



Food and Agriculture  
Organization of the  
United Nations



# Impacts of and adaptations to climate change in fisheries and aquaculture: not a zero-sum game

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 @Manu\_FAO

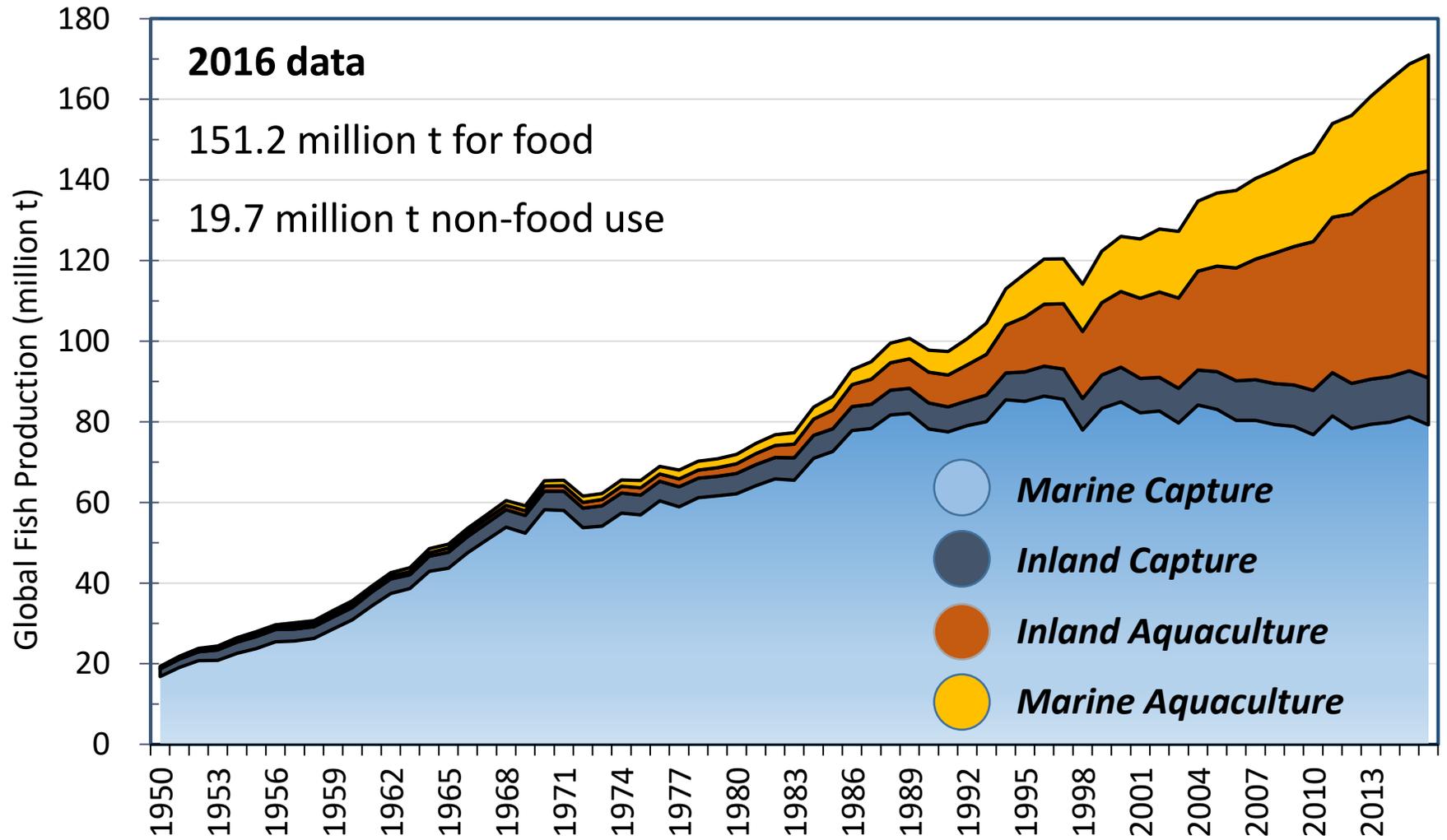
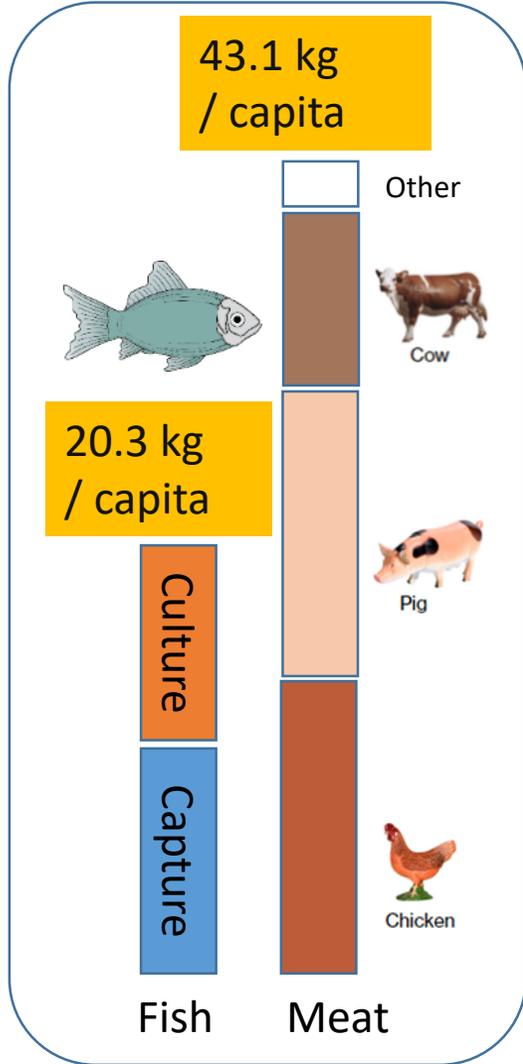


