Food and Agriculture Organization of the United Nations

FAO, ONE HEALTH, ENVIRONMENTAL STEWARDSHIP AND VETERINARY MEDICINE

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WAVMA CONFERENCES
St kitts 2018

2018 World Aquatic Veterinary Medical Association Conference
November 8-12, St. Kitts

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Eradicate hunger, food insecurity and malnutrition

Eliminate rural poverty through socio-economic development

Sustainable management and utilization of natural resources

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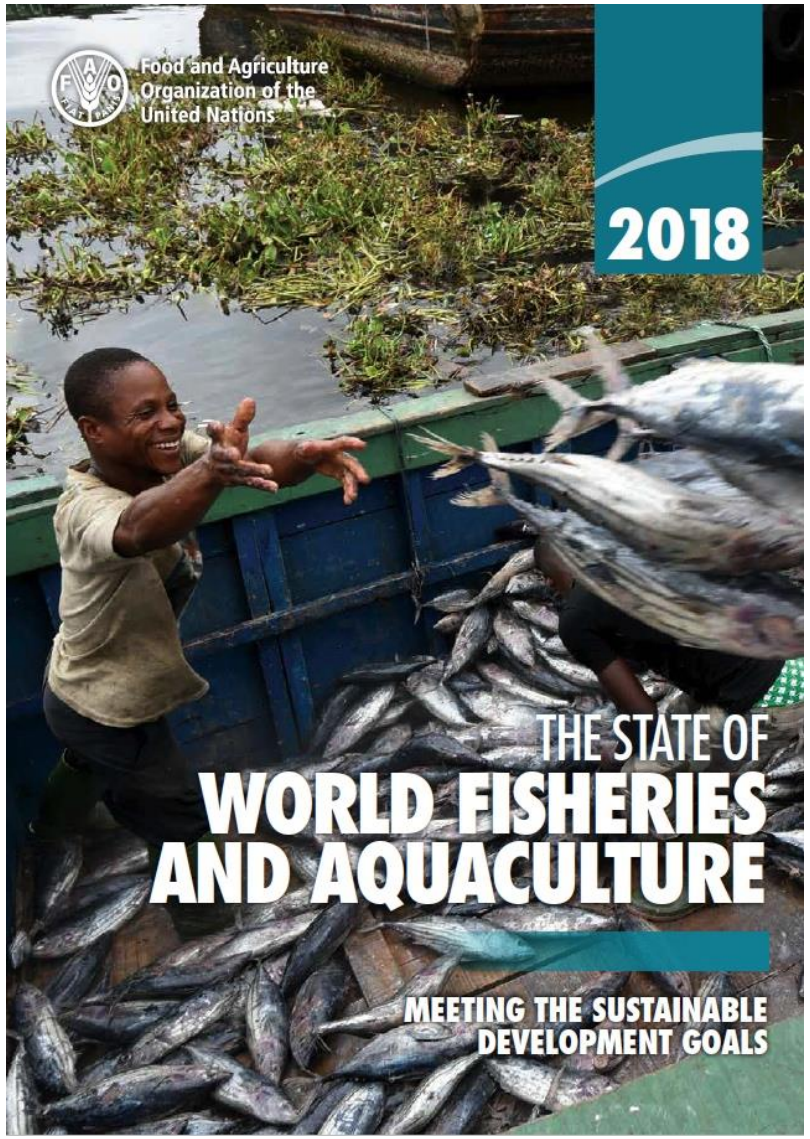
The State of World Fisheries and Aquaculture 2018



Key facts & figures

Global total **capture fishery production** in 2016 was **90.9 million tonnes**.

33.1% of fish stocks are estimated as **overfished** (fished at biologically unsustainable levels).

Global total **aquaculture production** of aquatic animals in 2016 was **80.0 million tonnes**.

Fish consumption has increased from **9 kg** per capita in 1961 to more than **20 kg** per capita today.

Fish trade was valued at **US $143 billion** in 2016.

World fish supply reached a record high of **20.3 kg per capita** in 2016.

Women account for **14%** of all people directly engaged in primary sector of fisheries and aquaculture.

SOFIA 2018 highlights the critical importance of fisheries and aquaculture for the

FOOD, NUTRITION AND EMPLOYMENT

of millions of people, many of whom struggle to maintain reasonable livelihoods.

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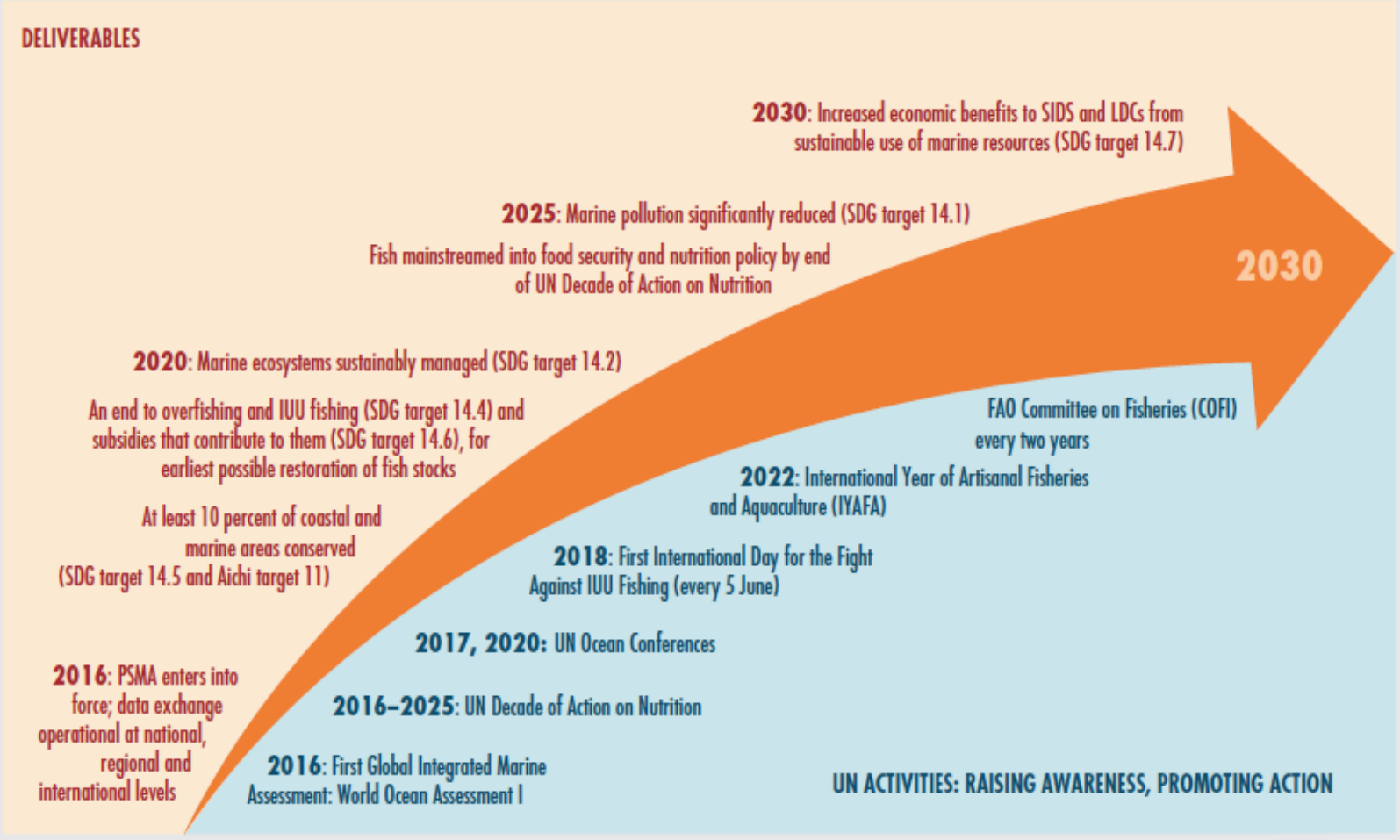
Meeting the Sustainable Development Goals

FIGURE 32
KEEPING MOMENTUM TO ACHIEVE THE 2030 AGENDA



Many SDGs are directly relevant to fisheries and aquaculture,

in particular SDG 14

‘Life under water’

SUSTAINABLE DEVELOPMENT GOALS

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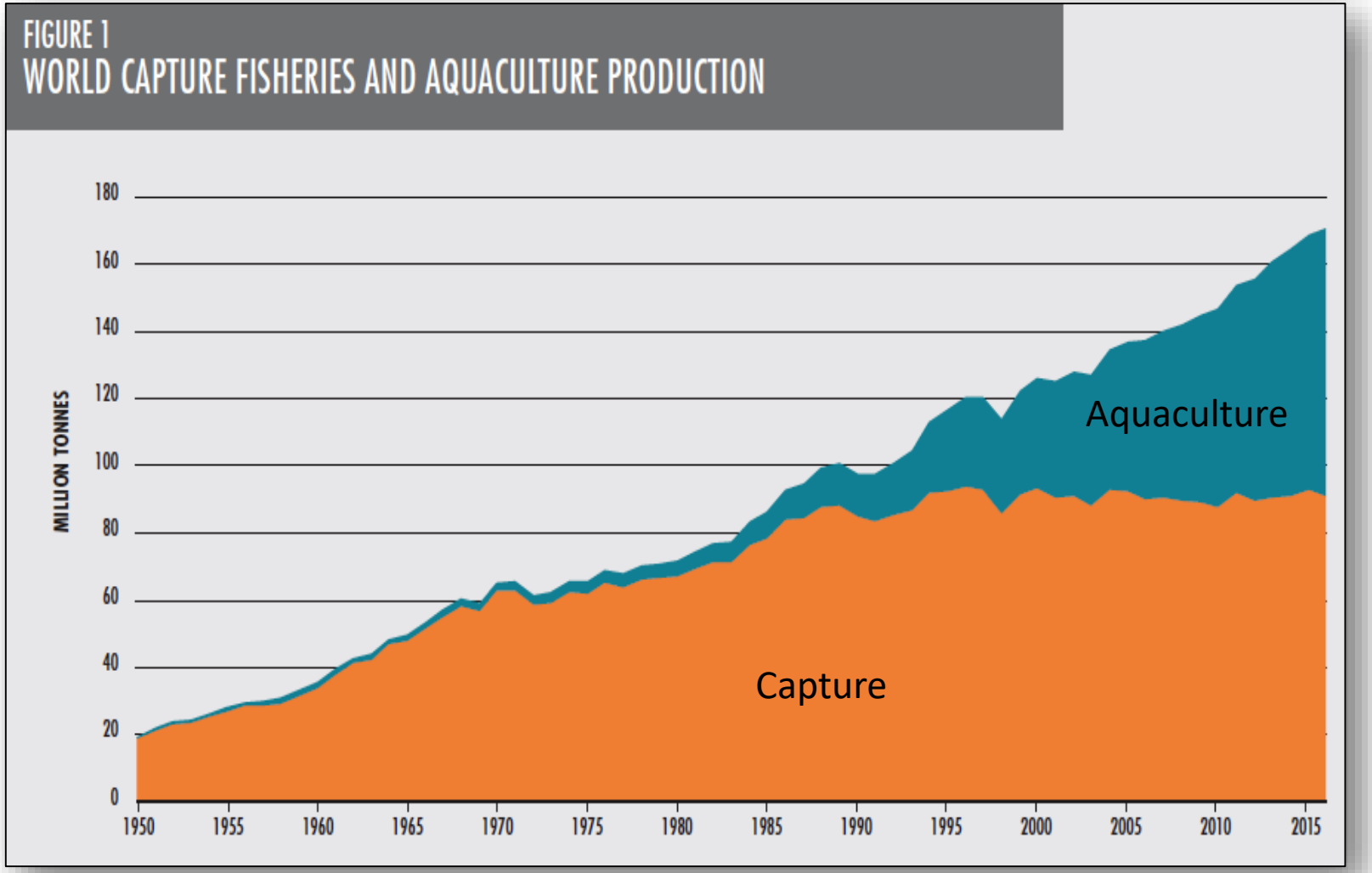
Global Total Fish Production



