



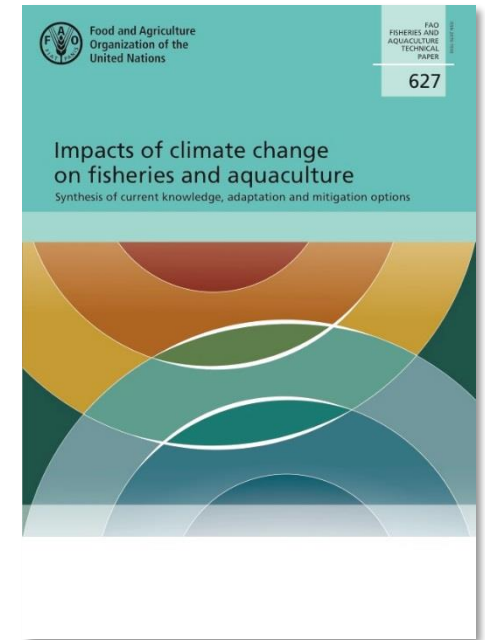
Food and Agriculture
Organization of the
United Nations

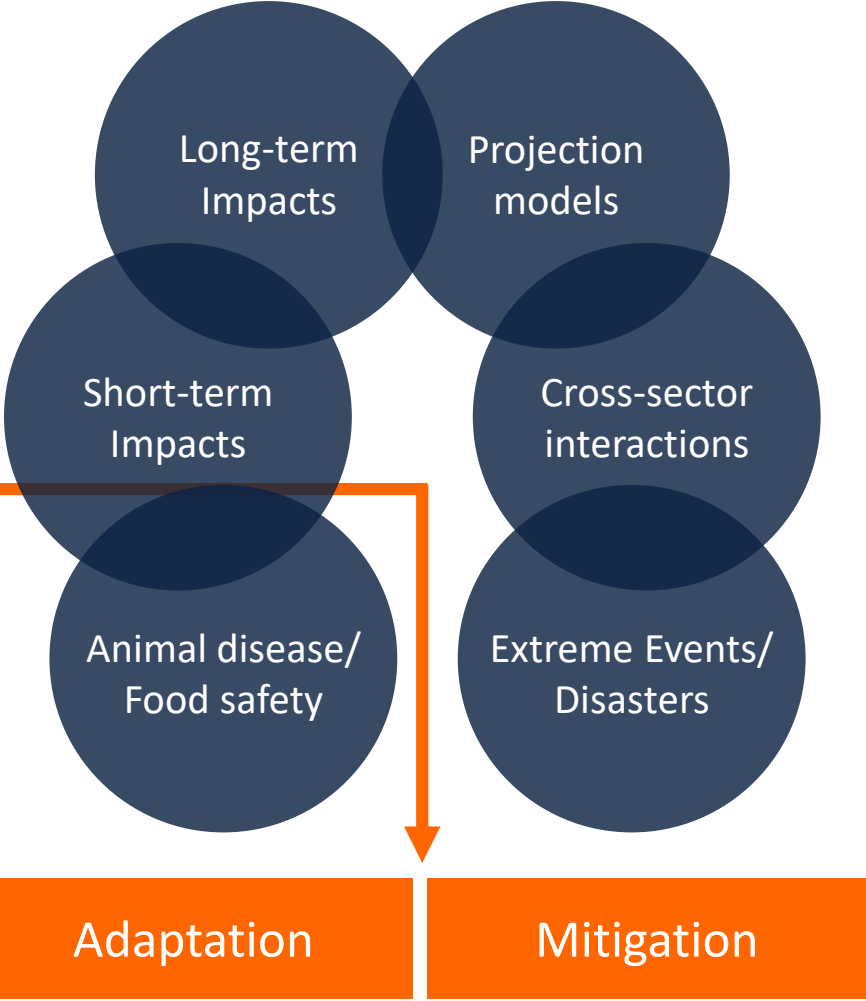
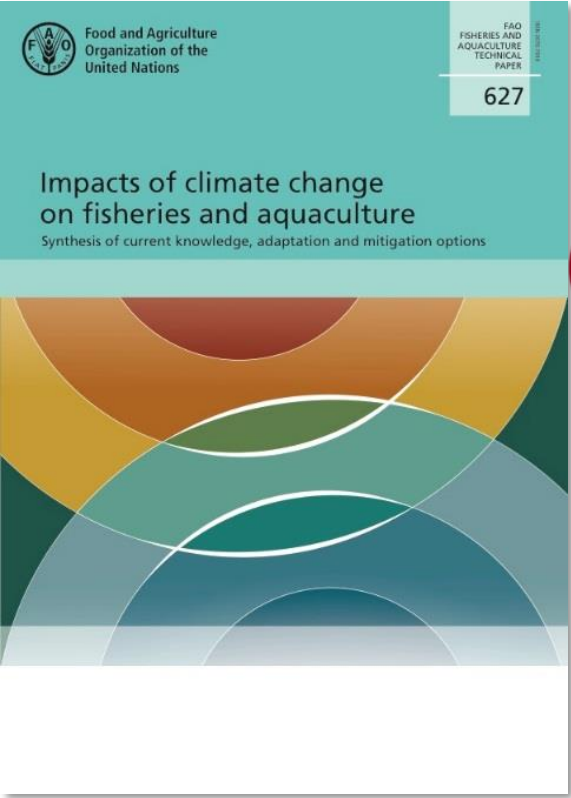


Aquatic food production in the context of climate change

Graham Mair, Jose Aguilar Manjarrez, Tarub Bahri

Fisheries and Aquaculture Policy and Resources Division, FAO





Why and What for?

