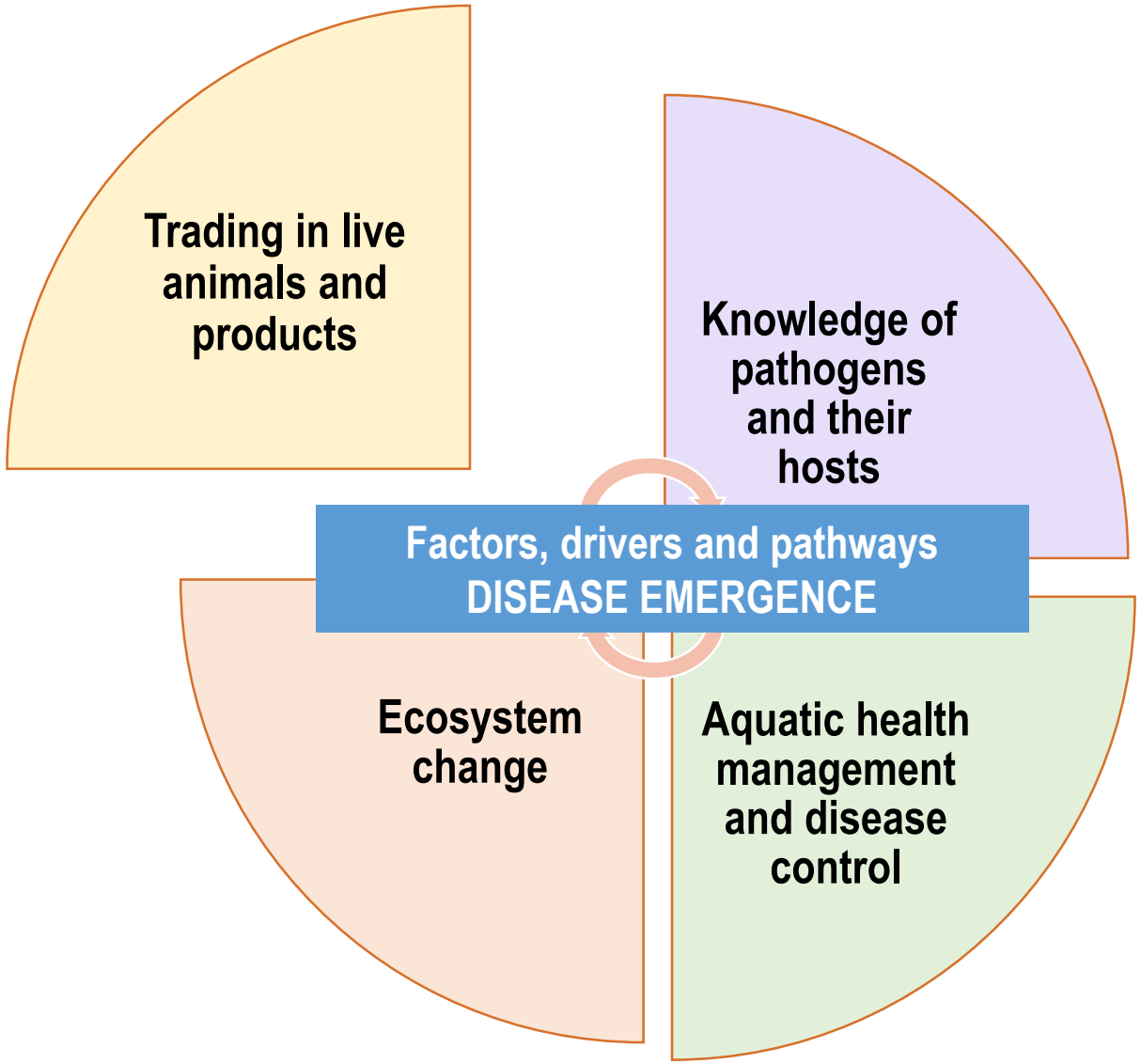
Period	Species	Disease	Losses (USD)
1987-1994	Shrimp	Several pathogens	3 019 million[1]
1998-1999	Salmon	ISA	39 million[2]
2010-2017	Shrimp	AHPND	12 billion[3]
2015	Shrimp	AHPND	>26 million[3]
2017	Tilapia	Several pathogens	450 million[4]
2017	Shrimp	Several pathogens	1.6 billion[4]
2017	Oysters	Several pathogens	540 million[4]
2017	Seaweed	Several pathogens	190 million[4]

[1]Israngkura and Sae-Hae, 2002
[2]Hastings *et al*., 1999
[3]Shinn *et al*., 2018;
[4]Annual Report on Aquatic Animal Health in China, 2017