Note: Excludes aquatic mammals, crocodiles, alligators and caimans, seaweeds and other aquatic plants

- In 2016, reached an all-time high of 171 million tonnes
- 88 % utilized for direct human consumption

Owing to:

- Stable capture fisheries production,
- Reduced wastage and
- Growth of **Aquaculture**

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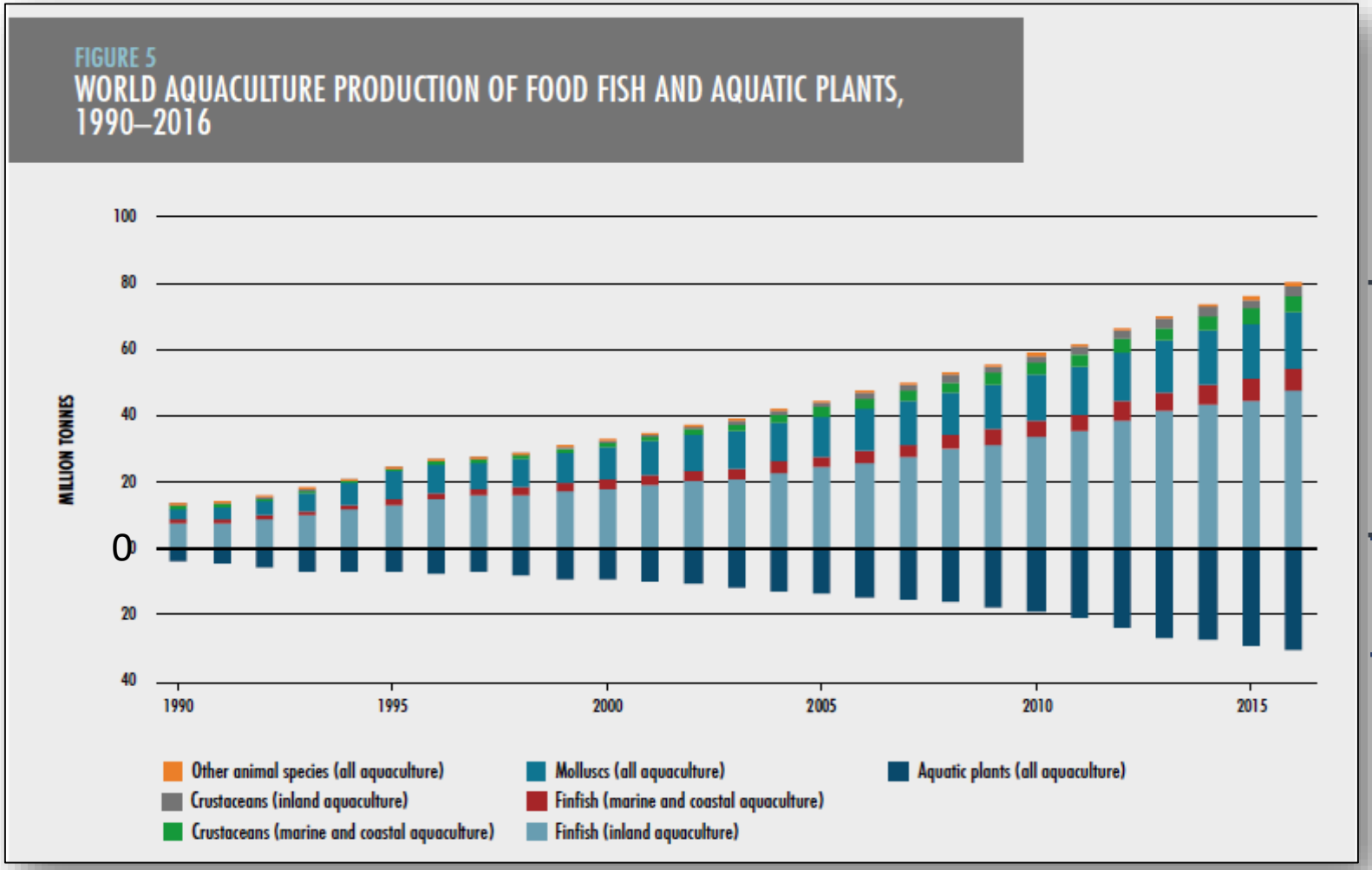
Global Aquaculture Production



In 2016:

80 million tonnes of food fish

(53% of total food fish)

30 million tonnes of aquatic plants

5.8 percent annual growth rate during 2001-2016

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Food and agricultural systems are facing an unprecedented confluence of challenges

Natural resources are over-exploited, degraded, and their productivity declines

- water scarcity and pollution
- land degradation,
- deforestation
- biodiversity and ecosystem services losses,
- overfishing and IUU fishing.

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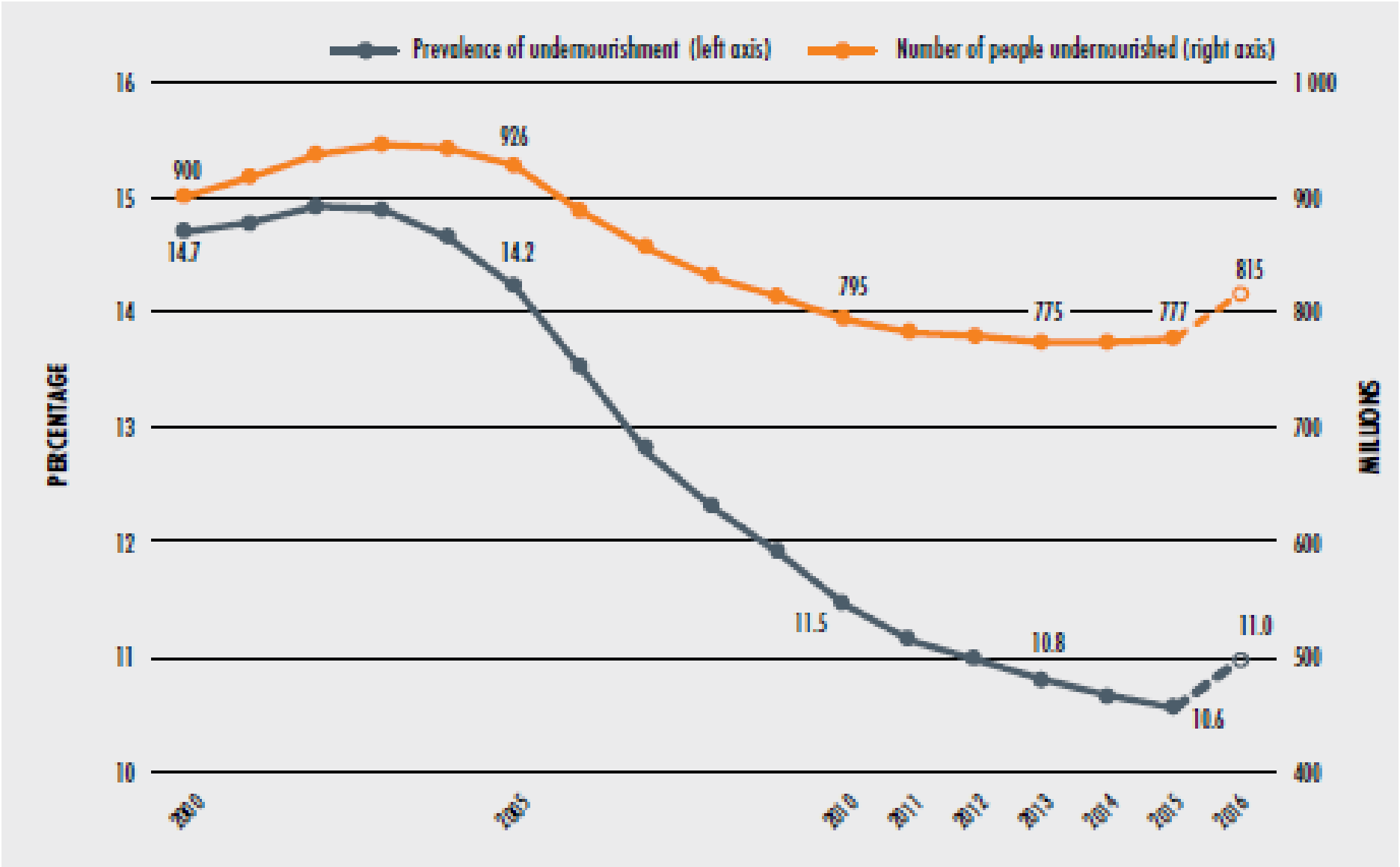
Hungry World



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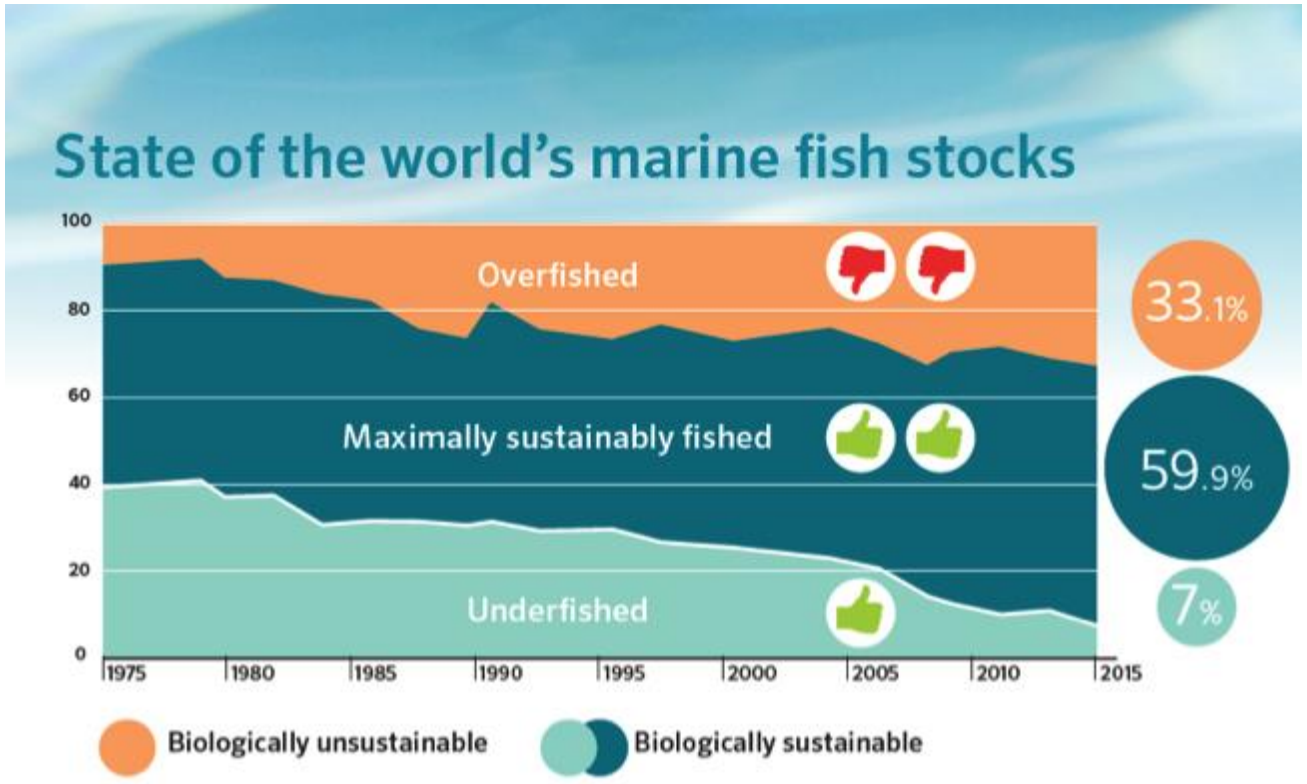
Status of Fishery Resources