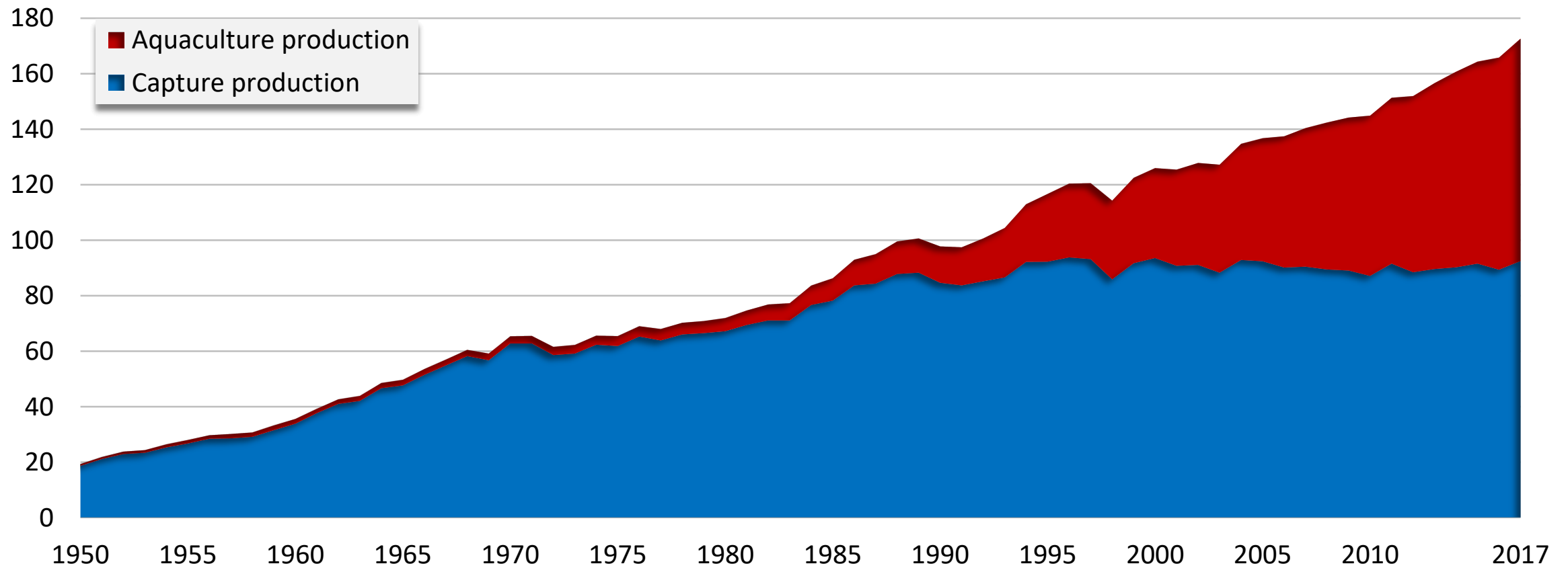


- © **2015 Paris Agreement** includes a long-term adaptation goal, *in a manner that does not threaten food production*, alongside mitigation goals
- © **89 Nationally Determined Contributions (NDCs)** include fisheries and aquaculture as a climate adaptation or mitigation priority, and need to be updated by 2020 with detailed activities matching ambition
- © This report provides up-to-date information on the disaggregated impacts of climate change in the sector, **to facilitate NDC implementation by countries and the development of National Adaptation Plans**



World capture fisheries and aquaculture production

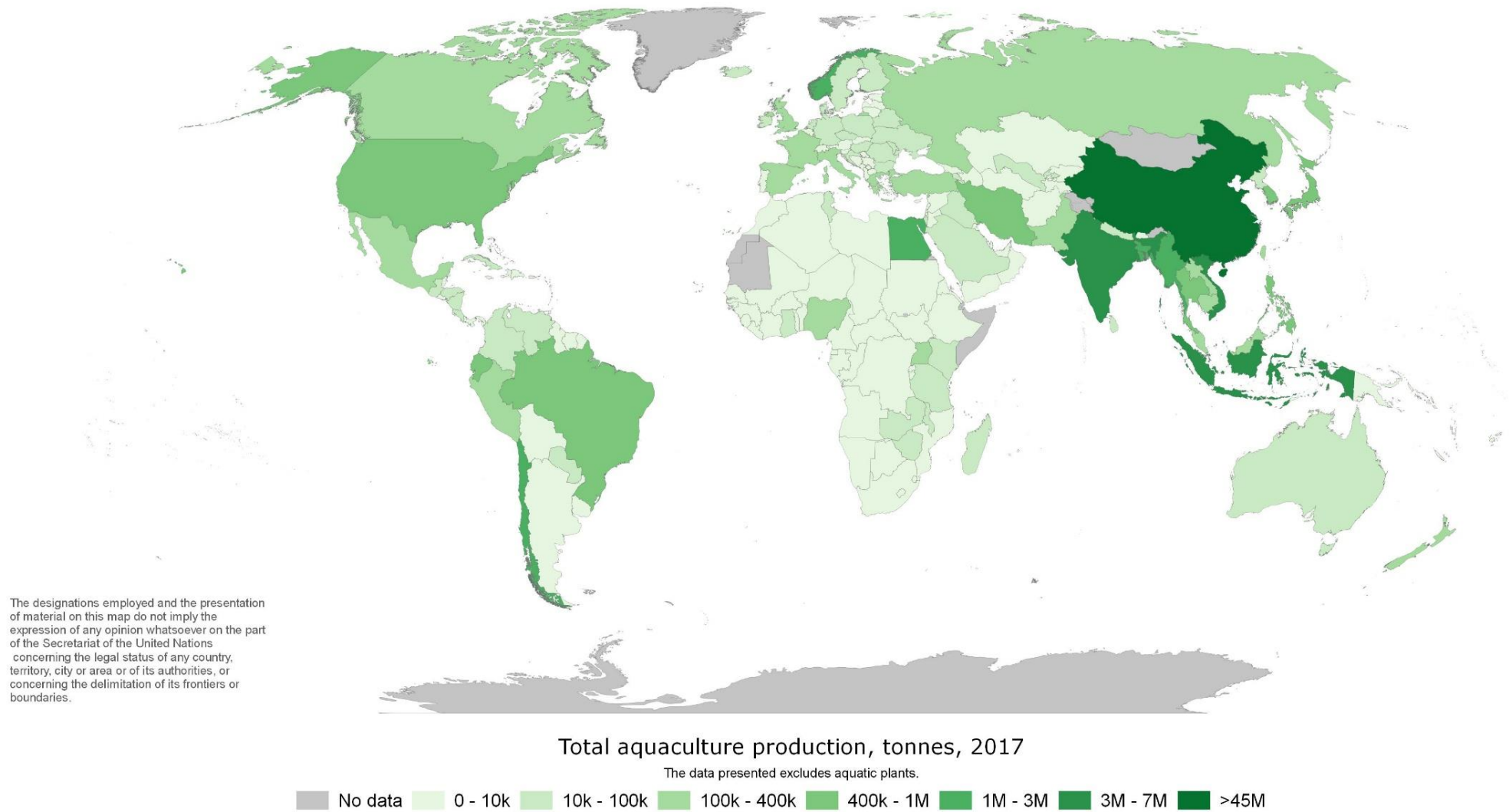
Million tonnes live weight



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

Source: FAO FishStat

Total aquaculture production - 2017



Source: FAO (data), OCHA (map)