## Take home messages

- In a world rapidly approaching 9 billion people, where agriculture already uses 40% of the Earth's land surface and over 70% of water used, increased utilization of the ocean as a human food provider seems inevitable
- How to do so is less evident, when over 30% of fish stocks are exploited above sustainable levels, and when climate change is expected to have significant consequences for marine ecosystems, especially in Africa, Asia and Oceania, where dependency for fish products is largest
- But this effort does not have to be a zero-sum game, or a fight to maintain status quo. Solutions are available – but they need political commitment, technological innovation and behavioural change. Simple “protection” will not be a solution
- (in addition to Mitigation) Effective and coordinated adaptation will be key:
  - ❑ Institutions and management practices
  - ❑ Livelihoods
  - ❑ Risk and resilience management
- For a zero-hunger world, this must happen



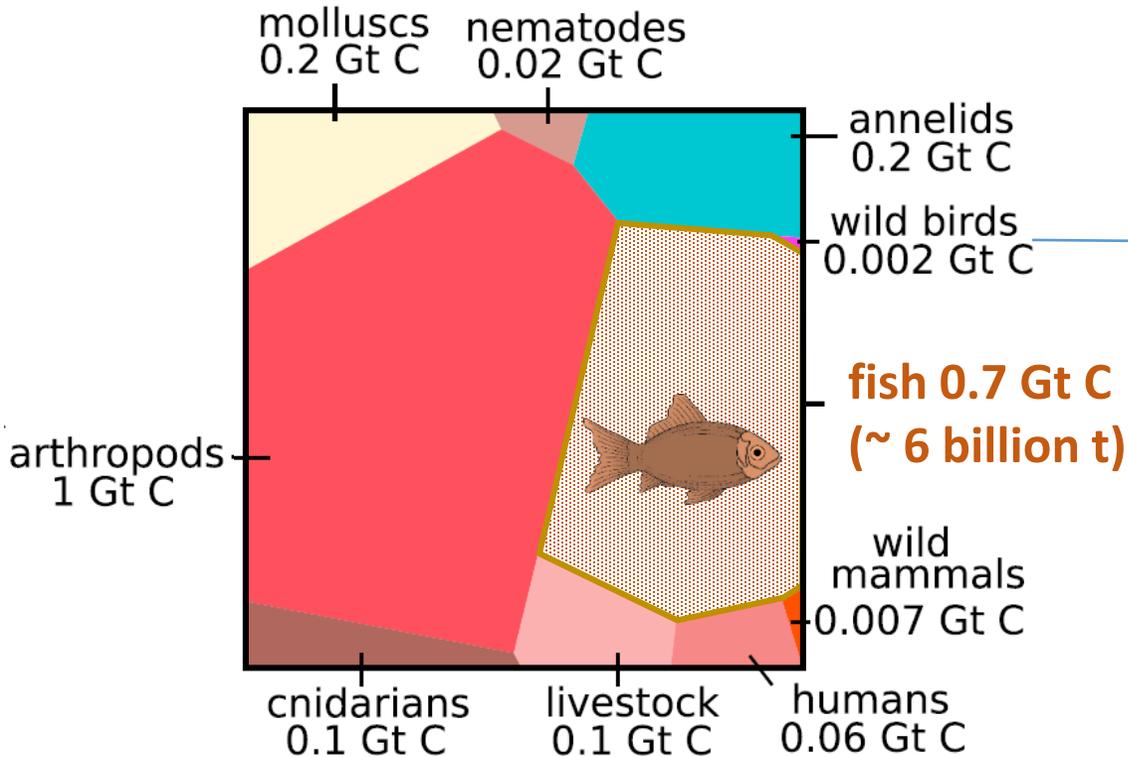
# The insatiable hunger for animal protein...





# Fish is food – diverse and abundant if used well...

## global animal biomass distribution by taxa



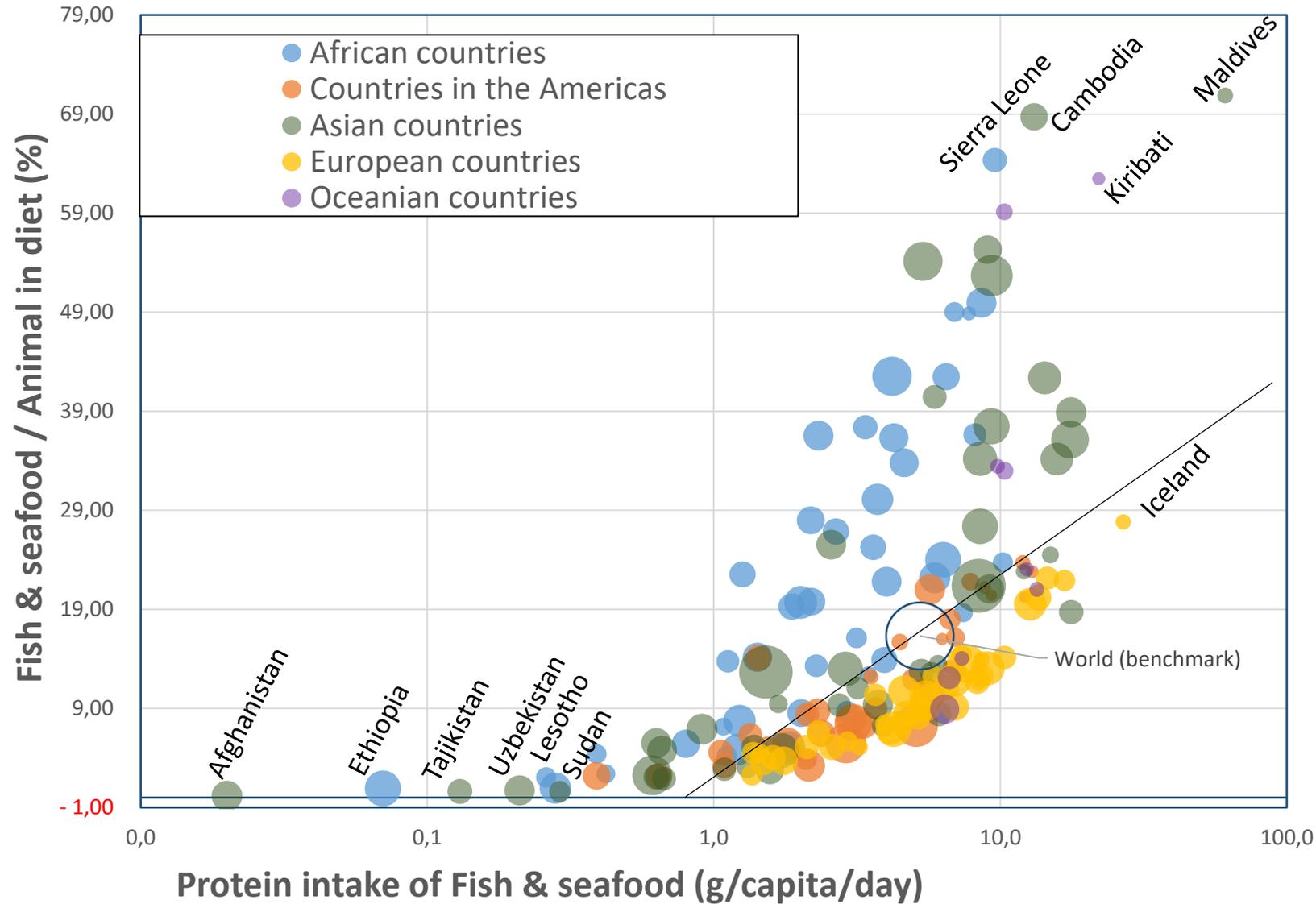
Capture Fisheries : 2,113 species  
Aquaculture: 598 species