Continues to show worrying trends:

Stocks fished within biologically sustainable levels decreased from 90.0 in 1974 to 66.9 percent in 2015

The global picture masks signs of recovery in the developed world

The sustainability divide between developed and developing countries constitutes a major challenge to achieving SDG14.4

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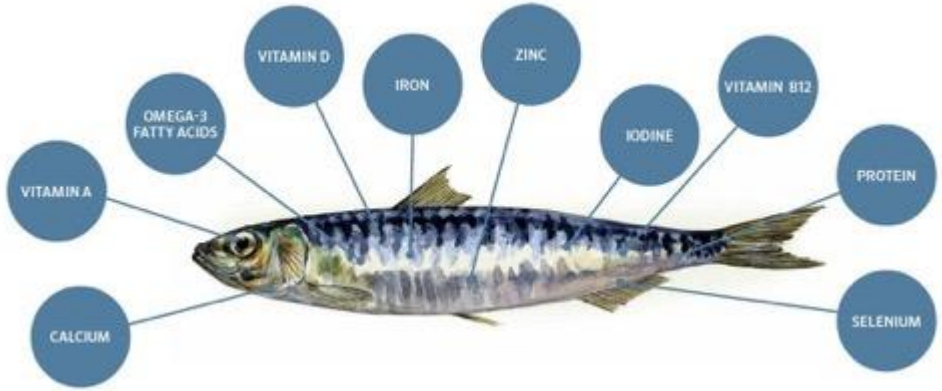
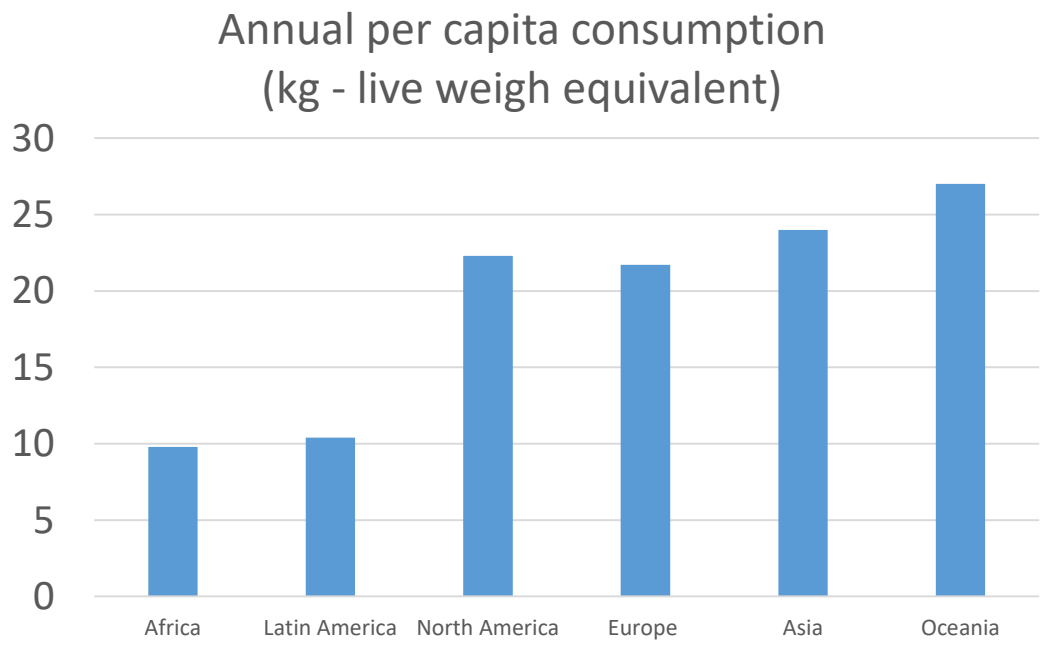
Fish = Food + Livelihoods + Trade





- Fish account for about 17% of animal protein consumed by the global population
- 12% of world population's livelihood depend on fish (200 million jobs along value chain)
- 54% of fish exports worth 80 billion USD from developing countries

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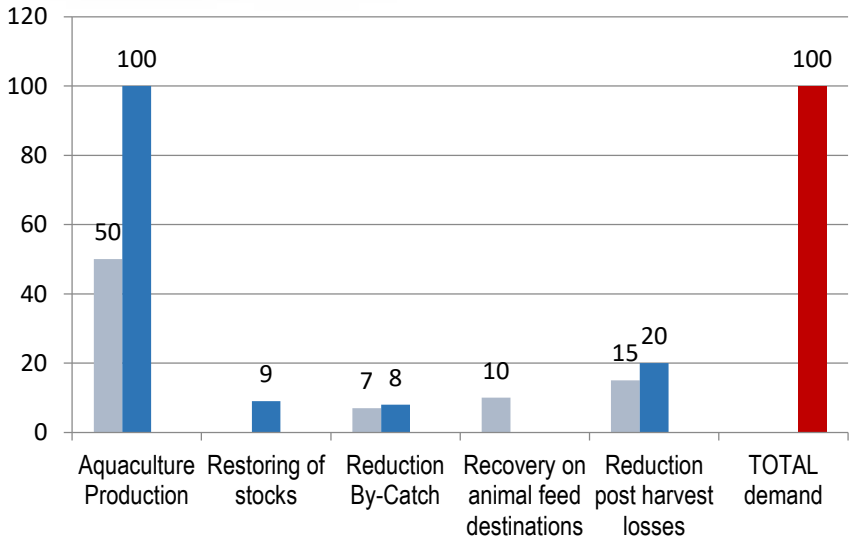
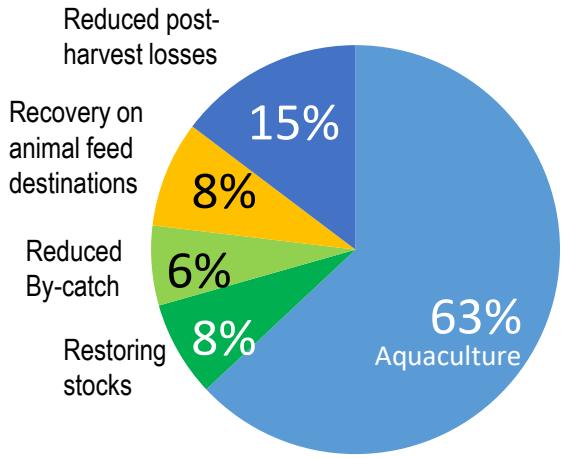
Prospects 2050 - Sector Contributions to Global Growth in Fish Demand (FAO Blue Growth Initiative)

"By 2050 we need 50% more food than we produce today to meet the demand of the population"





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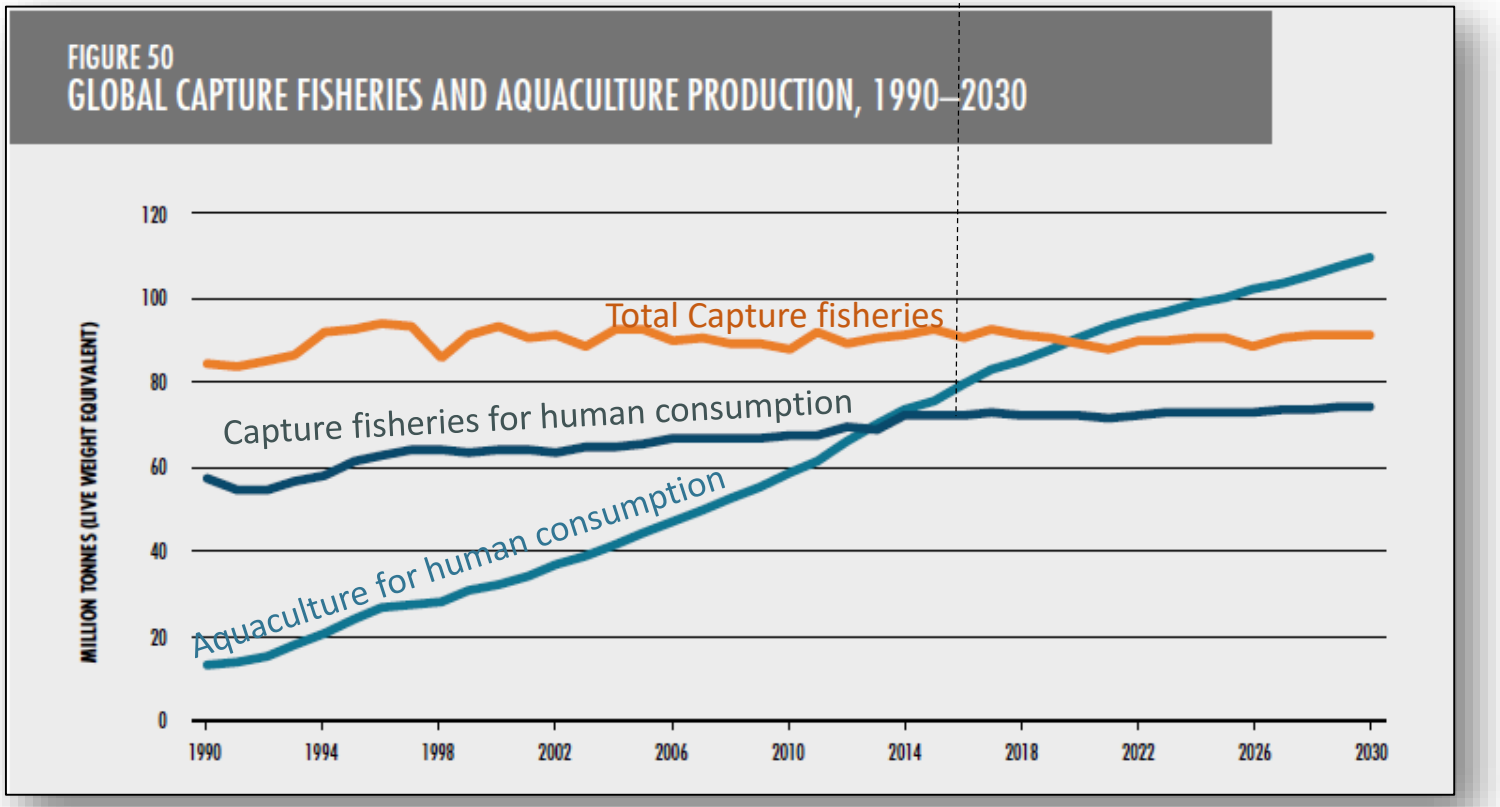
Outlook to 2030 – Projections for Fisheries, Aquaculture and Markets

Average Fish consumption 20.2 kg / capita in 2015



- World fish production, consumption and trade are expected to increase.
- Expanding world aquaculture production is anticipated to fill the supply–demand gap.
- This growth rate will slow down over time.
- Prices will all increase in nominal terms while declining in real terms, although remaining high.
- Food fish supply will increase in all regions, while per capita fish consumption is expected to decline in Africa, which raises food security concerns.

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Aquaculture is dynamic and complex!