Projection: Sphere Robinson (EPSG:53030)

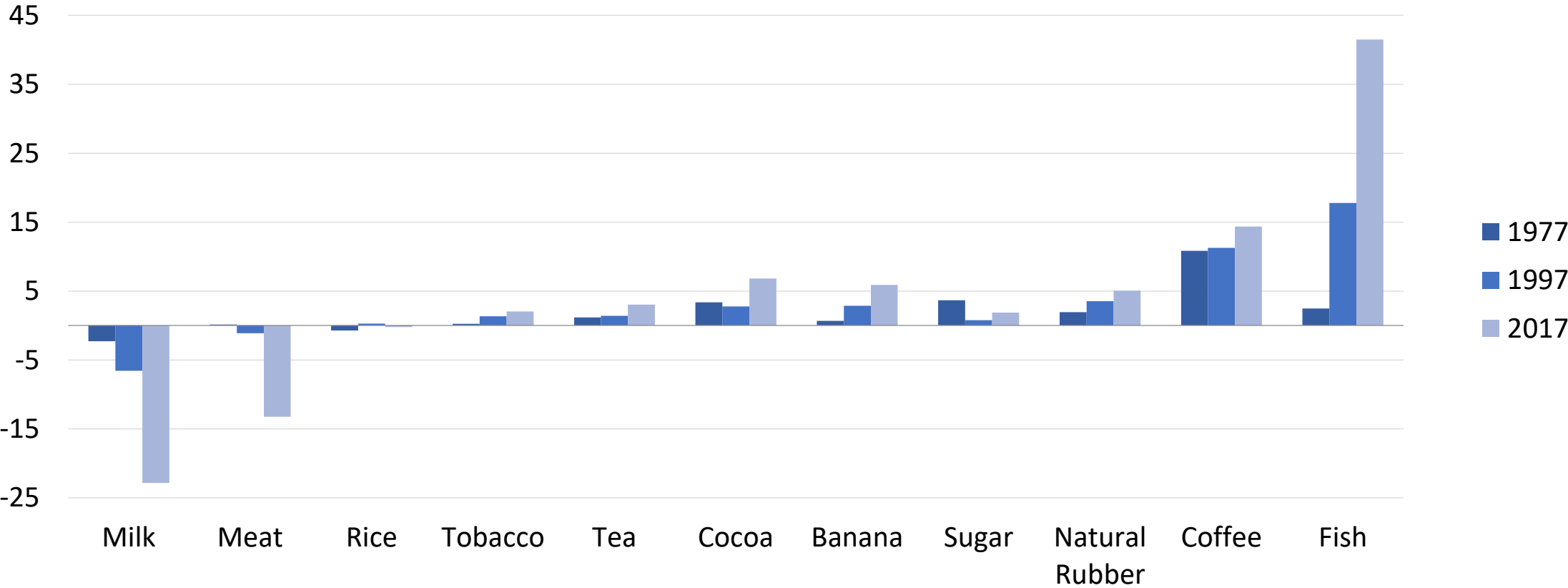
© FAO 2019

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

Source: FAO FishStat

Net-exports of selected agricultural commodities by developing countries

US\$ billions

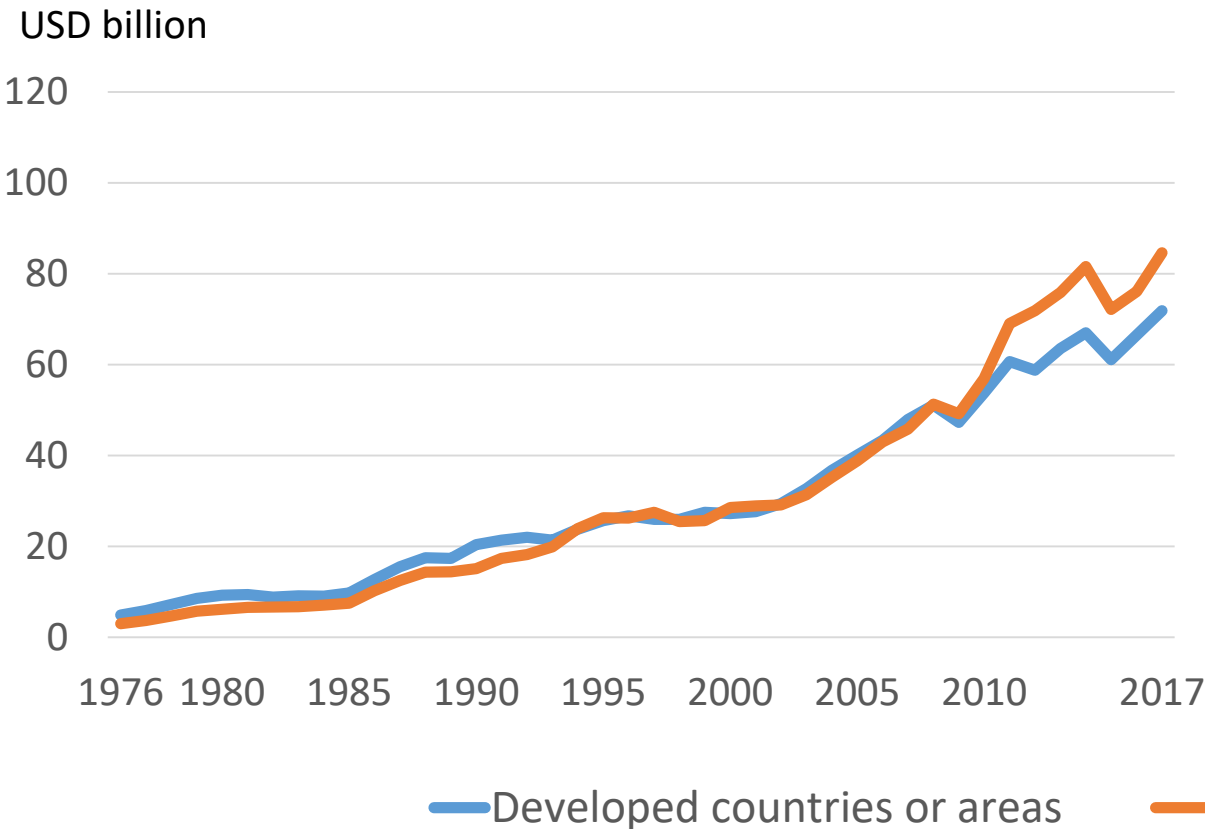


NOTE: The aggregate Fish excludes aquatic mammals, crocodiles, alligators and caimans, seaweeds and other aquatic plants