Fish Biomass 12 x Human biomass  
Fish Biomass 7 x Livestock biomass

*Bar-On et al. 2018. PNAS 115: 6506-6511*



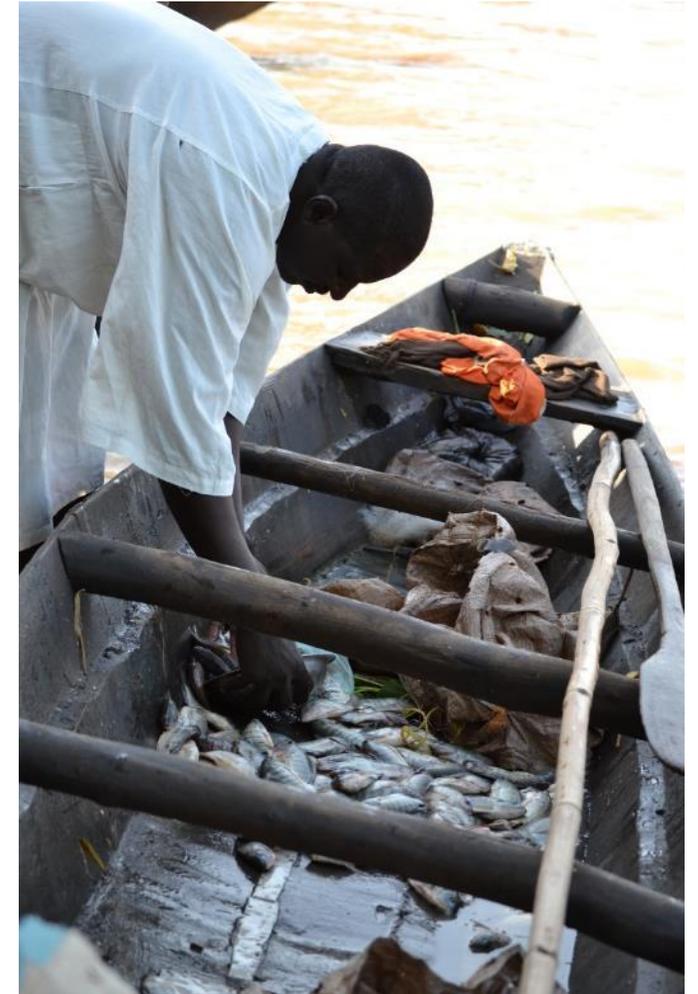
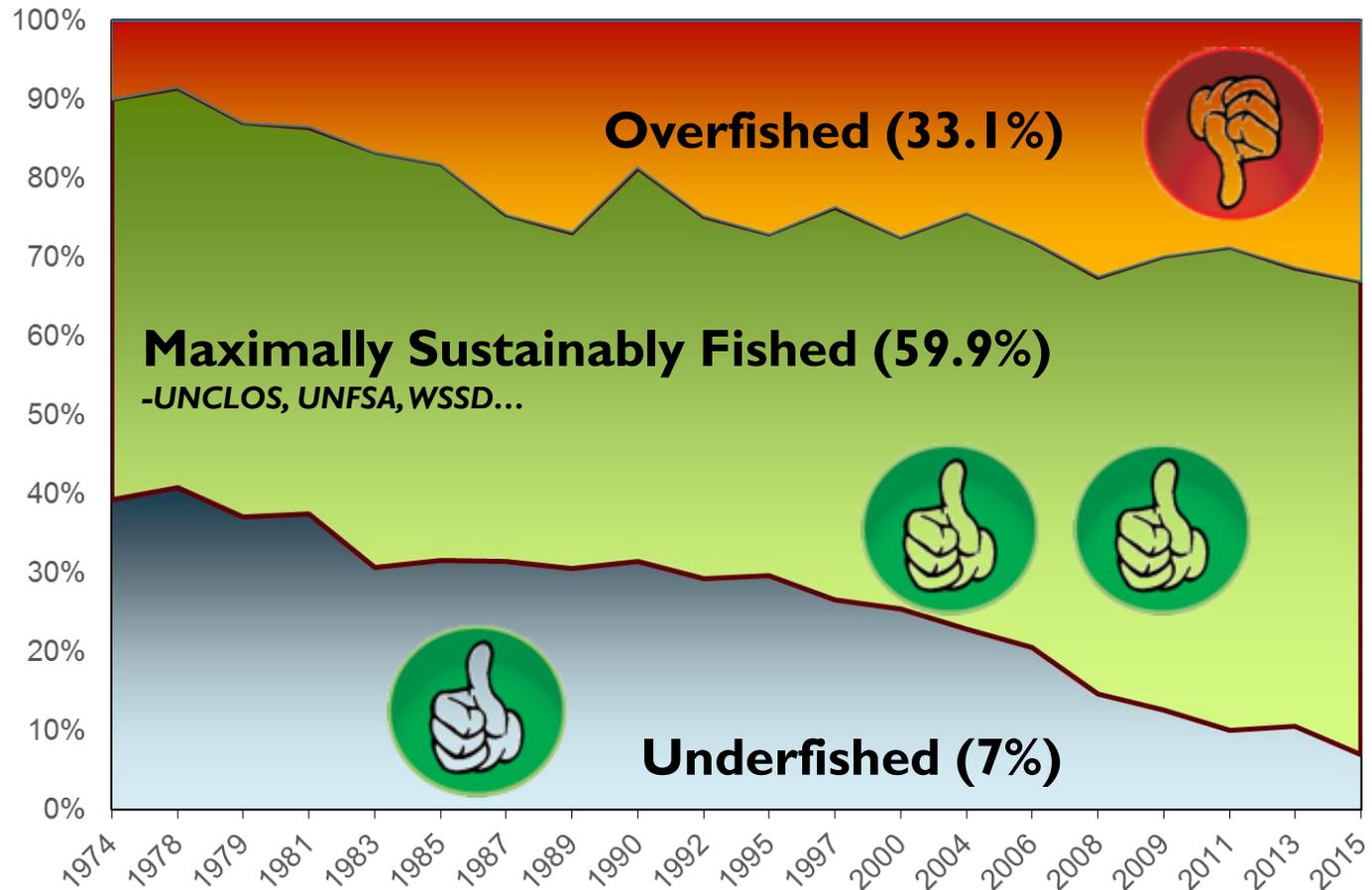
# Fish is crucial for nutrition, especially in Africa, Asia and Oceania