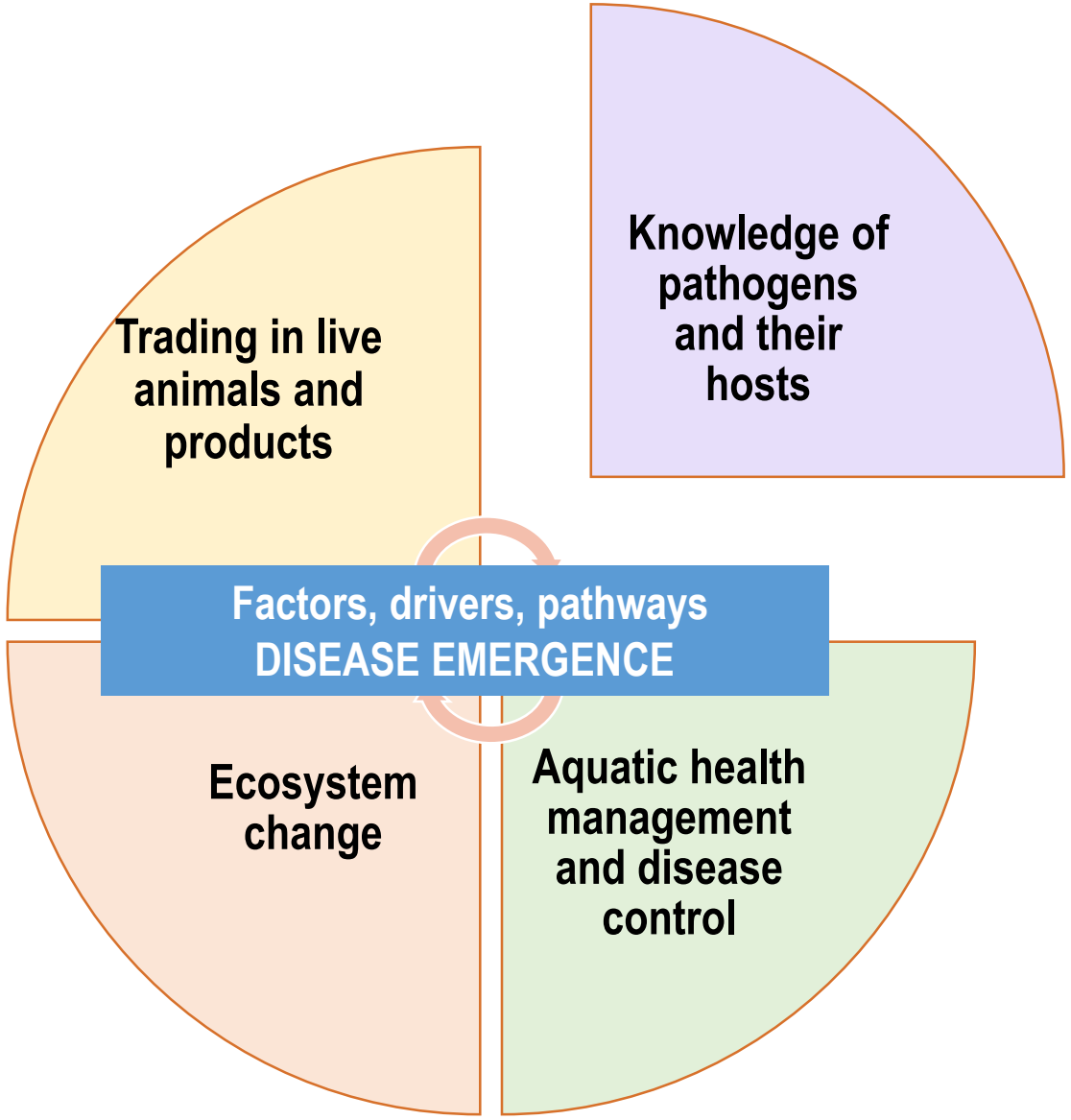
- Numerous unmanaged disease outbreaks with high economic losses reflect an immature aquaculture industry
- A maturing aquaculture industry requires a focus on disease prevention supported by:
  - Improved governance
  - Understanding disease impacts (burdens and investments)
- The current approach to disease challenges needs to be supplemented with an economic dimension for improved responses and more efficient resource allocation
- Big opportunity for engagement with GBADs

Factors, drivers and pathways to aquatic animal disease emergence 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)