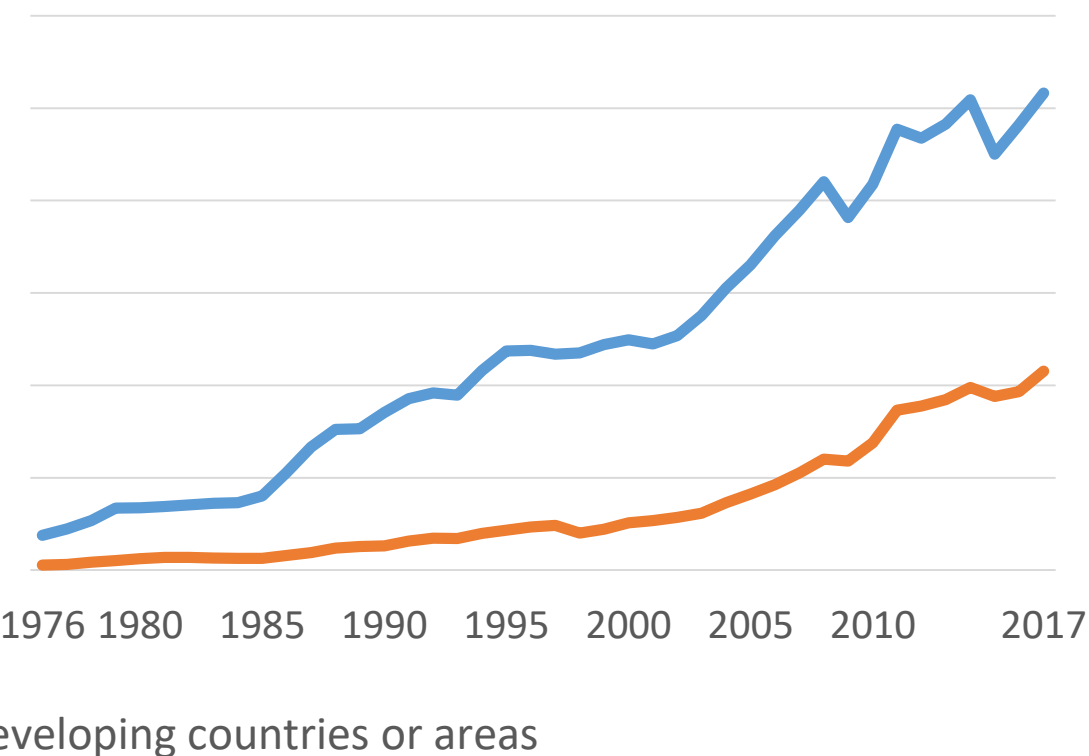
Source: FAO FishStat and FAOSTAT

Trade of fish and fish products

EXPORTS



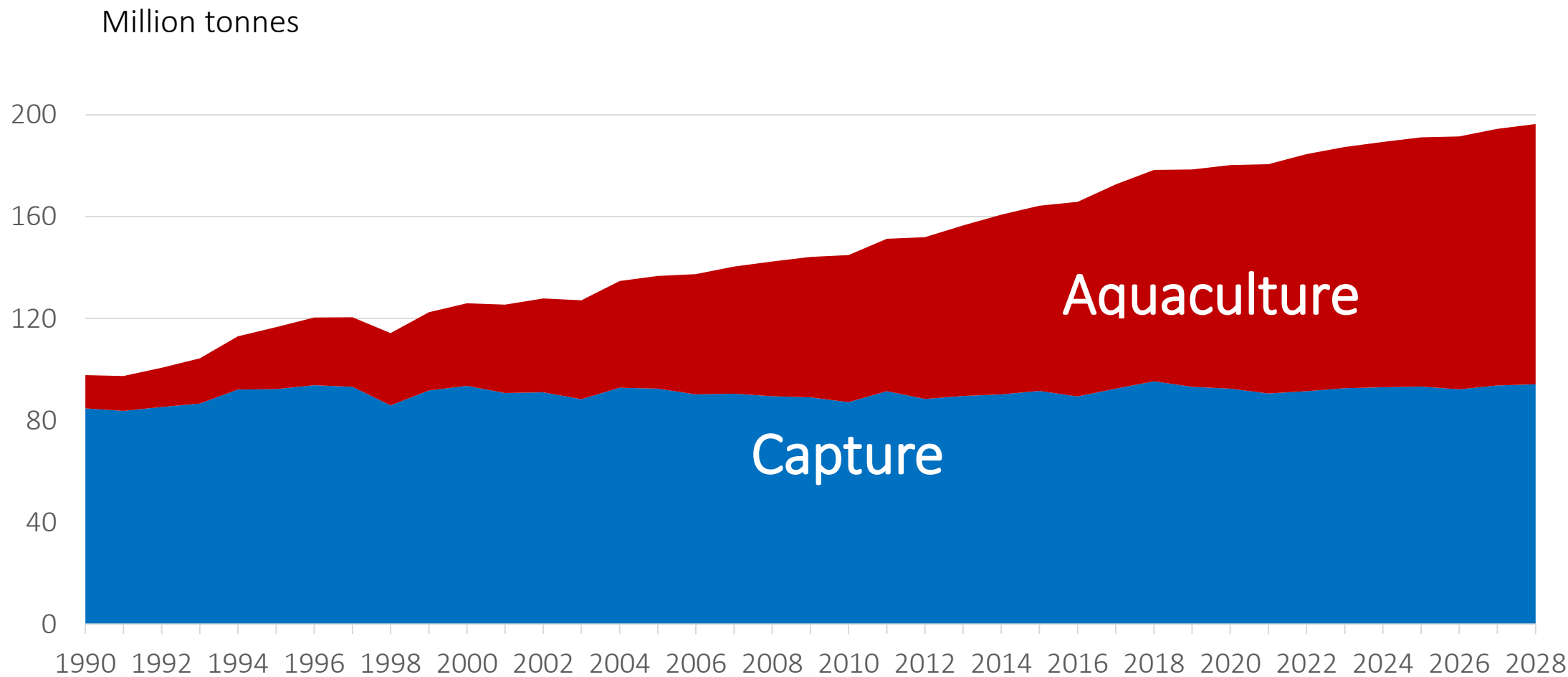
IMPORTS



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

Source: FAO FishStat

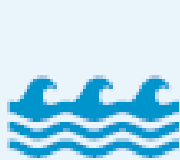
Outlook - World fishery and aquaculture production