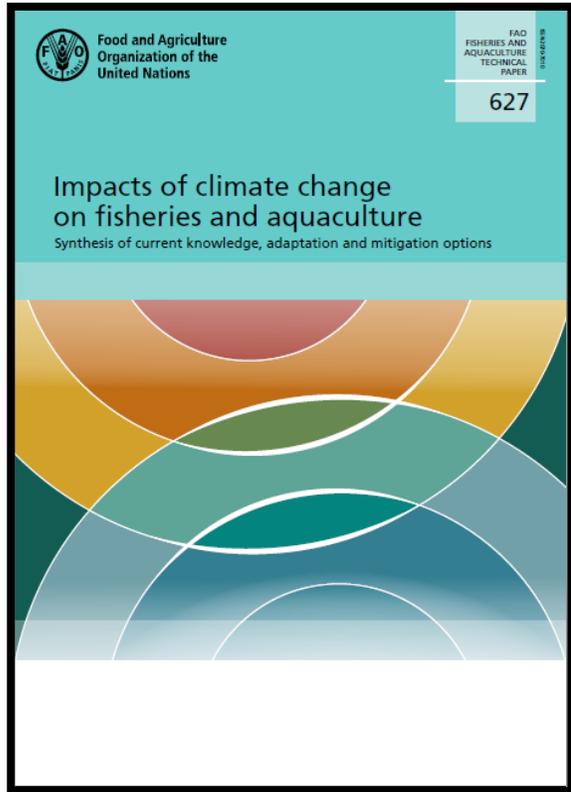




# Status of marine capture fisheries resources

SDG14.4. "...restore fish stocks...to levels that can produce maximum sustainable yield..." – Currently 67%