About **580** species cultured:

362 finfishes (including hybrids)

104 molluscs, **62** crustaceans,

6 frogs and reptiles,

9 aquatic invertebrates, and

37 aquatic plants

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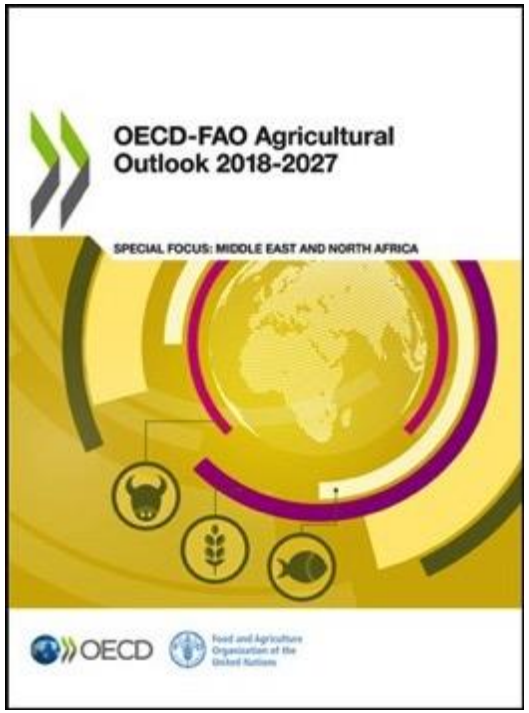
Top 12 aquaculture producers

Country	Quantity (million tonnes)	Value (USD)
1. China	49.2 million tonnes	USD 144.7 billion
2. India	5.7 million tonnes	USD 10.6 billion
3. Indonesia	5.0 million tonnes	USD 9 .0 billion
4. Vietnam	3.6 million tonnes	USD 9.3 billion
5. Bangladesh	2.2 million tonnes	USD 5.6 billion
6. Egypt	1.4 million tonnes	USD 1.8 billion
7. Norway	1.3 million tonnes	USD 7.6 billion
8. Chile	1.0 million tonnes	USD 7.9 billion
9. Myanmar	1.0 million tonnes	USD 2.0 billion
10. Thailand	0.96 million tonnes	USD 2.5 billion
11. Philippines	0.8 million tonnes	USD 1.8 billion
12. Japan	0.7 million tonnes	USD 4.0 billion



Chapter 8: Fish and seafood: Project highlights For production, these include issues related to …**transboundary issues with respect to … diseases and escapes**…

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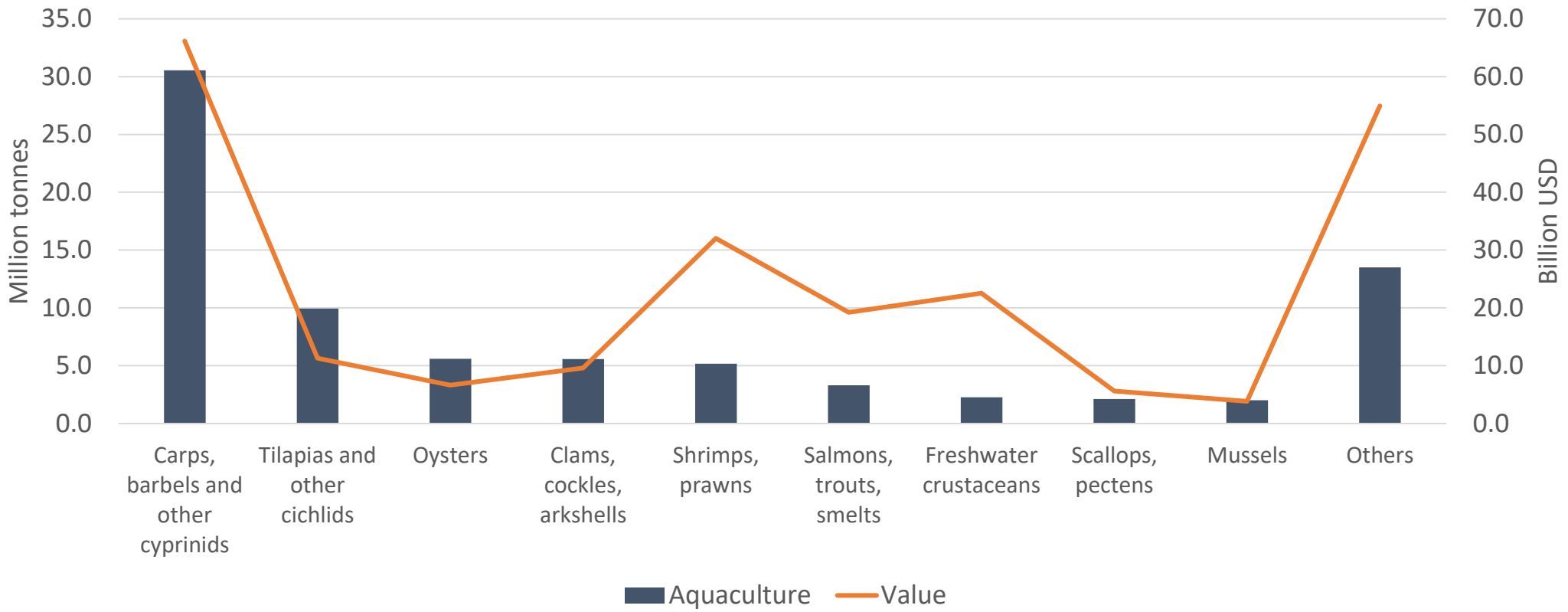
Aquaculture animal production (2016)
Main species groups



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Examples of chronology of disease/pathogen emergence in aquaculture

1970s

Gyrodactylus (salmon)

EUS (many finfish)

1980s

MBV (shrimp)

LCDV (tilapia)

ISA (salmon)

IPNV (tilapia)

Sea lice (salmon)

WSSV, HPV, IHHNV, BP (shrimp)

NHP (shrimp)

Many bacterial, fungi, parasitic diseases affecting all phases of production (hatchery, nursery, grow-out). Vaccines available for some bacterial diseases

1990s

YHV, TSV (shrimp)

KHV (carps/koi carp)

Vibriosis: *Vibrio (harveyi, damsela, alginolyticus, vulnificus, penaeicida)* **(shrimp)**

2000

MoV, IMNV, CMNV, LSNV (shrimp)

AHPND (shrimp)

TiLV (tilapia)

EHP *Enterocytozoon hepatopenaei* (shrimp)

VNN (tilapia and marine finfish)

Parasites

Bacteria

Virus Fungi

Current known distribution of AHPND and TiLV based on OIE notification, scientific reports, stakeholder information

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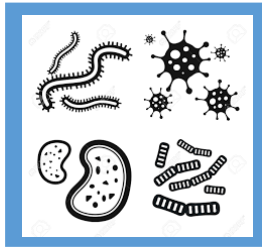
Diseases in aquaculture: examples from largest aquaculture-related epizootics

 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/many finfish species	1980s		?			
WSSV (1980s): virus/shrimp	mid-1990s		?			
KHV (late 1990s): virus/carp & tilapia	mid-2000	OIE: 2006	?			
AHPND (2009): bacteria/shrimp	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, diagnosis, surveillance, containment, training/education, research, trade disputes, etc.); compensation; alternatives)

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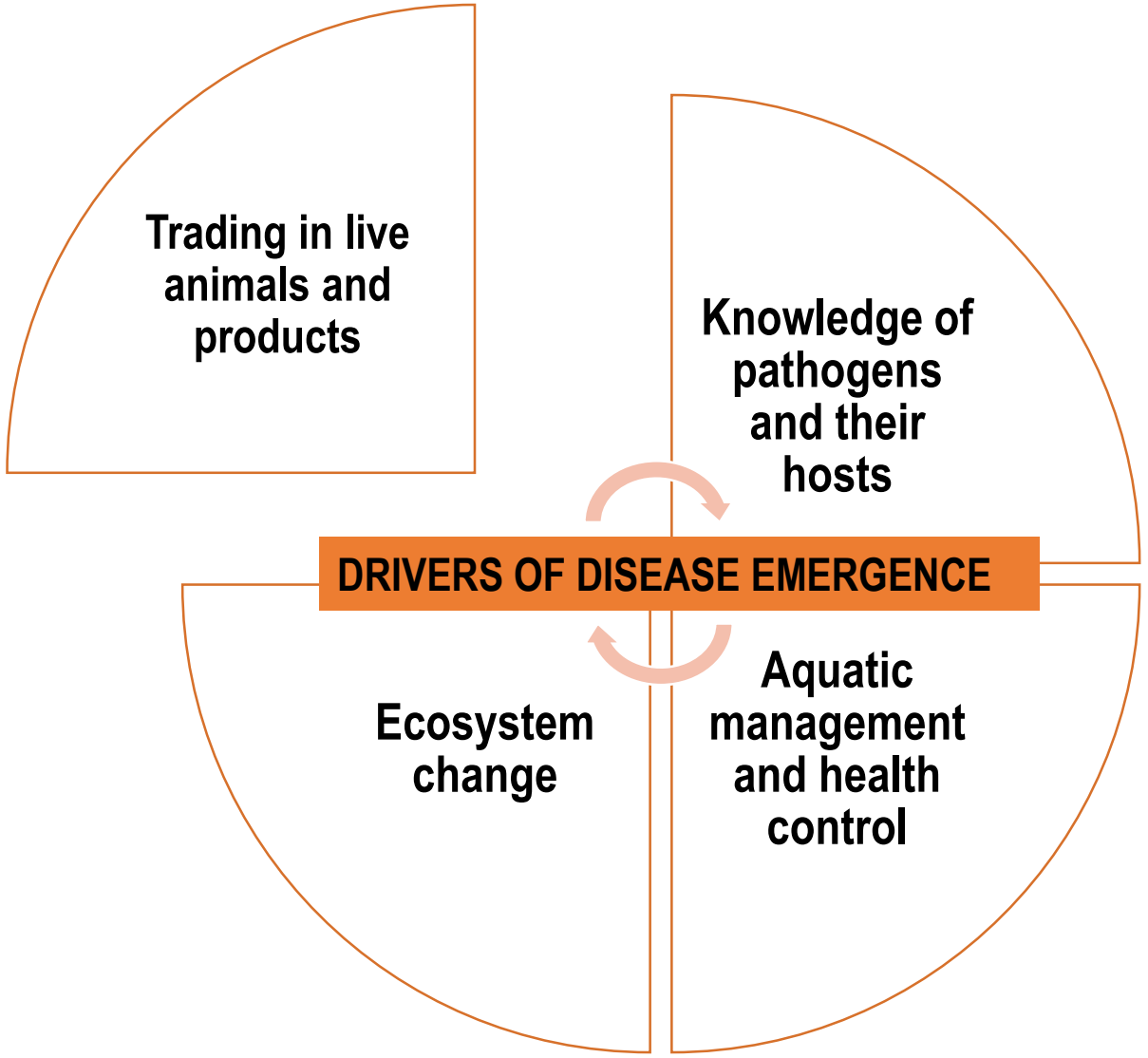
Main factor affecting emergent disease in aquaculture

- 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)