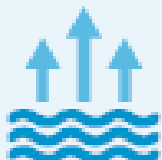
NOTE: Excludes aquatic mammals, crocodiles, alligators and caimans, seaweeds and other aquatic plants

Source: OECD-FAO Agricultural Outlook 2019-2028

BIOPHYSICAL CHANGES FROM GLOBAL WARMING



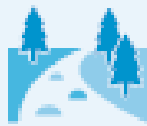
Ocean currents



Sea level rise



Rainfall



River flows



Lake levels



Thermal structure



Storm severity



Storm frequency



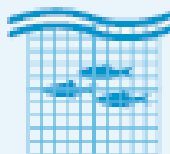
Acidification



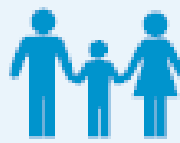
EFFECTS ON



Production ecology and biodiversity



Fishing, aquaculture and associated post-harvest operations



Communities and livelihoods



Wider society and economy



IMPACTS ON FISHERIES AND AQUACULTURE



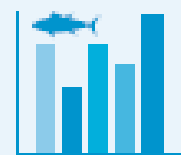
Species composition; Reduced production and yield; Increased yield variability; Diseases; Coral bleaching; Calcification; Distribution



Safety and security
Efficiency and costs
Infrastructure

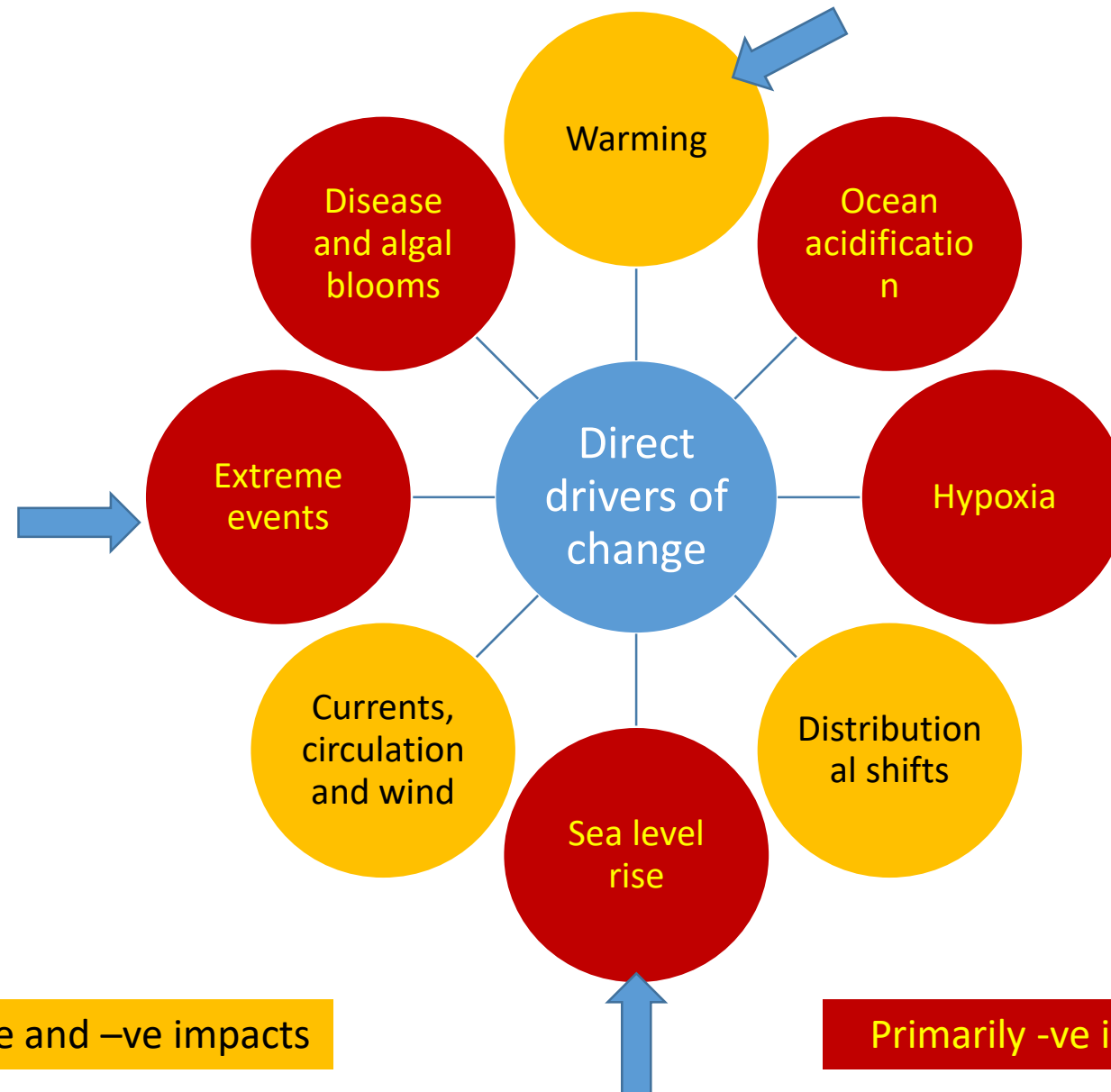


Loss/damage to assets
Risks to health and life
Mitigation, displacement, conflict



Market/trade impact
Water allocation
Floodplain and coastal defences

Direct impacts of climate change on aquaculture



Mix of +ve and -ve impacts

Primarily -ve impacts

Examples of impacts on aquaculture

Warming

- Increased growth rate & production efficiency (+)
- Increased sensitivity to other drivers, e.g . Pathogens (-)

Extreme events

- Supply of inputs or market access disrupted (-)
- Loss of infrastructure & livelihoods (-)

Sea level rise

- Saline intrusion may ↓growth, ↑increase mortality, ↑sensitivity (-)
- New opportunities for coastal aquaculture (+)