Marine Fisheries

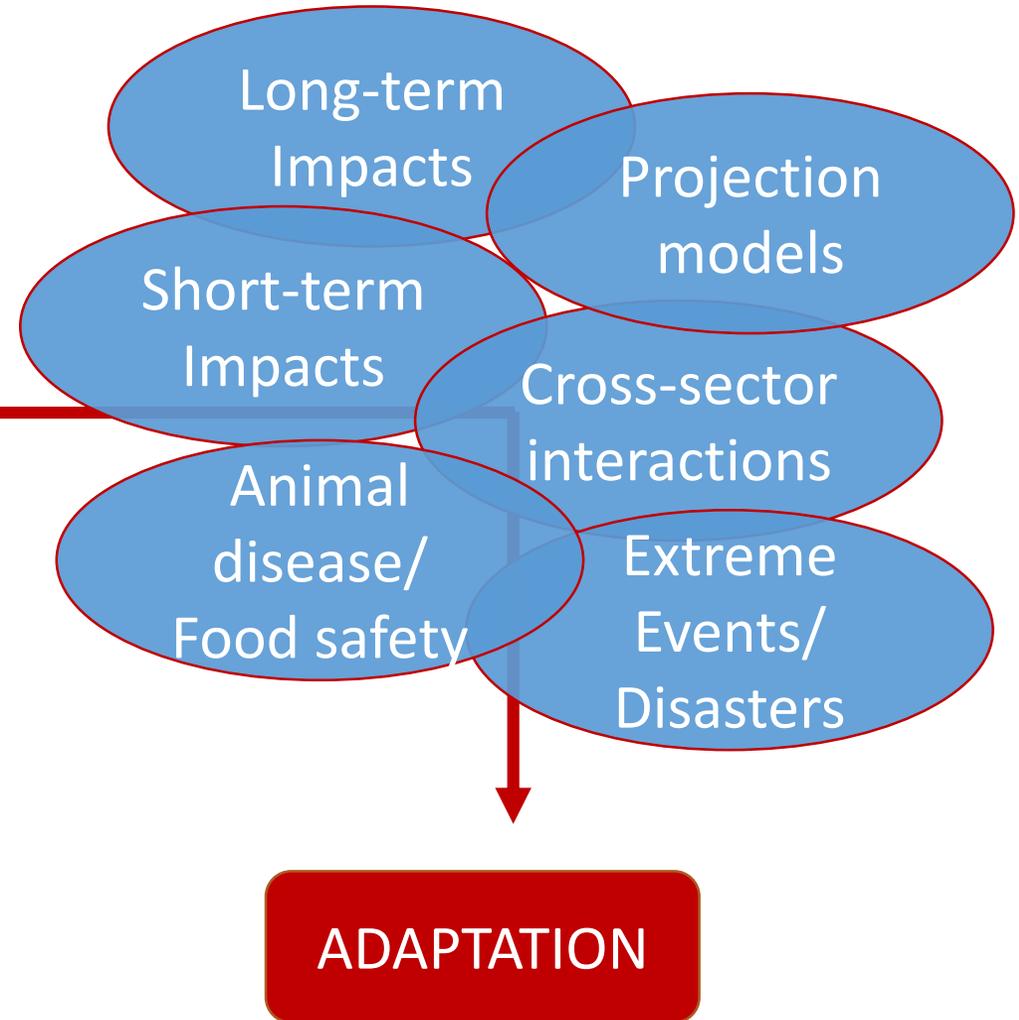


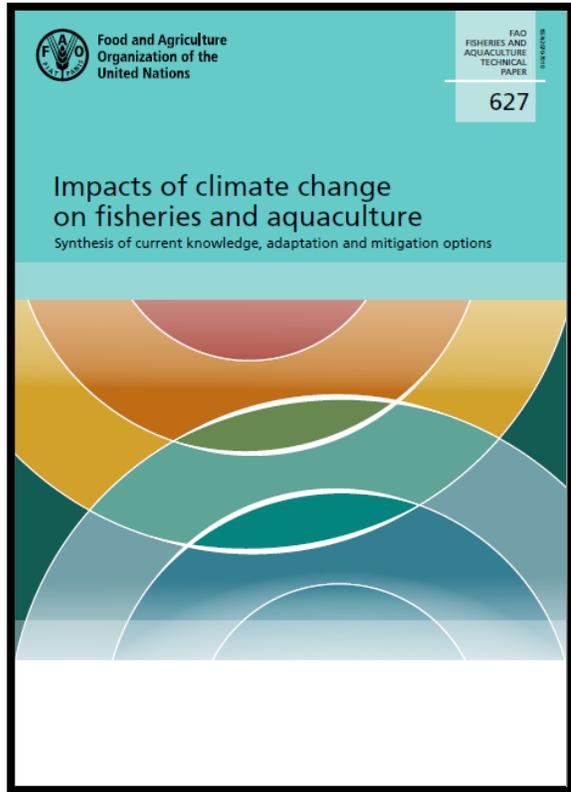
Inland Fisheries



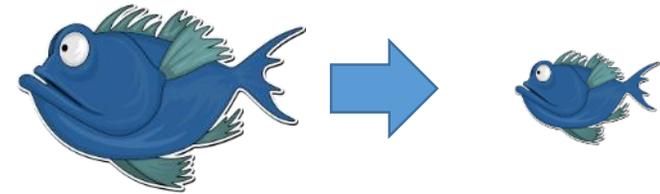
Aquaculture

Barange, M., et al. 2018. Impacts of climate change on fisheries and aquaculture: FAO Fisheries and Aquaculture Technical Paper No. 627. Rome, FAO. 628 pp.