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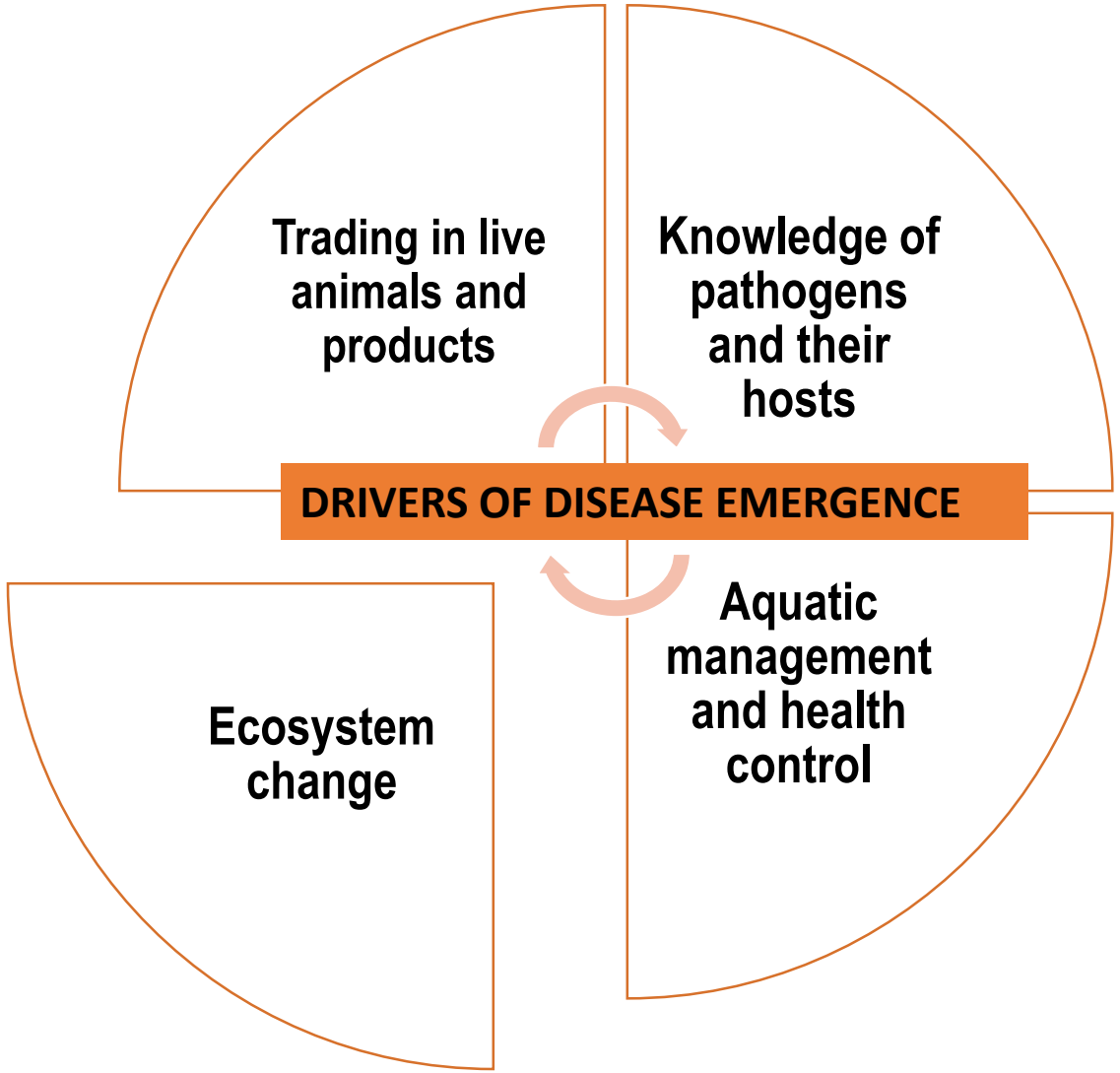
Drivers and factors of emergent disease in aquaculture

- 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)



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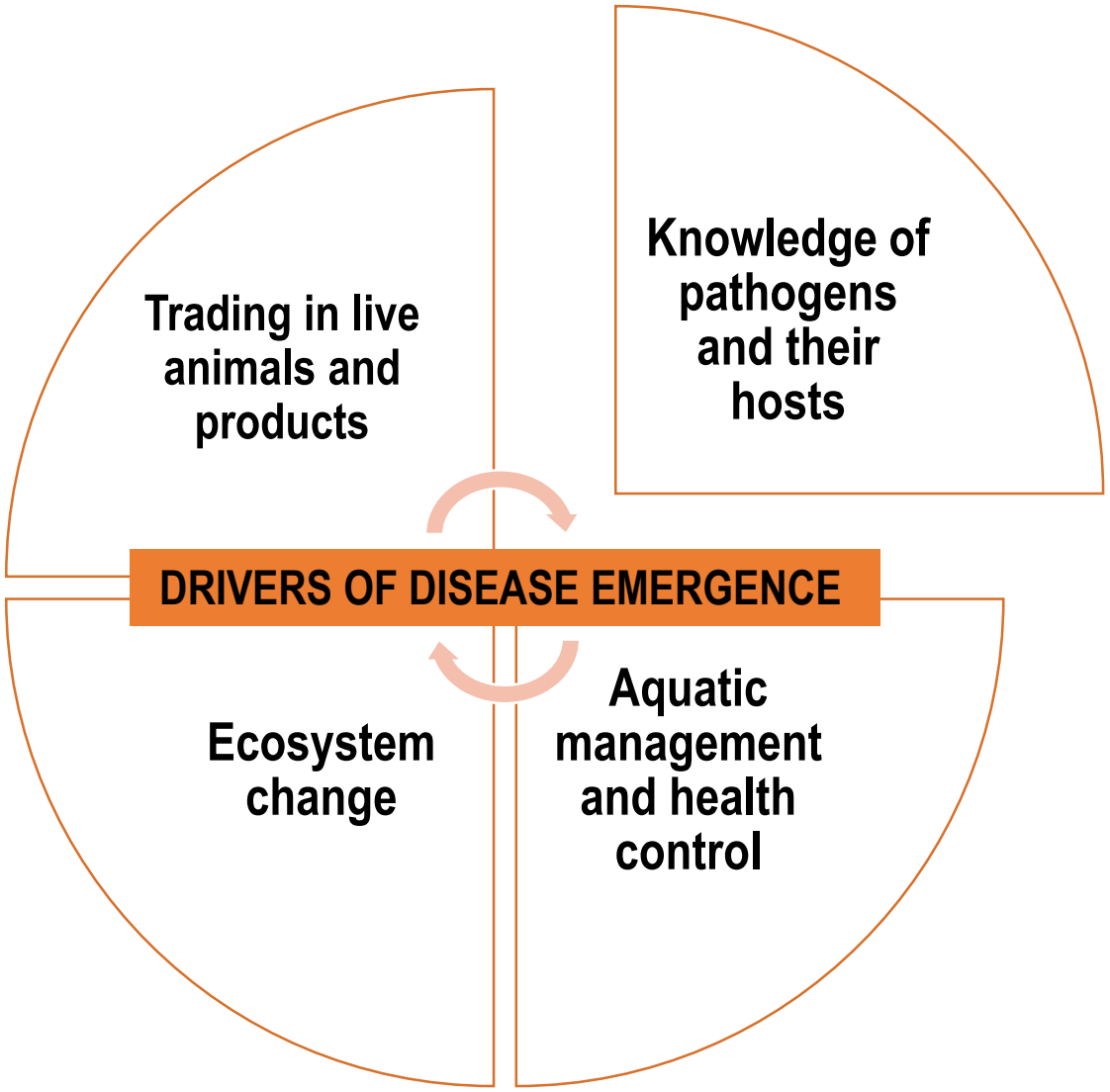
Drivers and factors of emergent disease in aquaculture



- 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
- Societal barriers to innovative genetics (e.g. GMO)

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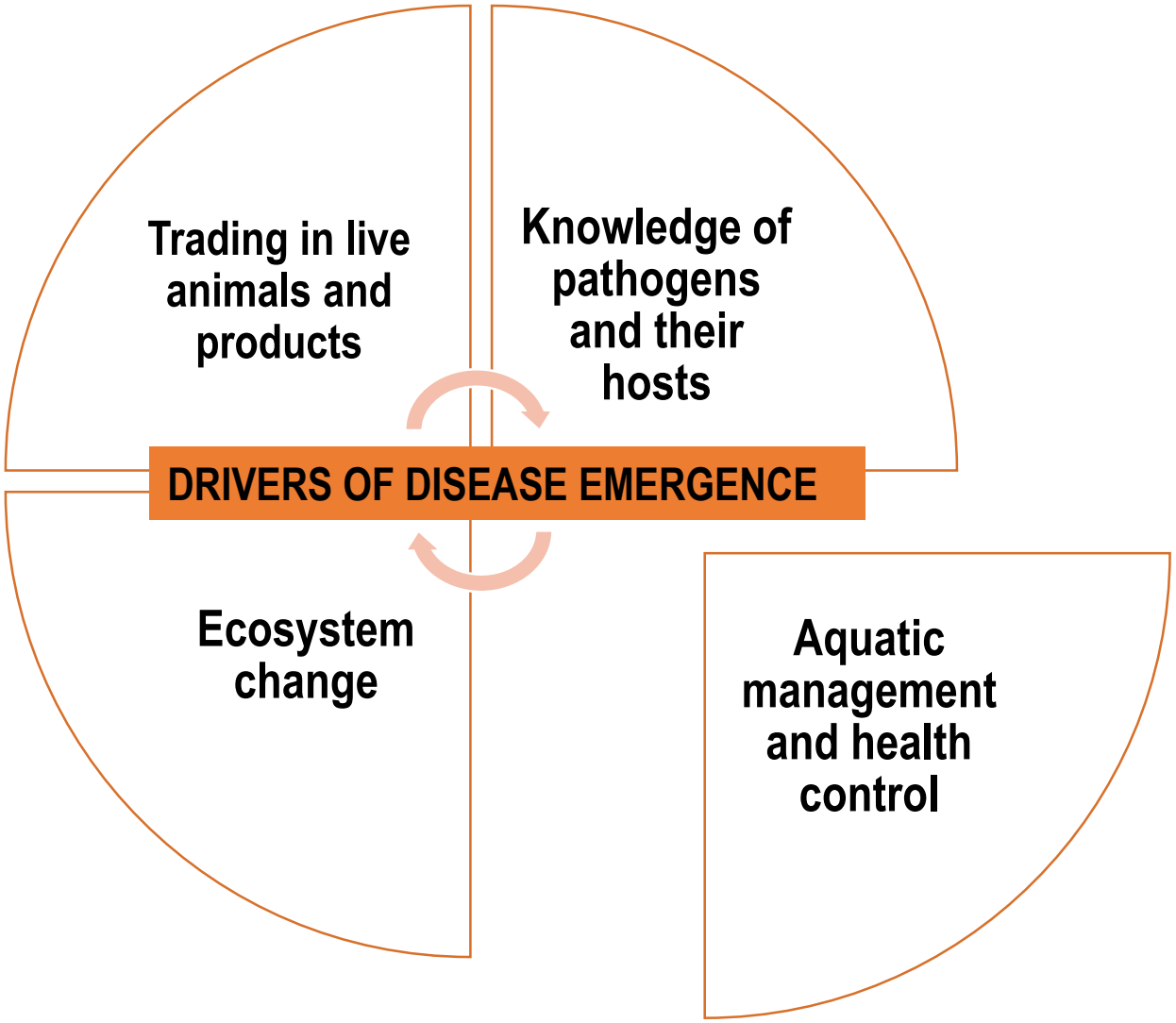
Drivers and factors of emergent disease in aquaculture



- 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

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

Participation: n=40

- Governments
- Regional and international intergovernmental organizations
- Industry
- Academe
- Development aid agencies and foundation

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What is a 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