Adaptation examples

Warming

- Adjusting farm calendars
- Shifting farms to higher latitudes or cooler deeper offshore and inland areas
- Long-term planning

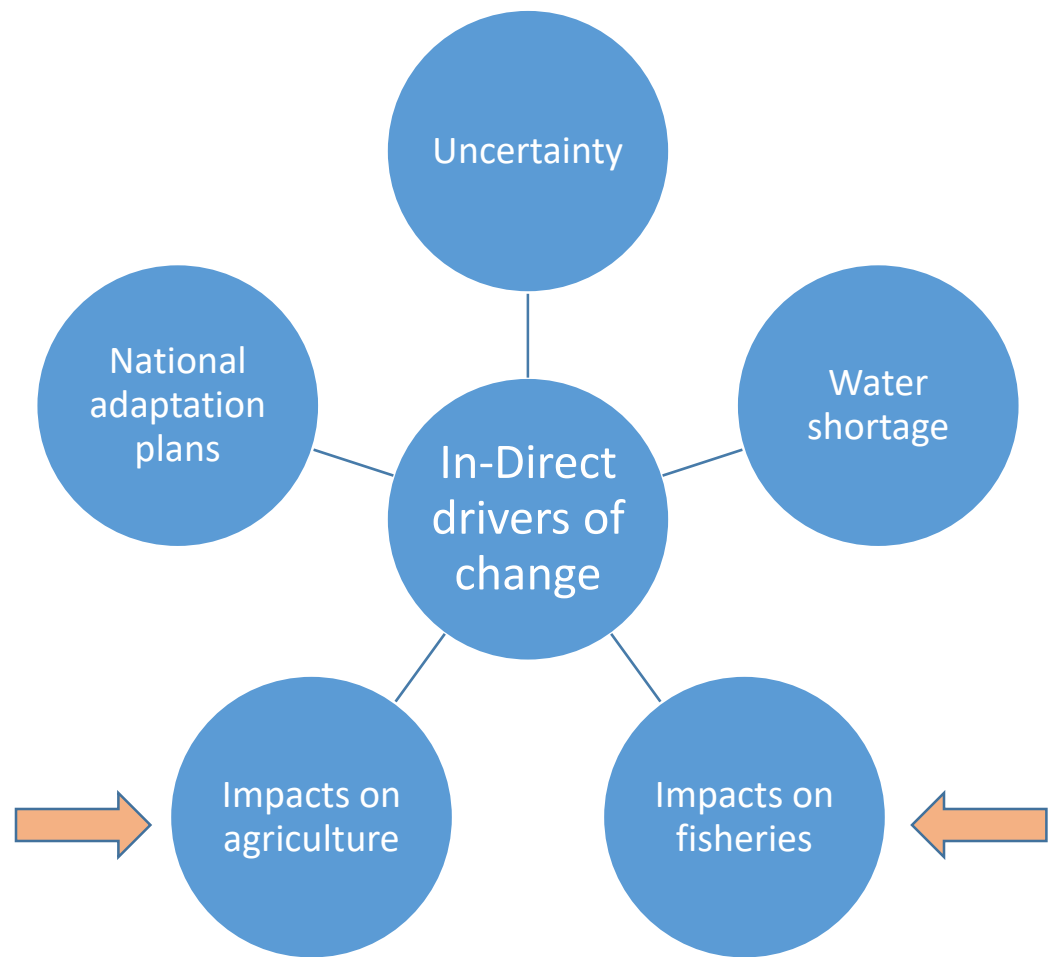
Extreme events

- Shift to shorter production cycles ↓ reduce risk
- Invest on more robust infrastructure
- Relocate farms away exposed sites (↑ spatial planning)

Sea level rise

- Shift towards natural or selected saline tolerant freshwater species/strains
- Invest in protection infrastructure (e.g. dams)
- Mainstream spatial planning and ecosystem approach to aquaculture

Indirect impacts of climate change on aquaculture



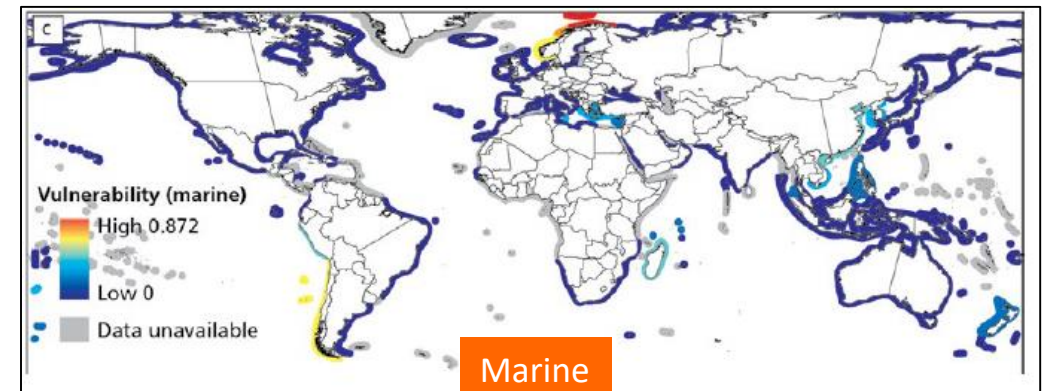
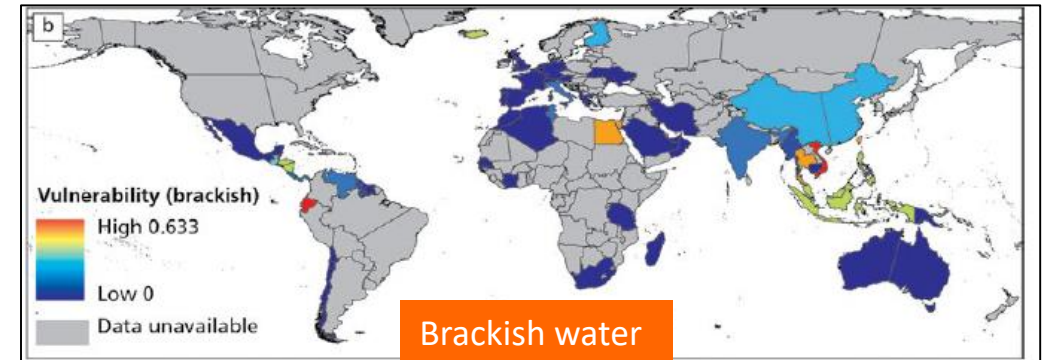
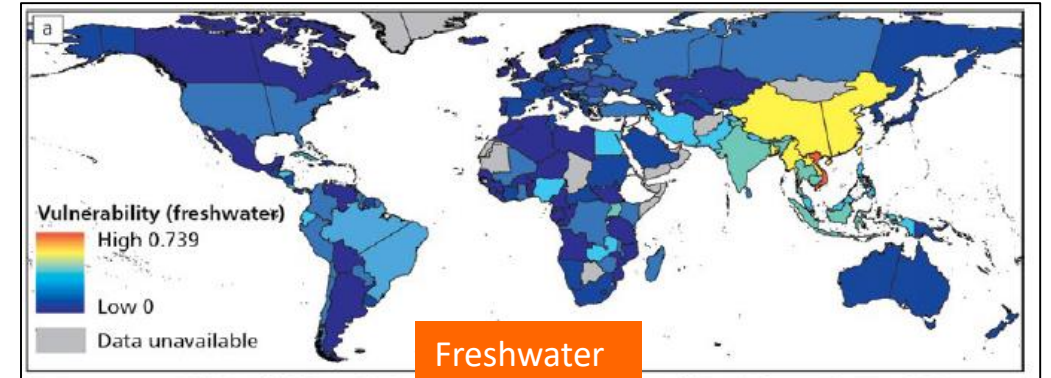
Global vulnerability of aquaculture