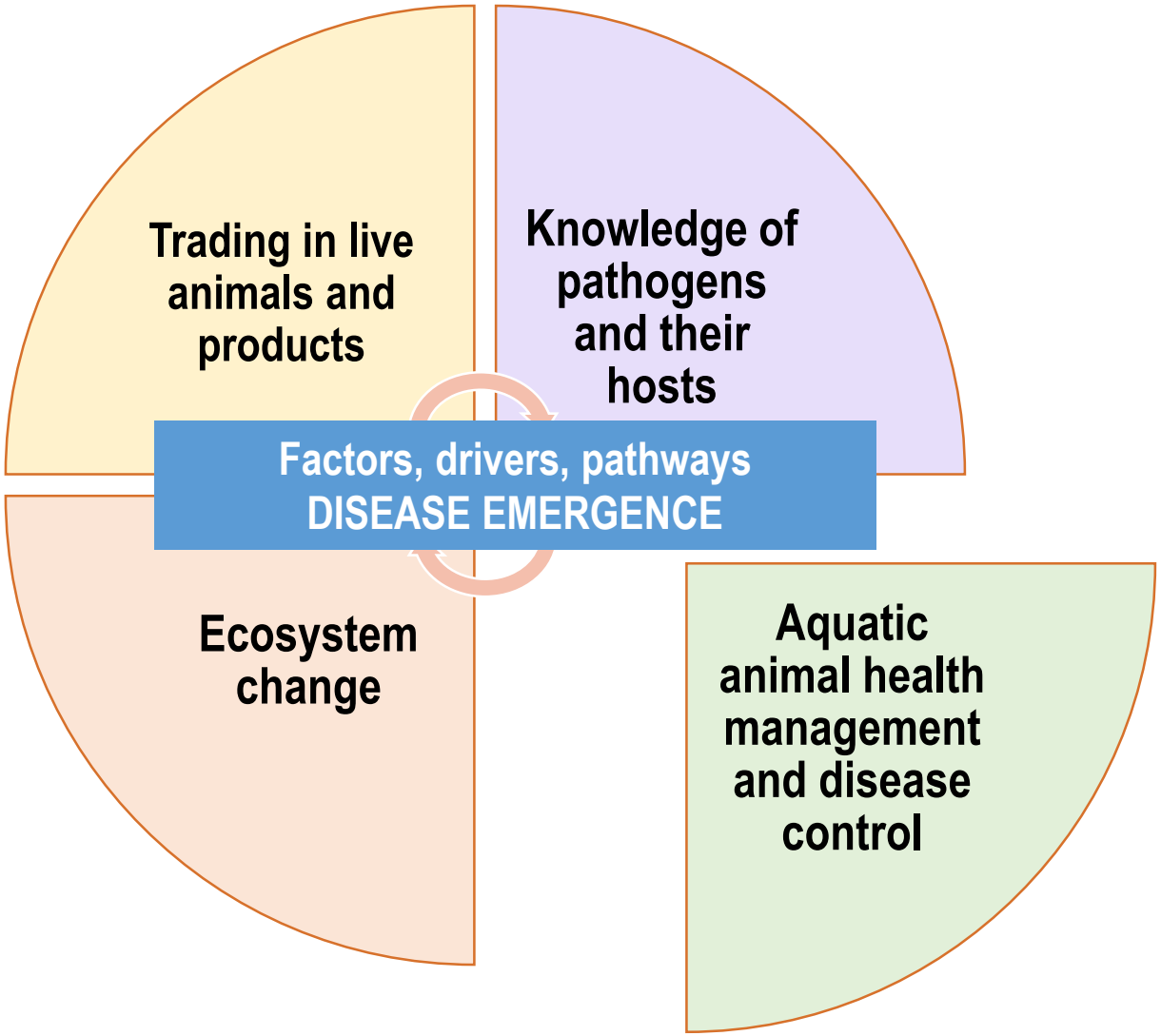


Factors, drivers and pathways to aquatic animal disease emergence in aquaculture



- 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, SPT, SPR, selective breeding)
- Misuse of stock (e.g. SPF) in some cases
- Limited availability of vaccines (fish) and other credible control options (invertebrates)

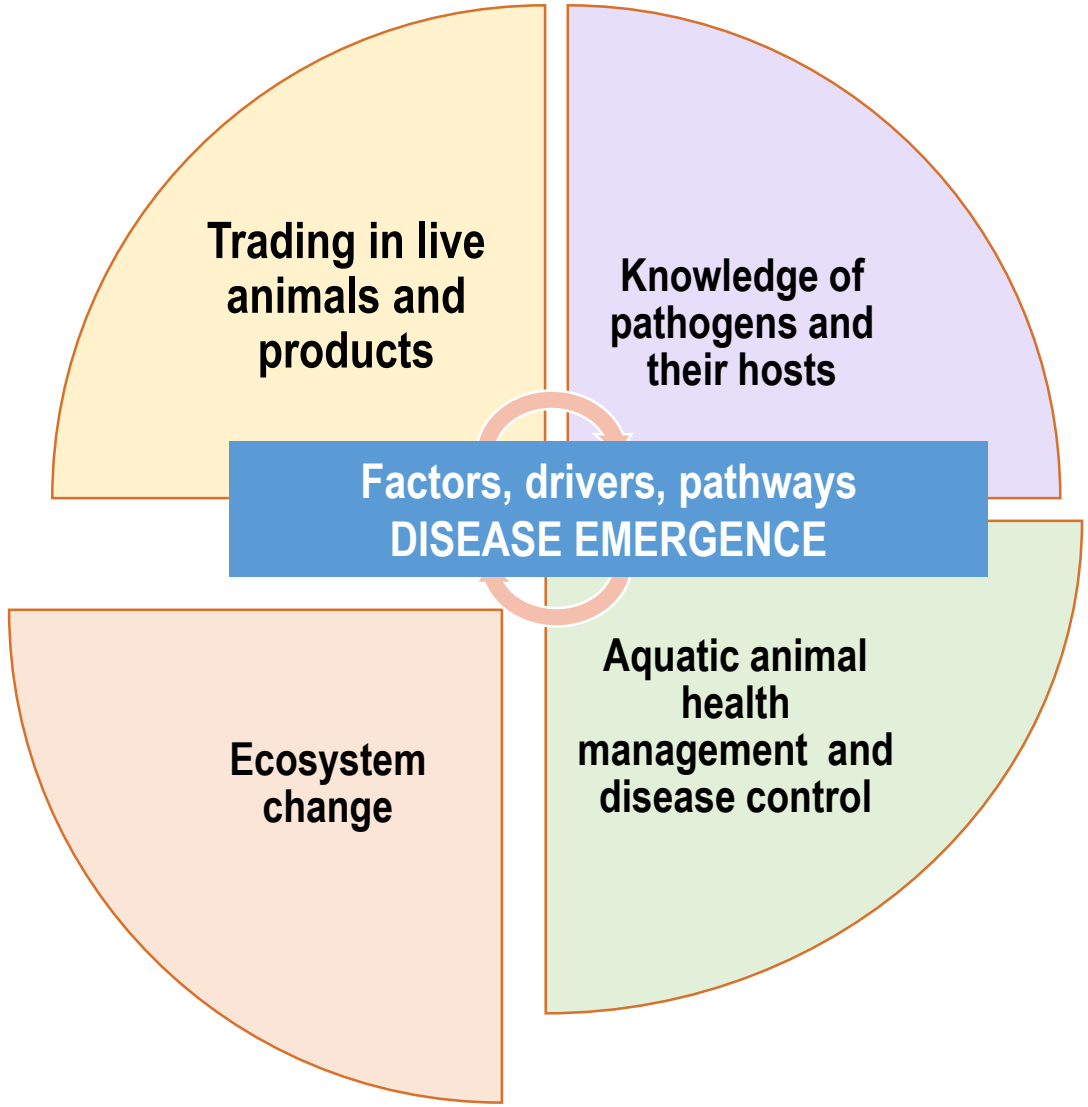
Factors, drivers and pathways to aquatic animal disease emergence in aquaculture