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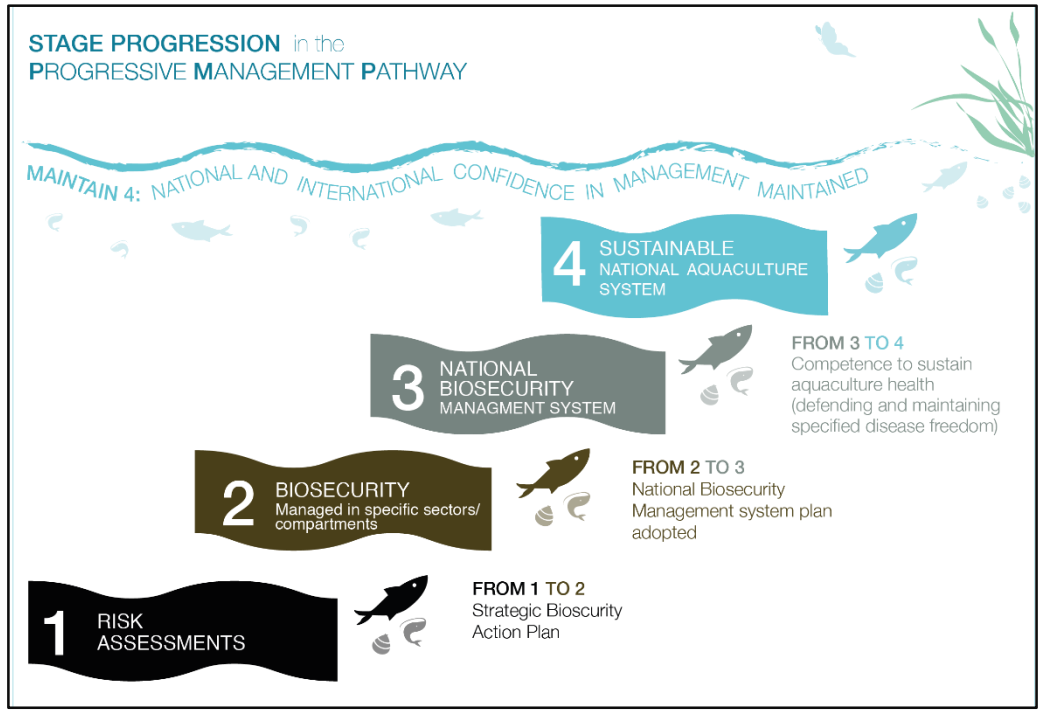
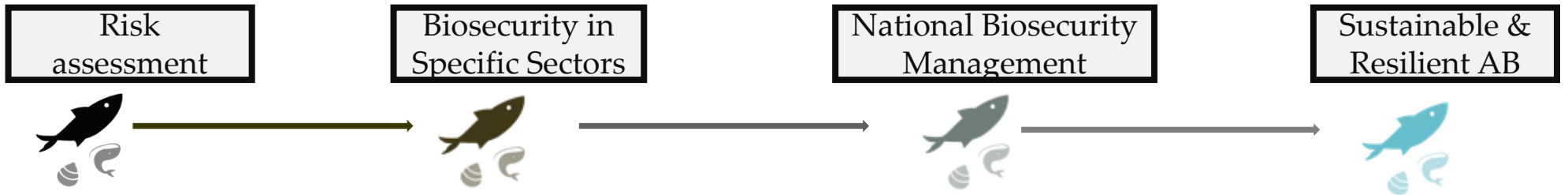
The Progressive Management Pathway (PMP) for Aquatic Biosecurity to support Sustainable and Resilient Aquaculture



4 stages
risk-based
collaborative
progressive

- Builds on management capacity
- Bottom-up and top-down approaches
- Strong stakeholder involvement & promotes risk management at producer level as part of national approach
- able to generate early warning information from monitoring and surveillance activities contributing to OIE notification
- At national level or targeted geographically
- Evidence-based and transparent assessment
- Fast-track system



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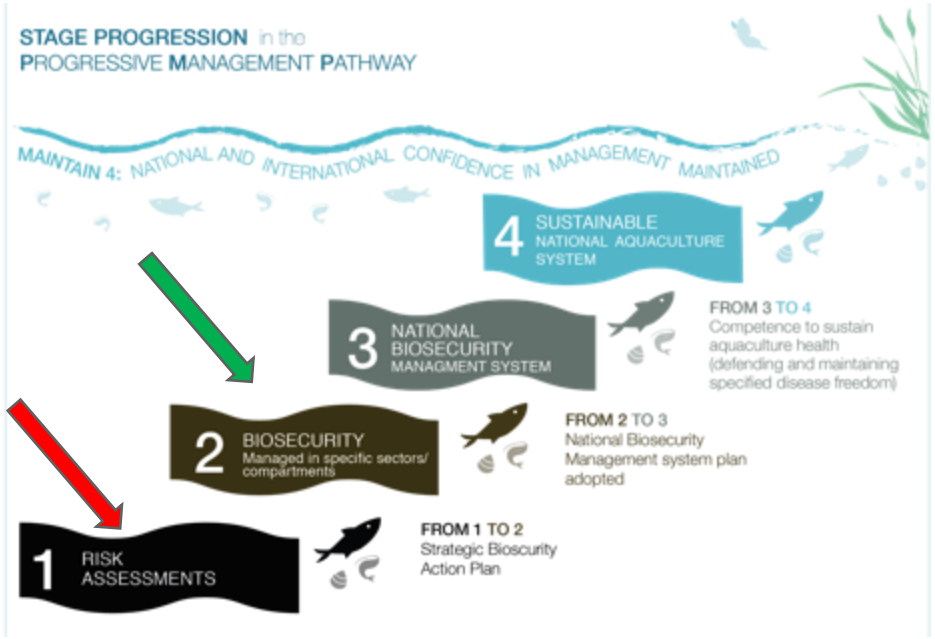
The Progressive Management Pathway (PMP) for Aquatic Biosecurity to support Sustainable and Resilient Aquaculture



Stages 1 and 2

PMP Stage 1 focus -

- **National strategy** that has confidence and support of the **stakeholders** (private and public) and common agreement on a long term vision
- **Principal hazards** and **risks** that affect aquaculture health and production: exotic, endemic, emerging diseases (known and unknown); map risks and gaps, identify negative impact on ecosystem
- **Strategic Biosecurity Action Plan** which will be the 'gateway pass' to enter **Stage 2**

PMP Stage 2 focus -

- **Implementation** of a **Biosecurity Action Plan** in **specific sectors/compartments**
- **Co-management** is expected to continue and strengthen the implementation and the improvements
- Should this stage move forward additional biosecurity efforts at ports and borders must be included
- Countries will need: **evidence** Strategic Biosecurity Action Plan implementation, & **commitment** through a National Biosecurity Management System in order to enter **Stage 3**

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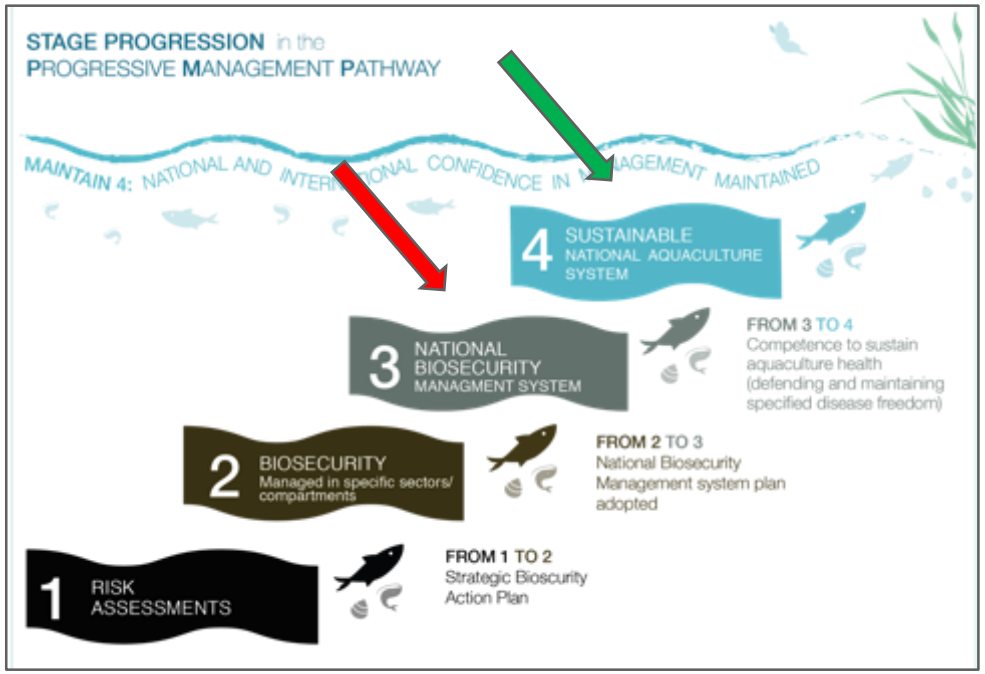
The Progressive Management Pathway (PMP) for Aquatic Biosecurity to support Sustainable and Resilient Aquaculture



Stages 3 and 4

PMP Stage 3 focus -

- Zoning, restrictions of movement and reporting of any disease/emerging problems through constant surveillance should be in place
- Once the management system is found to be capable to sustain the Aquaculture health by defending and maintaining specific disease freedom it can move forward to **Stage 4**

PMP Stage 4 focus

- End stage - Achievement of a Sustainable and Resilient National Aquaculture System acquired through the capacity to maintain confidence, biosecurity system, emergency preparedness and preventive measures
- All these activities must be coordinated and maintained, otherwise a 'downgrading' of the PMP status may result

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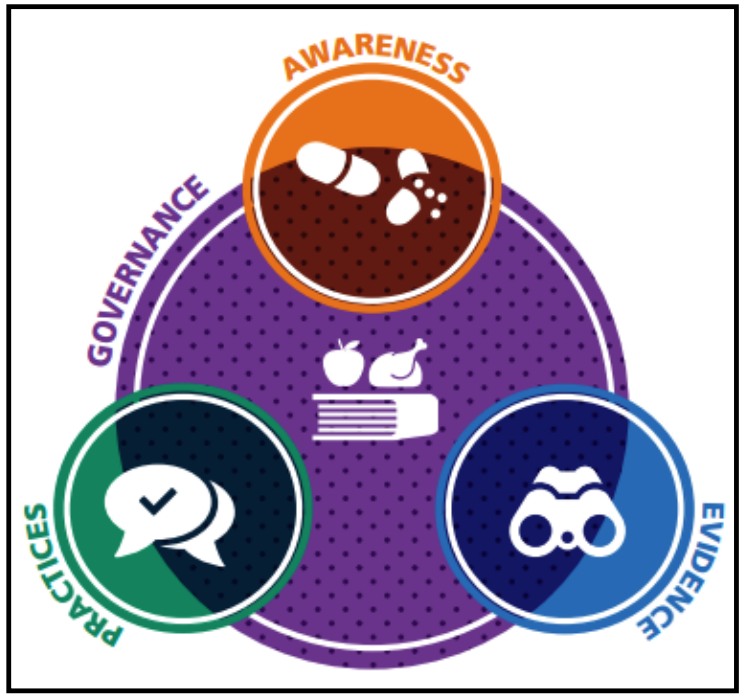
Antimicrobial resistance (AMR)