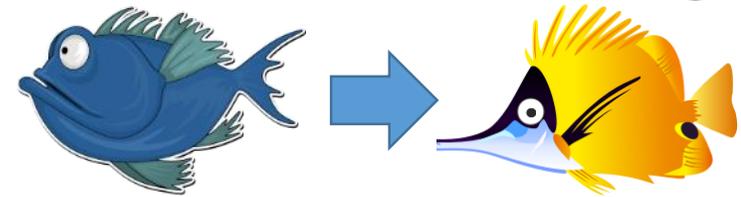




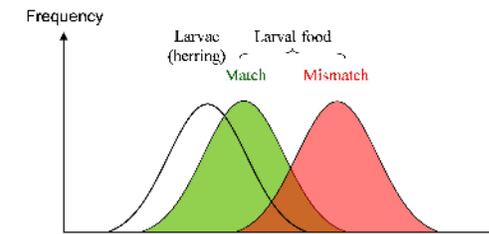
- Productivity changes



- Distributional changes



- Seasonality changes



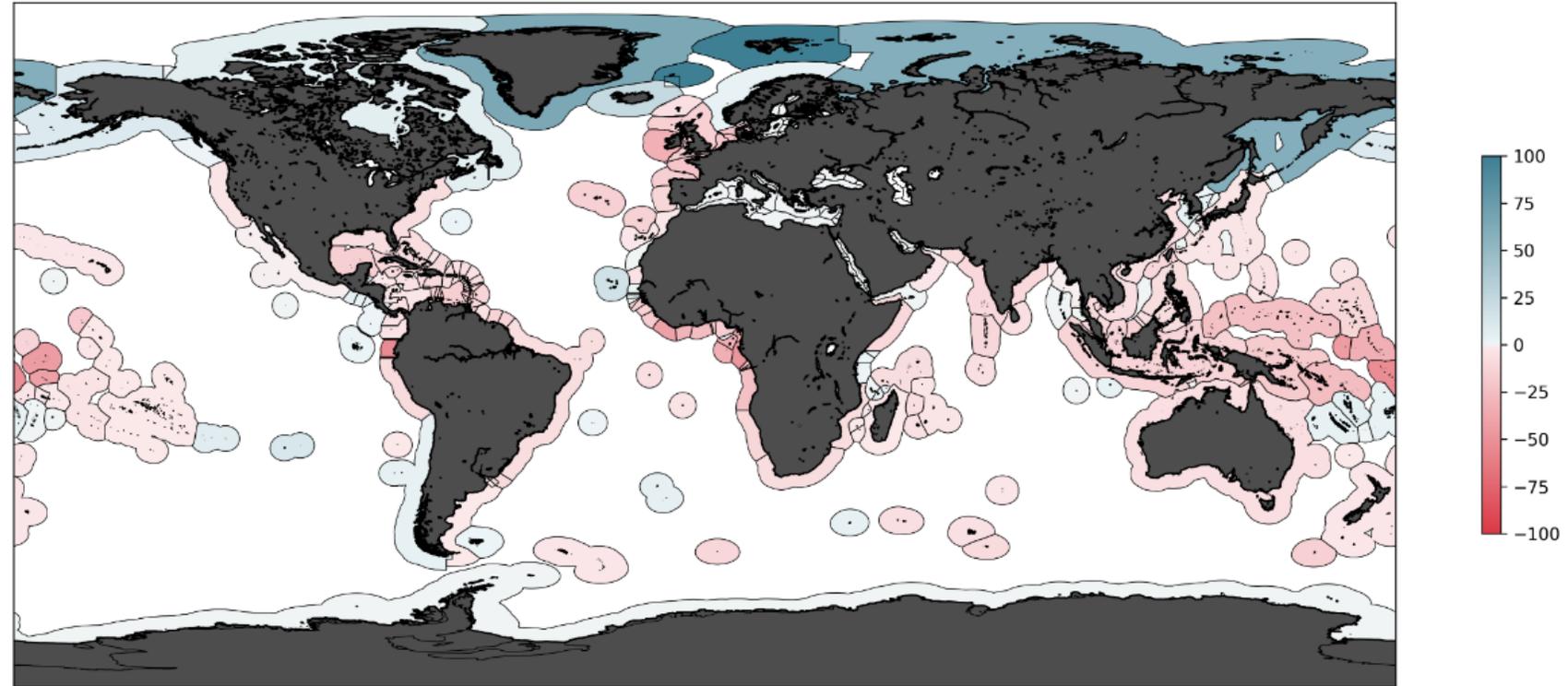


## Change of Catch Potential by 2050 (DBEM – RCP2.6 emissions) (%)

### Productivity changes



- 3 GCMs X
- 2 Ecosystem models X
- 2 RCP emission scenarios
- Equal forcings
- Averaged by EEZ

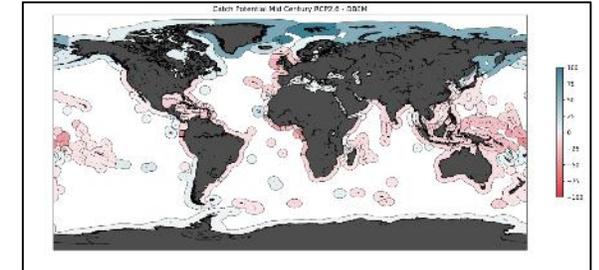
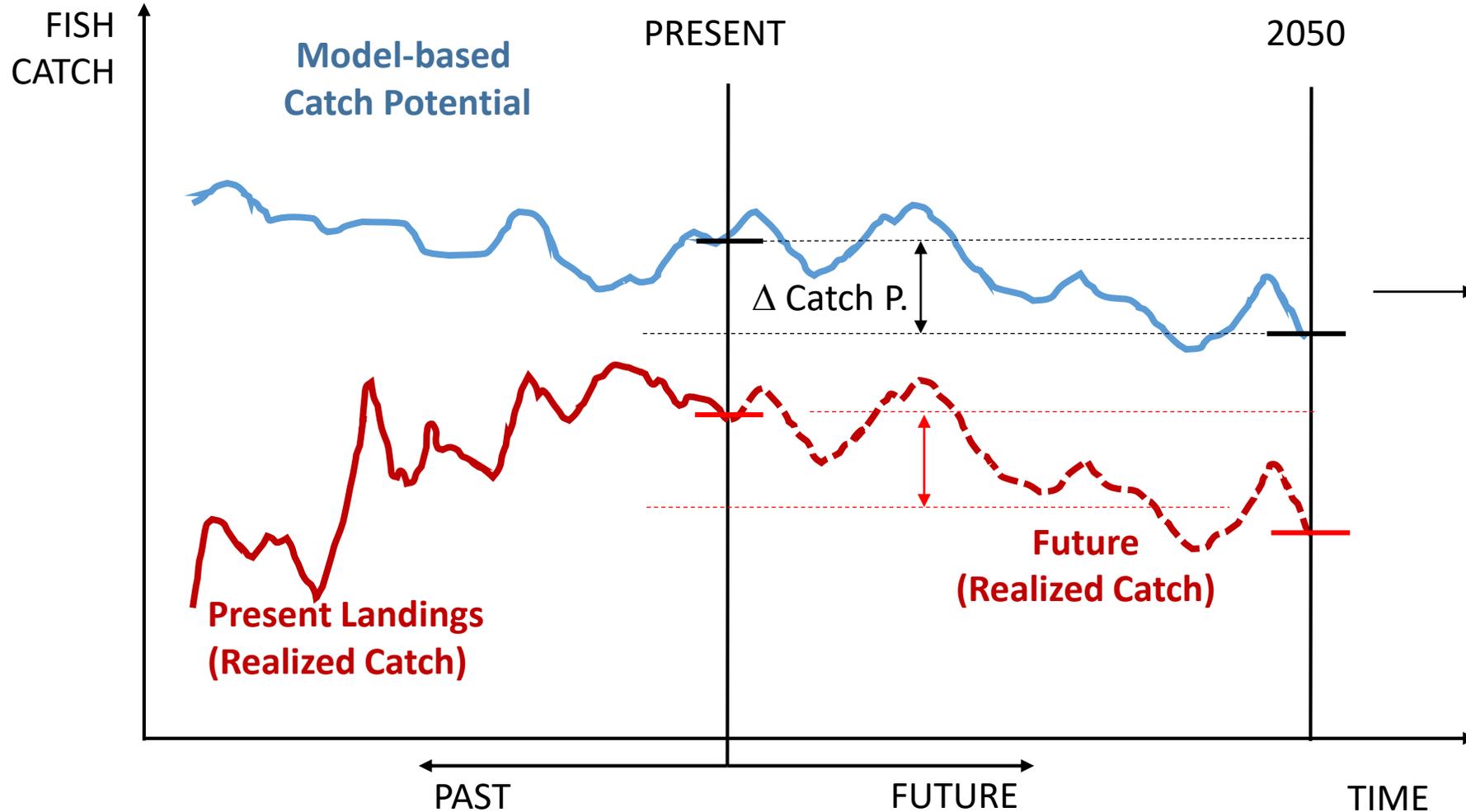


*Barange et al. 2018. FAO Technical Paper 629*

- Impacts on global fish catch potential = (-) 2.8-5.3% (Low emission) or (-) 7.0-12.1 (High emission) by 2050
- Tropical regions (particularly Pacific SIDS) are worse affected // High latitudes more positively affected
- **Projections are subject to significant uncertainties, some not yet estimated**
- Whether an impact is positive or negative is likely to be a matter of scale