- 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

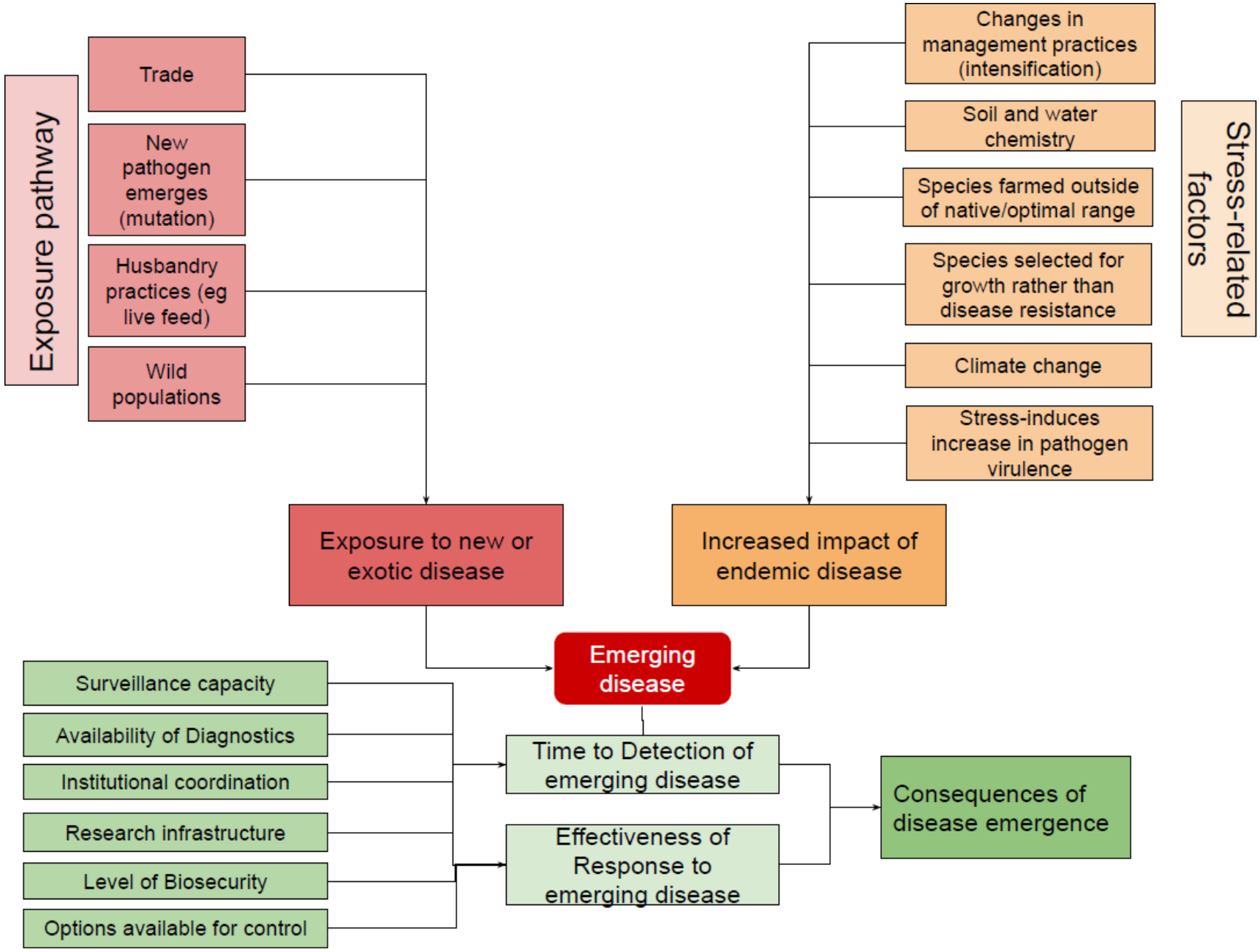
Factors, drivers and pathways to aquatic animal disease emergence in aquaculture