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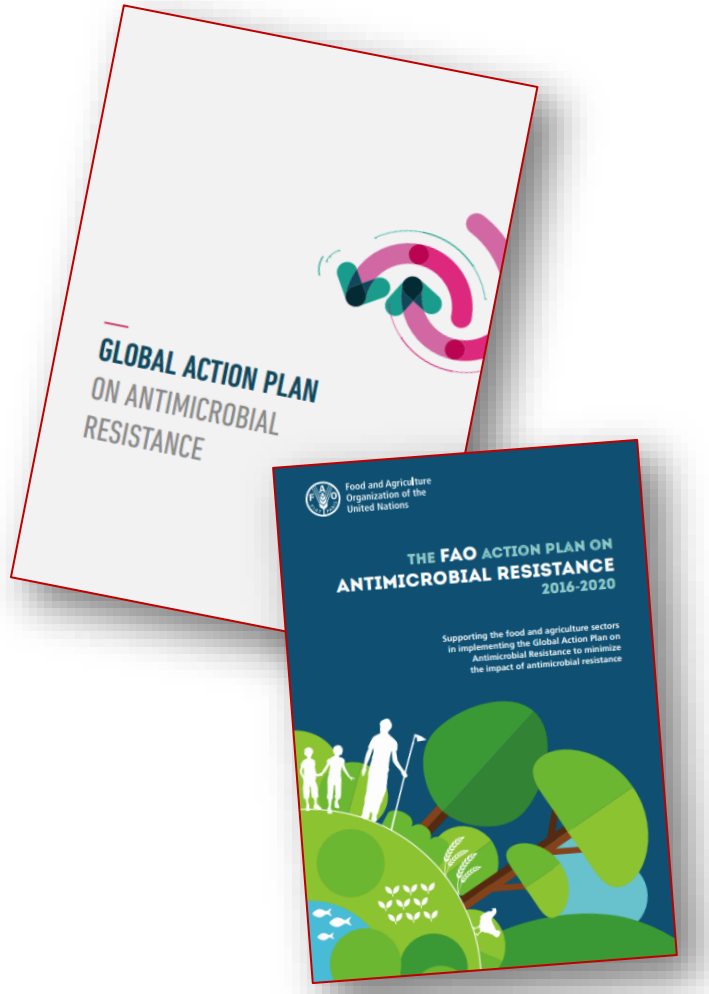
Antimicrobial Resistance (AMR): not a stand-alone issue

- 68th World Health Assembly (May 2015)
  - Adoption of the Global Action Plan (GAP) on AMR (FAO and OIE contribution)
- 83rd World Assembly of the OIE Delegates (May 2015)
  - Adoption of the Resolution No. 26 on AMR
- 39th Food and Agriculture Organization (FAO) Conference (June 2015)
  - Adoption of the Resolution 4/2015 on AMR
- 71st UN General Assembly (UNGA) - High Level Meeting on AMR (September 2016)
  - Political Declaration



One Health collaboration

UNGA called upon the Tripartite (and other intergovernmental organizations), to support the development and implementation of national action plans and AMR activities at the national, regional and global levels

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Global leader for food and agriculture

WORLD ORGANISATION FOR ANIMAL HEALTH

Global leader for animal health and welfare standards

World Health Organization

Global leader for human health

Awareness, Evidence, Governance, Best practice

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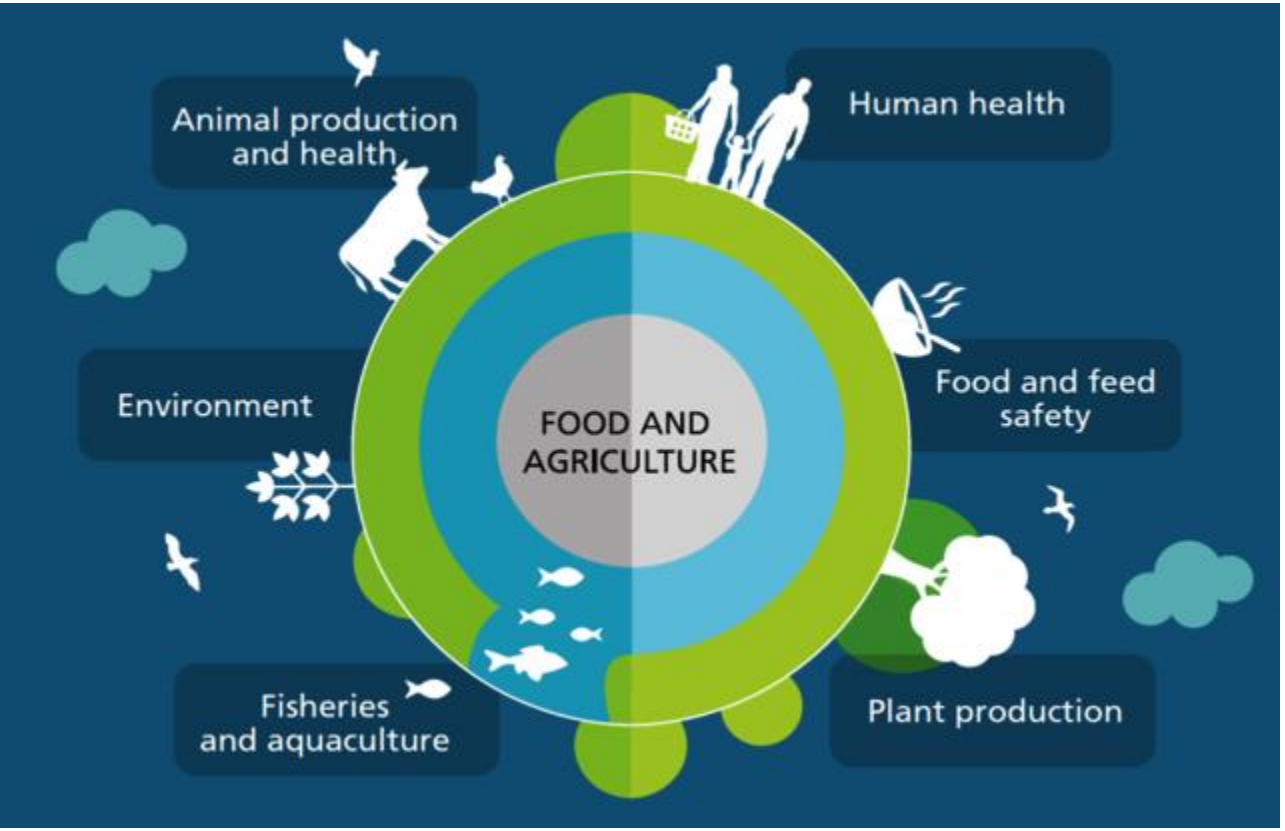

14 sectors

- Finfish
- Crustaceans
- Mollusks
- Dairy
- Beef
- Sheep, mutton and lamb
- Goat
- Swine
- Poultry – layers
- Poultry – broilers
- Turkey
- Rabbit
- Fruit
- Crops
  - Legumes
  - Grains
  - …

Very complex interface: different productions systems and sectors involved: aquatic, terrestrial, environment.

- Smallholder farms
- Medium commercial operators – local markets
- Intensive, large commercial entities – national and international scope

One Health at FAO

Inter-departmental Working Group chaired by FAO CVO

Multidisciplinary expertise: animal health, livestock and production, food and feed safety, plant health and production, **fisheries and aquaculture**, legislative contexts, etc.) - needed to address a cross-sectoral issue such as AMR.

Each of these aspects were considered in developing the FAO Action Plan (in support of Global Action Plan on AMR) and implementation at national and regional levels.

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FAO advocacy and tools in aquaculture biosecurity and AMR

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Tools and advocacy to support responsible and prudent use of antimicrobials in aquaculture and reduce AMR targeting Competent Authorities

Aquaculture Biosecurity including AMR is being proposed as an Agenda during the 10th Session of COFI/SCA (August 2019, Norway)

Side Event during the FAO Committee on Fisheries (COFI) SubCommiittee on Aquaculture 9th Session (October 2017, Rome)

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- Aquaculture Biosecurity (and AMR) a priority for the work of COFI/SCA and Department of Fisheries and Aquaculture
- CCRF Technical Guidelines: Prudent and Responsible Use of Veterinary Medicines
- Responsible management of bacterial diseases in aquaculture

Other documents in preparation

- Performance of antimicrobial susceptibility testing programmes relevant to aquaculture and aquaculture products
- Review of alternatives to antimicrobials in aquaculture (vaccines, phage therapy, quorum sensing, prebiotics, probiotics, plant therapy)
- Fisheries and Aquaculture Technical Paper on Understanding AMR in Aquaculture (compendium of papers prepared by CA and experts presented during 3 regional AMR in aquaculture workshops in 2017
- Best practice guidance for carp, tilapia and shrimp

http://www.fao.org/fishery/nems/40929/en
http://www.fao.org/fishery/nems/40956/en
http://www.fao.org/fishery/nems/41001/ar

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Responsible management of bacterial diseases in aquaculture

Gram-negative bacteria		Gram-positive bacteria
Chapter 1	**INTRODUCTION**: Background, Objectives and Scope, Importance of Aquaculture, Health of Aquatic Animals, Guide for Users, Reference	
Chapter 2	**BACTERIAL DISEASES in AQUACULTURE**: **GENERAL CONSIDERATIONS**: Introduction, Bacterial Classification, Major Bacterial Diseases in Aquaculture, Pathogenesis of Bacterial Infection, Role of Diagnostics, Risk Factors, Reference	
Chapter 3	**BACTERIAL DISEASES in AQUACULTURE: PATHOGEN-SPECIFIC CONSIDERATIONS**: Gram-negative bacterial pathogens (n=6); Gram-positive bacterial pathogen (n=4): Each pathogen section contains Background information, causative agent, host, ecological factors, geographical distribution, clinical aspects, diagnostics, transmission, prevention, management (prevention), zoonotic potential, references	
Chapter 4	**PREVENTION AND MANAGEMENT**: Prevention (GAP, biosecurity, prebiotic, probiotic, immunostimulants, green water technology, vaccination); Management (treatment, alternatives to antimicrobials), reference	
Chapter 5	**PRUDENT USE**: (i) Correct diagnosis, etc.; administration; prophylactic, therapeutic, metaphylactic; medicated feeds (ii) AMU; (iii) AMR, (iv) reference	

regions

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Capacity building and advocacy to support responsible and prudent use of antimicrobials in aquaculture and reduce AMR targeting researchers, laboratory personnel, private sector, other service providers

FAO in Singapore to tackle Antimicrobial Resistance (AMR) in Aquaculture and Fisheries

13 ديسمبر / كانون الأول 2017

Prospectus and **presentations** can be downloaded **here**.

Some 45 delegates from FAO member countries (China, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Viet Nam), resource experts (China, Croatia, Hong Kong SAR, India, Ireland, the Netherlands, the Philippines, Sri Lanka, USA), organizations (MSD Pharma Singapore, NACA, SEAFDEC-AQD) and FAO officers tackle the challenges and key issues concerning AMR in the aquatic sector.

AMR occurs when microorganisms (e.g. bacteria, fungi, viruses and parasites affecting humans, terrestrial & aquatic animals and plants) become resistant to antimicrobial agents, thus making infections or diseases caused by such microorganisms more difficult or impossible to treat. While antimicrobials play a critical role for ensuring health and productivity, their imprudent use and the associated emergence and spread of antimicrobial resistant microorganisms place everyone at great risk.

This final workshop (12-14 December 2017), of the FAO Project FMM/RAS/298/MUL, hosted by the Agri-Food and Veterinary Authority of Singapore, in collaboration with INFOFISH, provides an important platform to improve the scientific understanding of AMR, to share experiences in setting governance mechanisms to support national action plans on AMR (within One Health and tripartite mechanism), to continuously enhance knowledge on food fish safety hazards, disease prevention, correct diagnostics, disease management and best practice (good biosecurity and good aquaculture) and future actions and capacity development needs to address AMR.