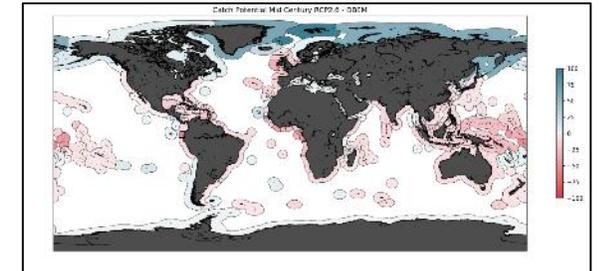
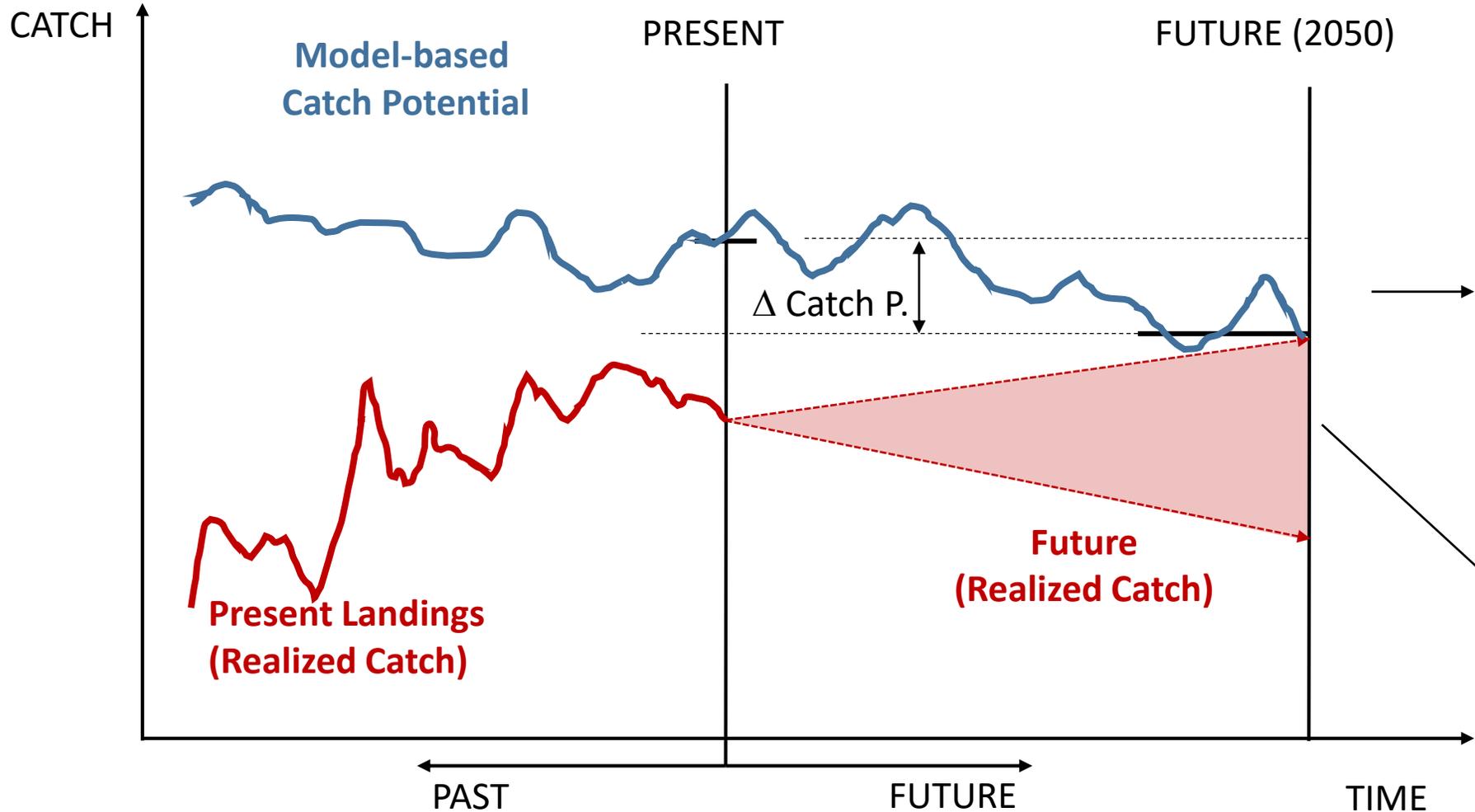


# (Mis)Understanding Catch Potential and Realized Catch





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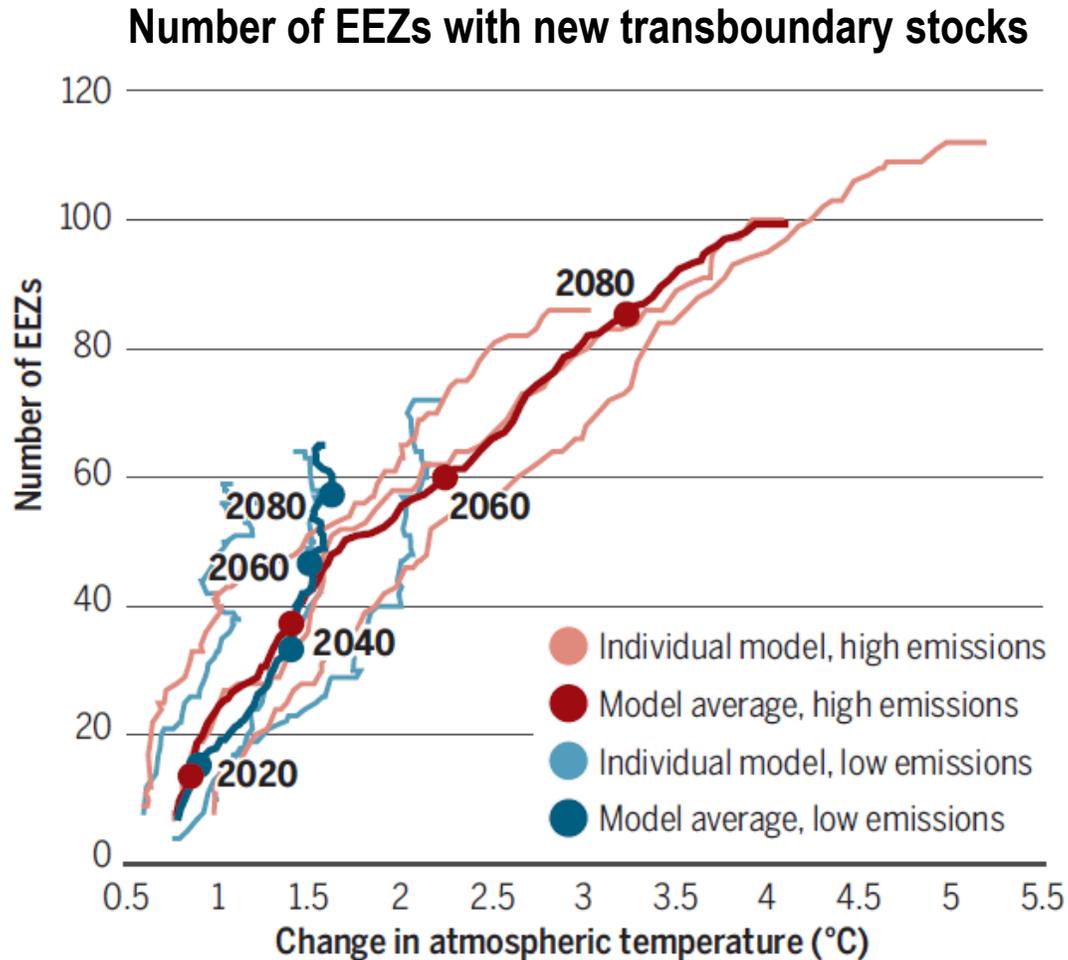
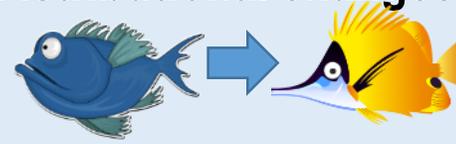