- 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



Aquatic Animal Disease Emergence Causal Web

- Emerging disease explained through:
  - exposure pathways to new or **exotic disease**
  - stress-related factors increasing impact of **endemic disease**
- Aspects affecting **detection** and **effective response**



Outline

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  - Current global aquatic animal disease situation
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- **PMP/AB concepts and application**
  - What is PMP/AB
  - Different stages of PMP/AB
  - Zambia: NSAAH and PMP/AB
- **ZAEDP Output 4**

What is PMP/AB?

- An extension of Progressive Control Pathway (PCP)
- Step-wise approaches are increasingly used for the **reduction**, **elimination** and **eradication** of a range of major **livestock and zoonotic diseases** including:
  - **Foot and Mouth Disease (FMD), Peste des Petits Ruminants (PPR), Rabies,**
  - **African Animal Trypanosomosis (AAT)**
- PCPs provide systemic frameworks for **planning** and **evaluating** field interventions and **enable** realistic disease control objectives to be defined and achieved.
- PCPs have been used since 2008 by FAO and **become adopted as joint tools with the OIE** (FMD, PPR), or **developed/owned by global alliances** (rabies, AAT)

- **PCP/FMD** developed by FAO and EuFMD in 2008
- 5 stages that progressively increase the level of FMD control
- Consist of set of activities focused on identifying and addressing the risk for FMD introduction and spread
- Intended to assist FMD-endemic countries to progressively reduce the impact and burden of FMD

Food and Agriculture Organization of the United Nations

Two multistakeholder consultations
Two Technical Working Group meetings

FAO/MSU/WB First multistakeholder consultation
World Bank HQ, Washington, DC, April 2018

Technical Working Group meeting
FAOLOW, Washington, DC, July 2019

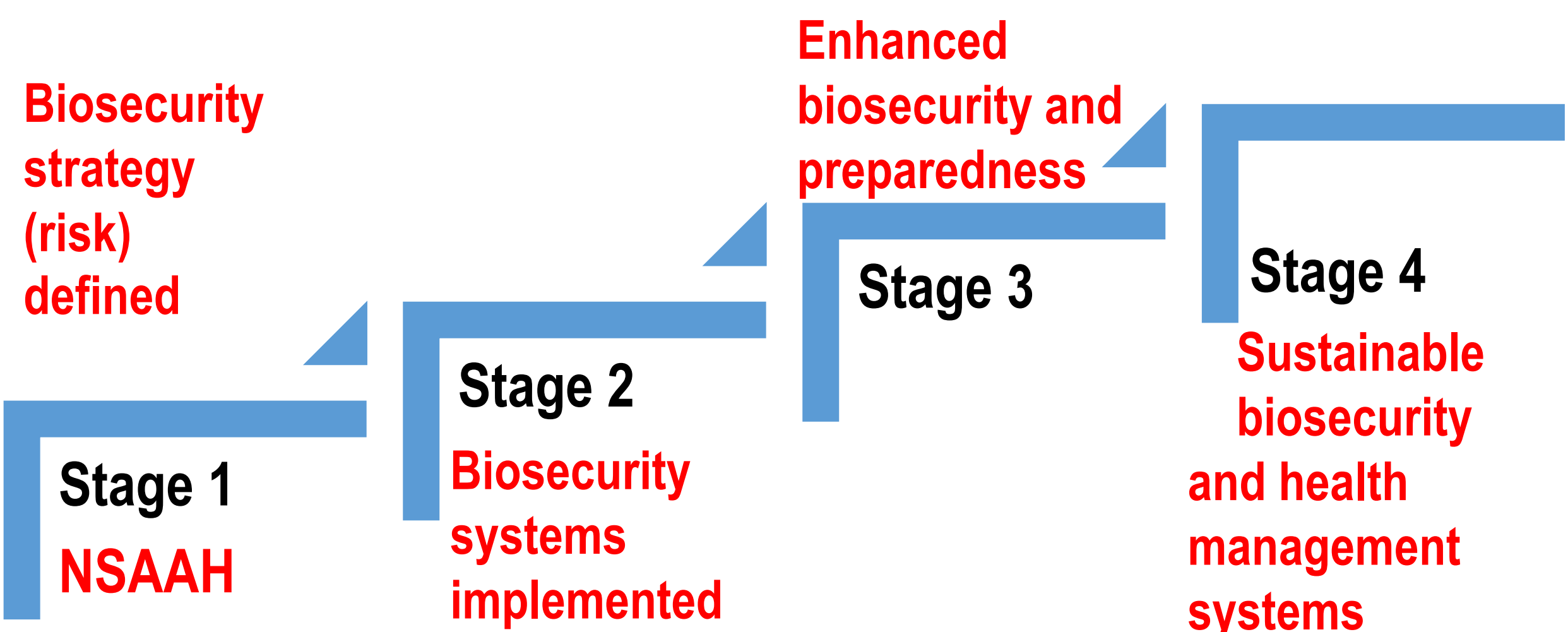
FAO/MSU/WB/Norad/NVI
Second multistakeholder consultation
OIE HQ, Paris, January 2019