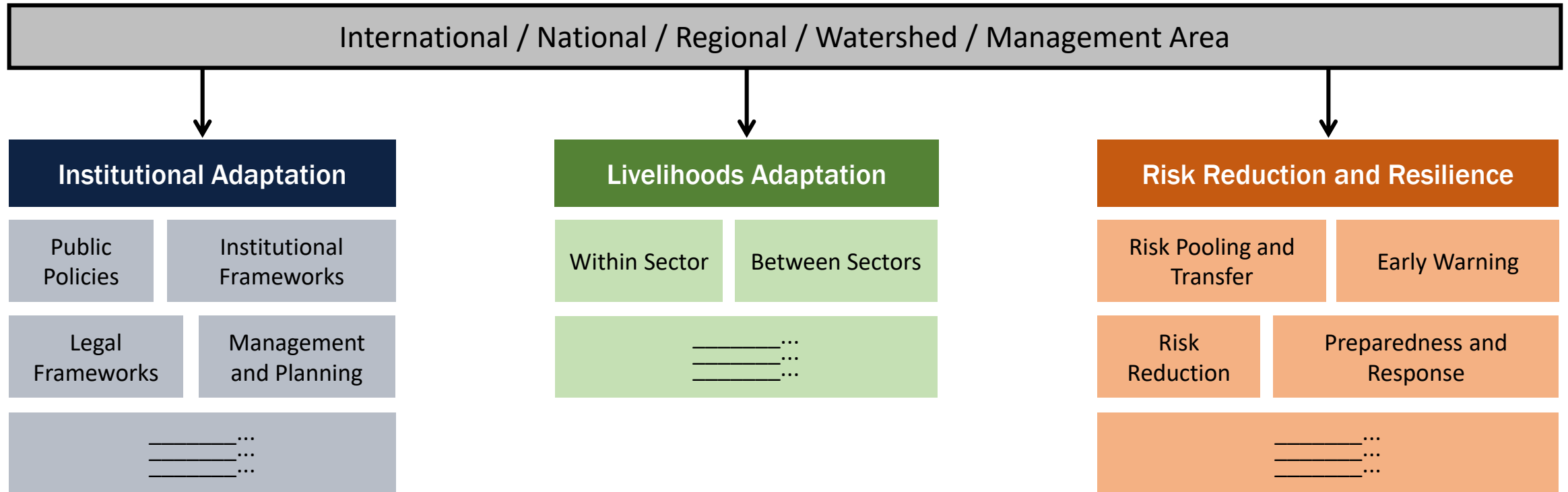
Vulnerability of Freshwater farming systems

	Storms	Flash-floods	Temperature increase	Rainfall increase	Rainfall decrease	Decreased water availability	Drought	Flooding
Intensive catfish farming	H	H	H	L	M	VH	VH	VH
Semi-intensive pond polyculture of tilapia, silver barb and carps	H	H	H	M	VH	M	H	VH
Extensive pond polyculture of carps and tilapia	M	M	M	L	M	H	H	H

Vulnerability indications: VH – very high; H – high; M – medium; L – low.