Strengthening capacities, policies and national action plans on prudent and responsible use of antimicrobials in fisheries Workshop 2 (FAO Project FMM/RAS/298)

Malaysia, Putrajaya, 7 August 2017 - 9 August 2017

Further information: Reantaso, Melba (FIAA) (Melba.Reantaso@fao.org)

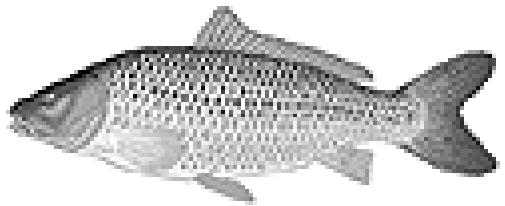
Reducing health risks from antimicrobial resistance (AMR)

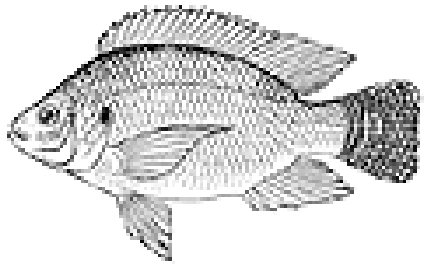
11 April 2017

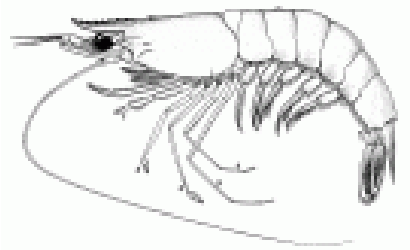
Food and Agriculture Organization of the United Nations

Tools for farmers: Best practice guidance

Best practice guidance for carp, tilapia and shrimp	
Know your fish	Maintain good husbandry
Know your pathogens	Manage stock health
Know your systems	Respect food safety
Know your contamination pathways	Respect environment
Source healthy seeds	Implement biosecurity plan including rapid response to disease emergencies







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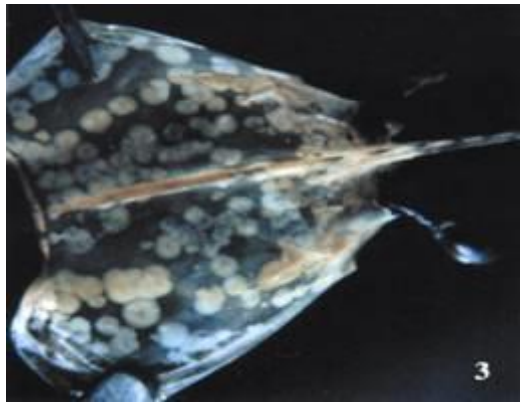
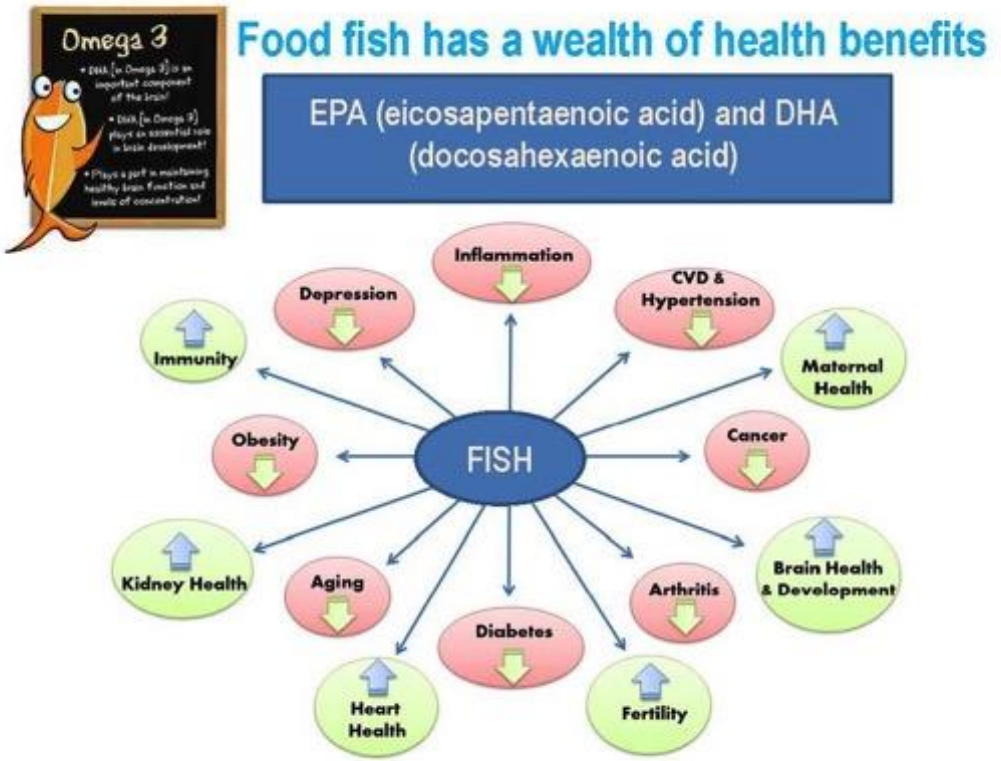


Key messages

Food and Agriculture Organization of the United Nations

Key message 1: Food fish has a wealth of health benefits

Aquaculture has huge potential to contribute to food and nutrition security: challenged with biosecurity issues; good farming and biosecurity practices; special attention because we are aquatics (they can't see us; with respect to AMR, we may be contributing and/or a recipient).



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Key message 2: Putting farmers in the equation (esp. small-scale producers)

Disease costs are too high for small-scale sector to survive

Getting them involved and utilise their indigenous knowledge

Making them aware of the risks and helping them manage the risks at farm level

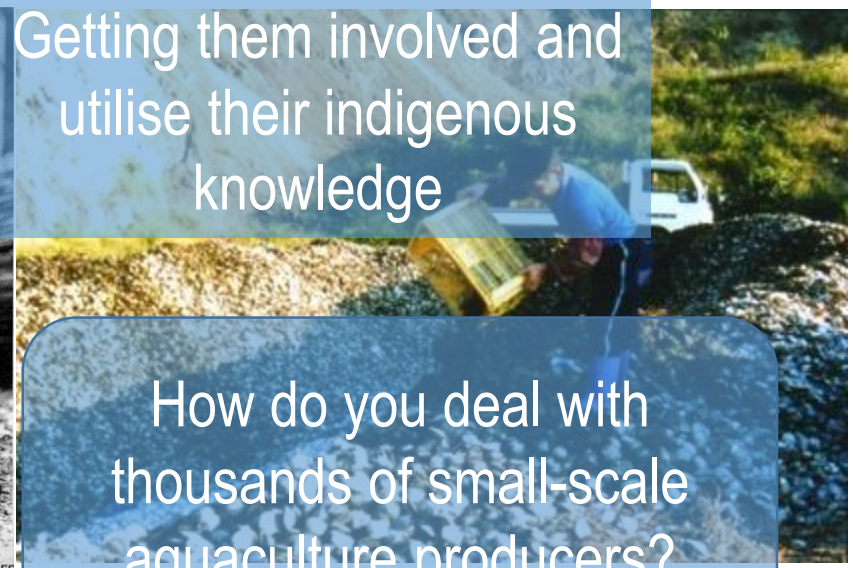
How do you deal with thousands of small-scale aquaculture producers?

Understanding their needs and expectations

Effective technologies and strategies which are accessible and affordable to the resource-poor small-scale sector

Provide feedback and updates

Important role of farmers



Farmers administer antibiotic treatment (tetracycline) with poor success.

Not only in the acknowledgement (for scientific presentations and papers!)

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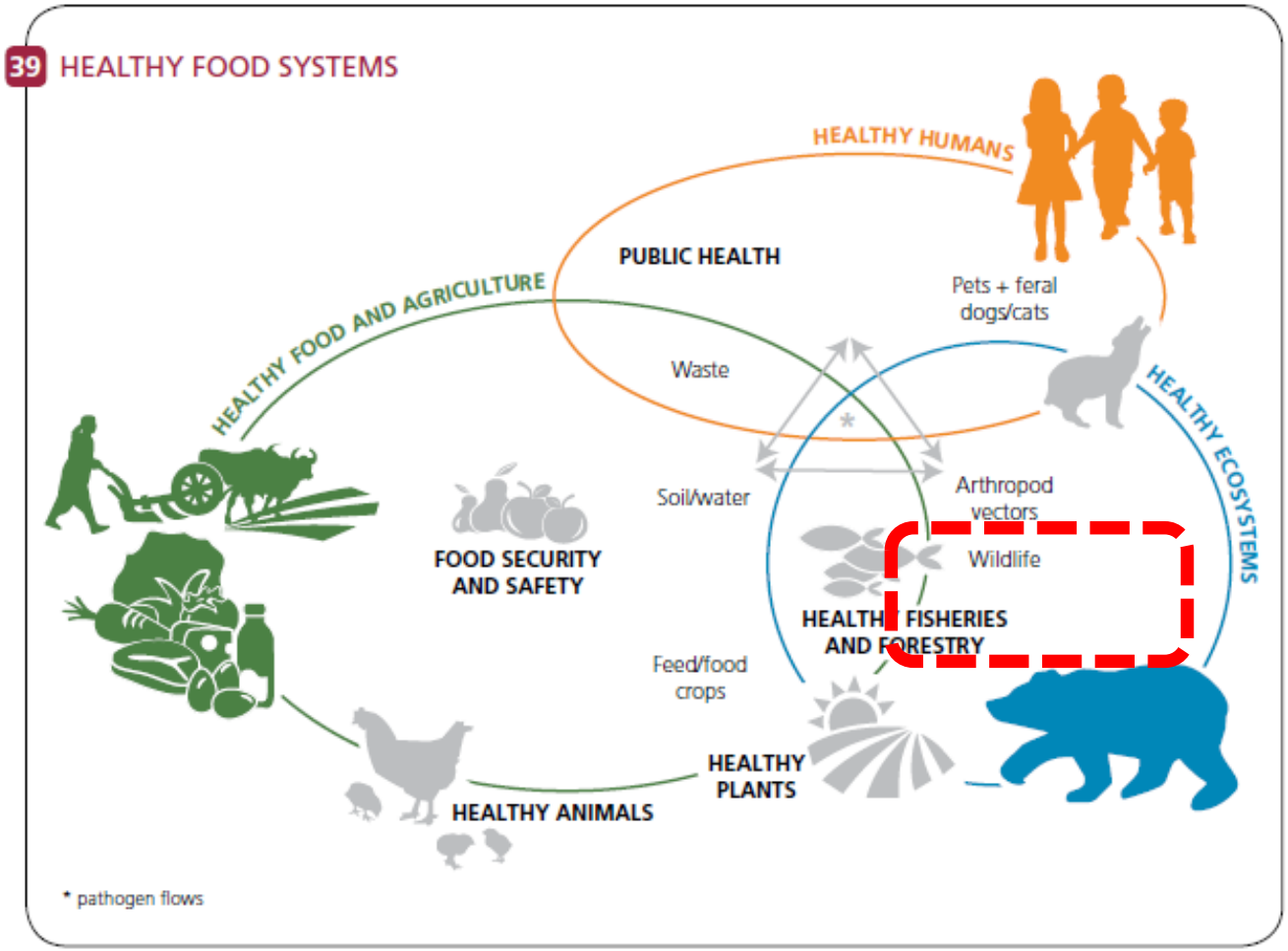
Key message 3: Better understanding, coordinated and integrated actions

- Aquaculture biosecurity and AMR is a complex problem and is driven by many interconnected factors.
- Single, isolated interventions have limited impact.
- Greater innovation and investment are required in research and development of new antimicrobials, vaccines, and diagnostic tools.
- Aquaculture producing countries need to have PMP/AB and develop the aquaculture component of country National Action Plans on AMR.
- We need better understanding of AMR in aquaculture before integration into One Health.



FAO expert meeting on Risk assessment of AMR in aquaculture, 26-29 November 2018, Palermo, Italy


THANK
YOU