Technical Working Group meeting
FAO HQ, Rome, March 2019

Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB)

- PMP/AB refers to a **pathway** aimed at enhancing **aquaculture biosecurity** capacity by building on existing frameworks, capacity and appropriate tools using risk-based approaches and **public-private partnerships**
- PMP/AB is expected to result in sustainable:
  - reduction of burden of disease
  - improvement of health at farm and national levels
  - minimization of global spread of diseases
  - optimization of socio-economic benefits from aquaculture
  - attraction of investment opportunities into aquaculture and
  - achievement of One Health goals
- *In the context of PMP/AB:* ***Aquaculture biosecurity:***

Biosecurity refers to the cost-effective management of risks posed by infectious agents to aquaculture through a strategic approach at enterprise, national and international levels with shared ***public-private responsibilities.***



PMP/AB 4 stages: risk-based, collaborative, progressive

Each stage has key considerations and key outcomes
Biosecurity action plans needed to move in between stages

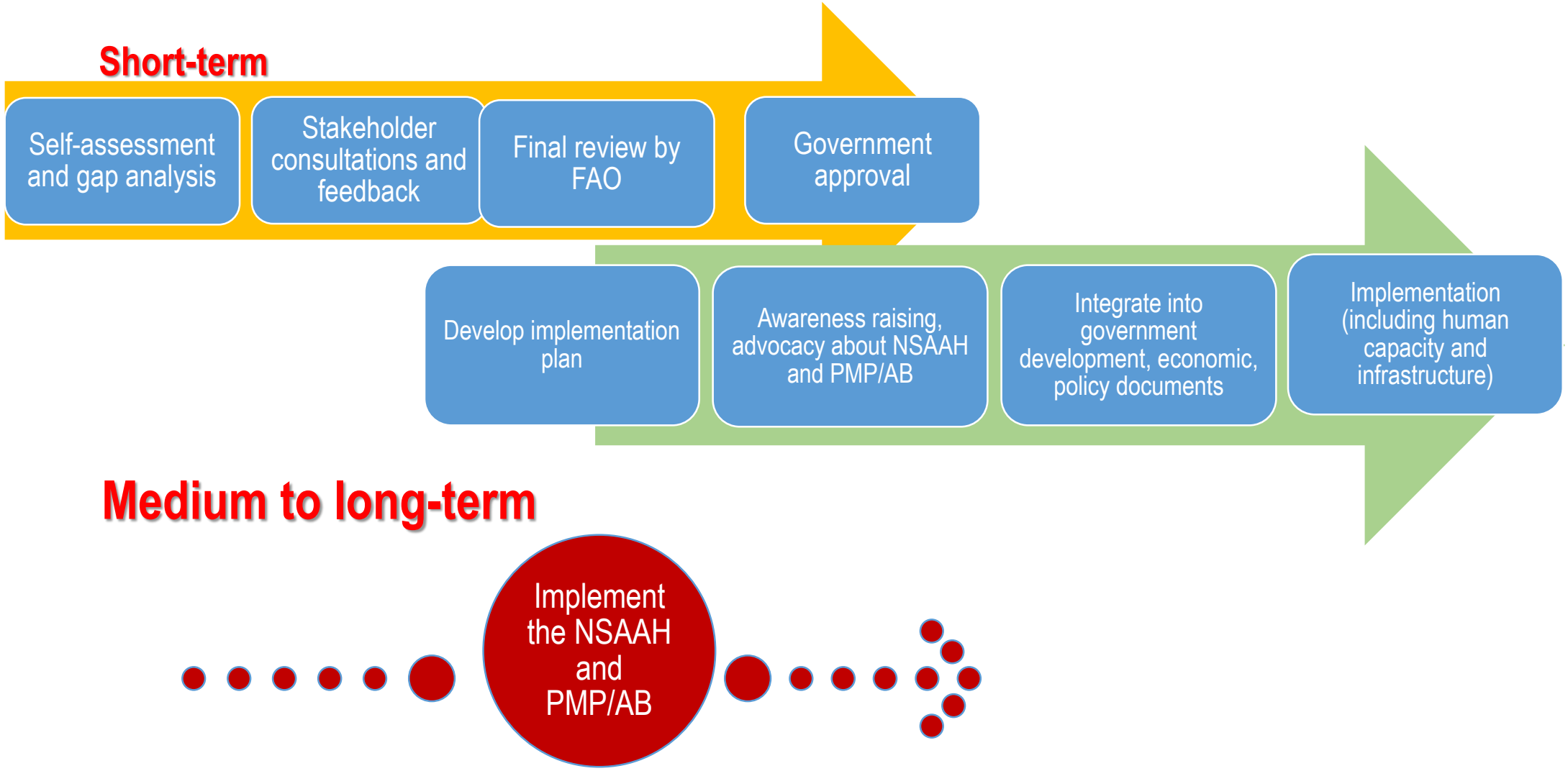
National Strategy on Aquatic Animal Health (NSAAH) within the PMP/AB