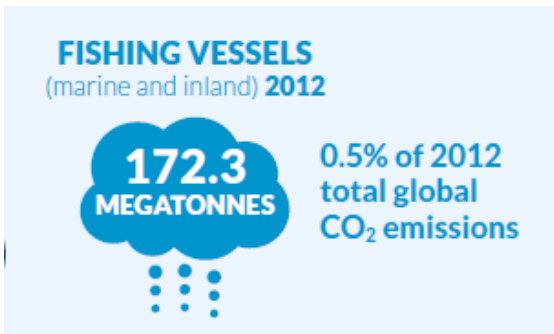


Adaptation Toolbox

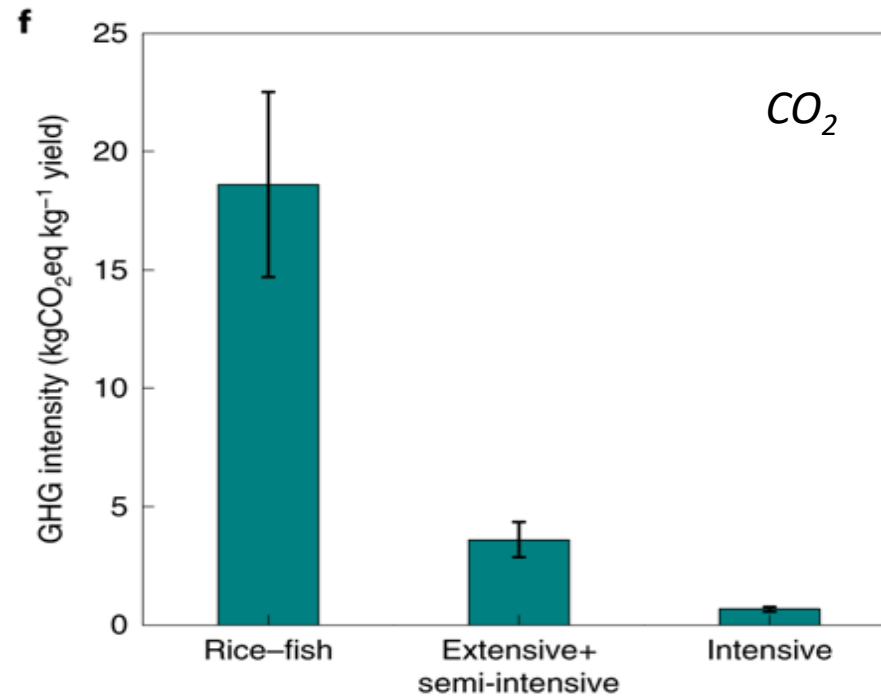


- ⦿ Adaptation is placed and context based
- ⦿ Adaptation should be viewed as an on-going and iterative process
- ⦿ Evaluations of success are necessary and often missing from adaptation studies
- ⦿ Transboundary issues need to be considered when developing an adaptation strategy

CO₂ emissions from aquaculture



Relative GHG emissions decrease with increasing intensity of production



Yuan et al, Nature Climate Change 9, 2019

Examples of mitigation measures:

- Reduce emissions from production of feed material
- Improve fish health to reduce mortality (and GHG emissions per unit farmed)

Take-home messages

- ⦿ Effects of climate change are and will be real and should be factored into aquaculture planning & development
- ⦿ Countries considering aquaculture in their NDCs are mostly located in the developing countries, especially in Africa – They require the most support
- ⦿ Unfavorable impacts predominate in developing countries, but adaptation measures are available.
- ⦿ Vulnerability is directly associated with governance, from national to farm level.
- ⦿ Vulnerability reduction depends on broader adaptation measures beyond the aquaculture sector.
- ⦿ **Higher risk countries:**
 - ⦿ Viet Nam, Bangladesh, Lao PDR, China (Freshwater);
 - ⦿ Viet Nam, Ecuador, Egypt, Thailand (Brackish);
 - ⦿ Norway, Chile (Marine)



© Anton



© Anton

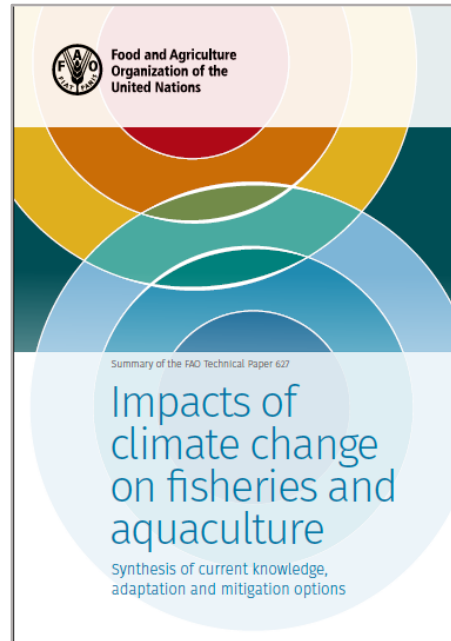
Conclusion

A Blueprint for:

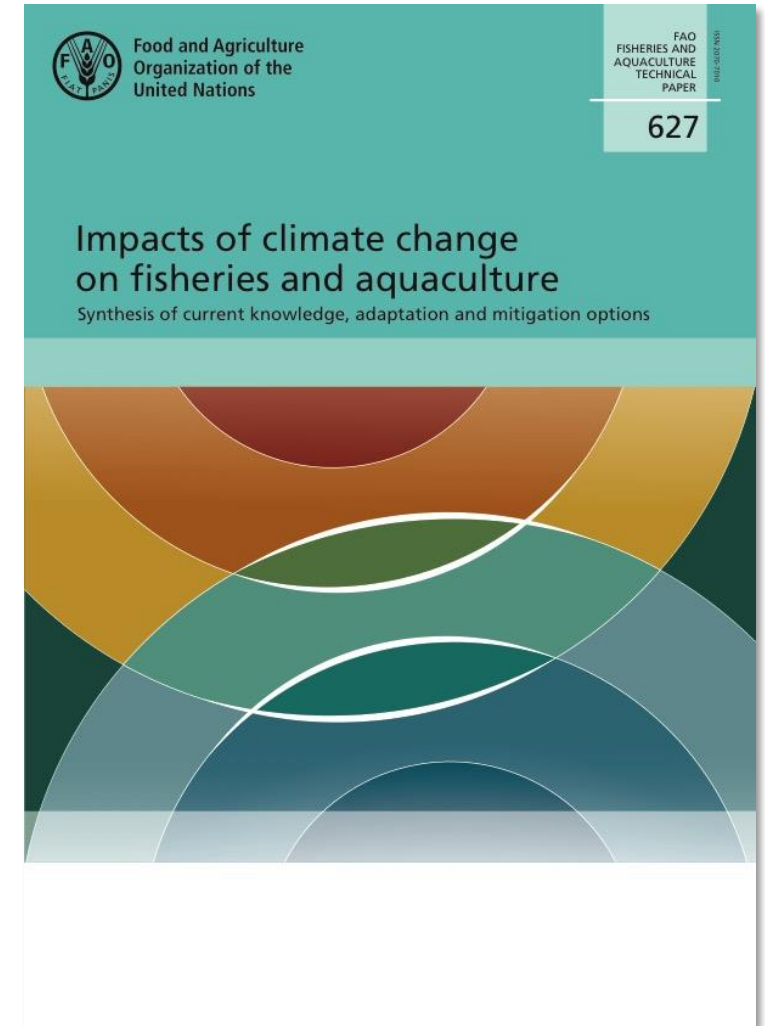
- ⦿ Nationally Determined Contributions (NDCs)
- ⦿ National Adaptation Plans
- ⦿ Green Climate Fund Projects
- ⦿ Global Environmental Facility Field Programmes
- ⦿ Country advice and support
- ⦿ Unique source of Sector-based information

Thank you!

Summary



Full report





**GLOBAL MILLENNIUM +20
CONFERENCE ON AQUACULTURE**

26-30 OCTOBER 2020 - SHANGHAI, CHINA

www.aquaculture2020.org



Food and Agriculture
Organization of the
United Nations



中华人民共和国农业农村部

Ministry of Agriculture and Rural Affairs of the People's Republic of China