Policy, legislation and enforcement	Risk analysis	Pathogen list	Border inspection and quarantine	Disease diagnostics	Farm-level biosecurity and health management
Use of veterinary drugs and avoidance of antimicrobial resistance	Surveillance, monitoring and reporting	Communication and information system	Zoning and compartmentalization	Emergency preparedness and contingency planning	Research and development
	Institutional structure	Human resources and institutional capacity	Regional and international cooperation	Ecosystem Health	

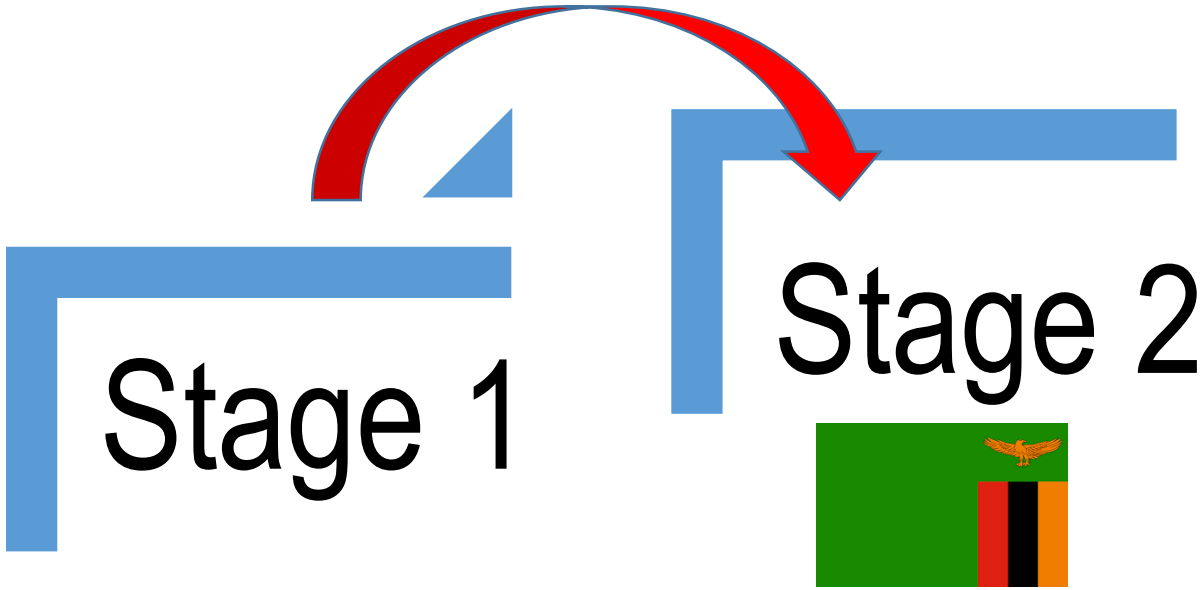
Country entry points for PMP/AB

- **Scenario 1**: Country with no aquaculture strategy nor National Strategy on Aquatic Animal Health (NSAAH) but with aquaculture or starting with aquaculture 
- **Scenario 2:** Country with NSAAH or other strategies from FAO projects or other assistance projects; certain levels of implementation - how can these be used to fit the context of PMP/AB
- **Scenario 3**: Country with advanced biosecurity strategies; what bottlenecks/lessons and good practices can be used; updated to fit the context of PMP/AB
- **Scenario 4**: Countries sharing water bodies or transboundary watersheds; regions with regional biosecurity strategies – updated within context of PMP

Moving forward with Zambia's National strategy on aquatic animal health within Progressive Management Pathway to improving Aquaculture Biosecurity



Moving forward with Zambia's Progressive Management Pathway to improving Aquaculture Biosecurity



MOVING TARGET: From **Stage 1** to **Stage 2** of **PMP/AB** within the next **3-5 years** in parallel with sustainable aquaculture aspiration

- Biosecurity measures are less expensive when put in place proactively and preventatively, and are more expensive as solution-based, reactionary responses to outbreaks
- Designing and applying a holistic global aquaculture biosecurity programme has now become essential taking into account the years of experience and research by both public and private actors, livestock sector achievements, and various bottlenecks observed and experienced, especially in developing countries
- Biosecurity should be in place and parallel to any aquaculture development by all producing countries

October mission for Output 4

- Event 1: First meeting of the National Task Force on Aquatic Animal Health Management in Zambia (11-12 October 2019)
- Event 2: Training Course on Development of an Active Surveillance for Epizootic ulcerative syndrome (EUS) and Tilapia lake virus (TiLV) using the FAO 12-point surveillance checklist (14-17 October 2019)
- Event 3: National Stakeholder Consultation on ZAED: Improving Aquatic Animal Health (17 October 2019)

Output 4: Aquatic animal health improved

Deliverables	2019	2020				2021	
	Oct-Nov	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Nov	Jan-Mar	Apr-Jun
Activity 4.1 Audit/self-assessment of capacity and performance on AAH and biosecurity management							
Activity 4.2 Formation of a Task Force (or Committee) on AAH							
Activity 4.3 National Workshops targeting different stakeholders to collect relevant information, build consensus and raise awareness and receive final feedback prior to finalisation of the National Strategy							
Activity 4.4 Finalization of National Strategy, launching, publication and dissemination							

Output 4: Aquatic animal health improved

Deliverables	2019	2020				2021	
	Oct-Nov	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Nov	Jan-Mar	Apr-Jun
Activity 4.5 Implementation of some elements of the National Strategy (e.g. surveillance design and implementation for selected diseases (e.g. **EUS, TiLV**), diagnostics for selected diseases, farm-level biosecurity and border controls, emergency preparedness and contingency plans)							
Activity 4.6 Detailed review of outcomes of Activity 4.1 pertaining to laboratories							
Activity 4.7 Identification and assessment of human resource and technical capacity requirements to fill the main and satellite aquatic animal health laboratories							

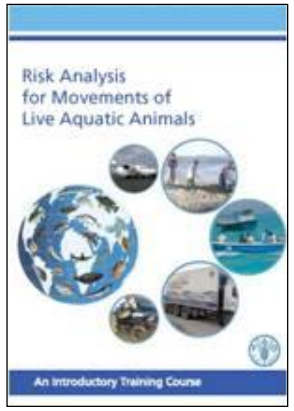
Output 4: Aquatic animal health improved

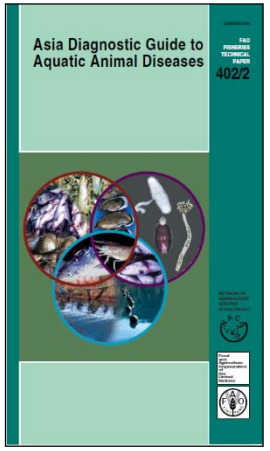
Deliverables	2019	2020				2021	
	Oct-Nov	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Nov	Jan-Mar	Apr-Jun
Activity 4.8 Prepare guidance in the renovation and rehabilitation of laboratories							
Activity 4.9 Prepare laboratory systems (wet laboratory, parasitology, microbiology, histopathology, DNA-based laboratory techniques; field sample and laboratory collection procedures, recording and reporting forms; and other laboratory requirements)							
Activity 4.10 Technical guidance in the identification of laboratory equipment and other required consumables for specific laboratories as in 4.9 above							
Activity 4.11 Implement technical capacity building of laboratory personnel							

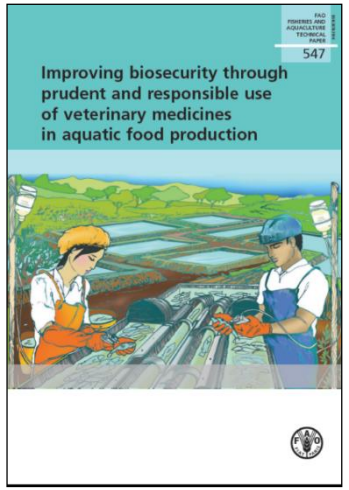
Implementation mechanisms

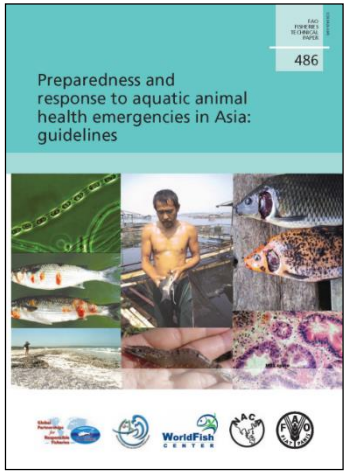
FAO guidance documents and other relevant reference materials (e.g. AU-IBAR, OIE, SADC, WFC):

- Self assessment, gap analysis
- AAH strategy development guidelines
- National Pathogen List
- Disease diagnostic guides
- 12-point checklist for design and implementation of surveillance for non-specialists
- Operational manuals
- Prudent use of veterinary medicines
- Emergency preparedness and response system audit









Implementation mechanisms

- **Round-table discussions, national consultations, field implementation, laboratory training**
- **Documentation outputs**: e.g. policy documents, disease strategy manuals, field guides, laboratory protocols, extension materials, scientific publications, and video
- **Collaboration**
  - **National government**: Competent authority and other relevant authorities
  - **Producer sector and other actors in the value chain**
  - **Academic and research sectors**: universities, research institutions
  - **Regional and international partners**: AU-IBAR, OIE, SADC, WFC
  - **FAO and AfDB**

4 Ps

- **Purpose**: to enhance capacities of government staff, producers and academic/research sectors in designing an active surveillance plan for EUS and TiLV including its implementation
- **Process**: 3.5 days; three sessions; 20 lectures; 11 working group exercises and presentations from trainees; practical work (Level I, II, III diagnostics) for EUS and TiLV

4 Ps

- **Participation**: (n=30 + n=6)
  - Trainees:DoF, DVS, NPWD, provincial governments, fish producers, research institutes
  - Trainors: Local experts (M Songe; B Mudenda); FAO experts (N Fejzic, M Reantaso, W Surachetpong, K Tang-Nelson)
- **Products:**
  - Active surveillance plan for EUS and TiLV
  - Enhanced capacities (theory and practical application) on surveillance and diagnostics and better understanding of diseases in aquaculture

Thank you for your attention