Management

It does not have to be a zero-sum or a minus game



### Distributional changes

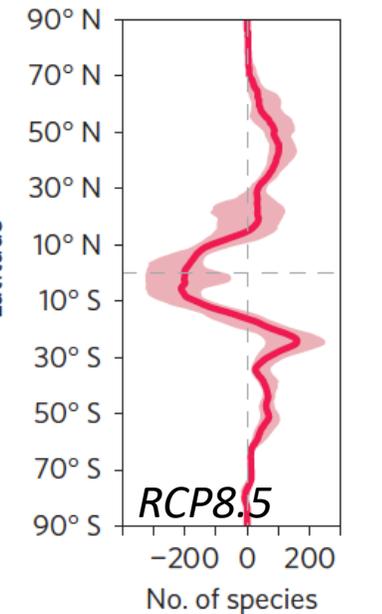
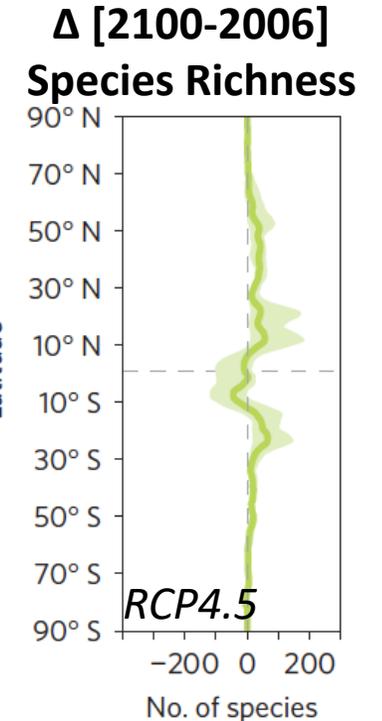


Pinsky et al. 2018. Science 360

- Many EEZs will see new transboundary stocks requiring institutional and management adaptations across the value chain
- **Management response crucial to minimize threats and maximize opportunities**

It does not have to be a zero-sum – but it will likely lead to winners and losers  
(Barange et al. 2014. NCC)

**ADAPTATION** will be crucial



Garcia-Molinos et al. 2017 NCC

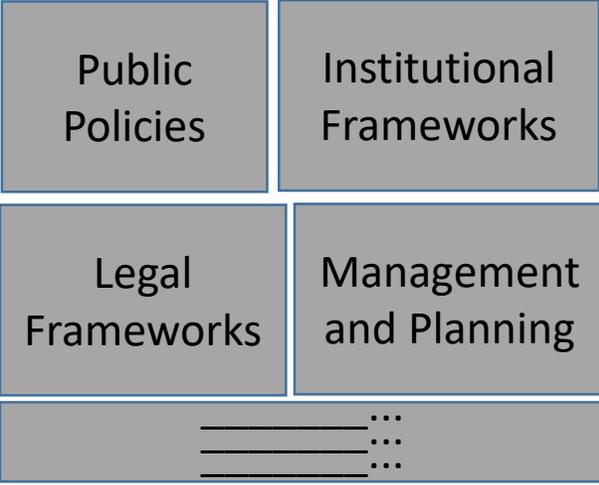


# Adapting for Success – *not for weathering storms*

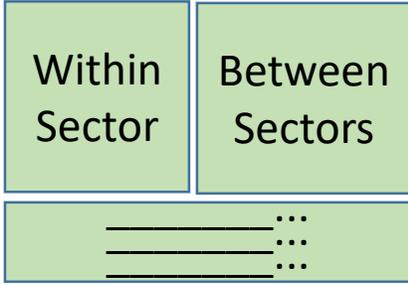


International / National / Regional / Watershed / Management Area

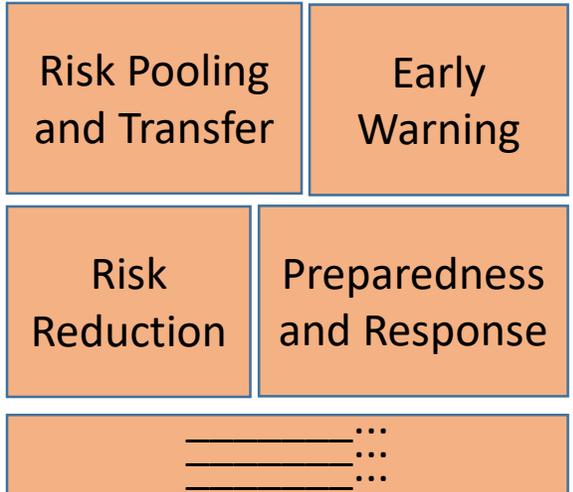
## Institutional Adaptation



## Livelihoods Adaptation



## Risk Reduction and Resilience



Barange et al. 2018. FAO TP 629

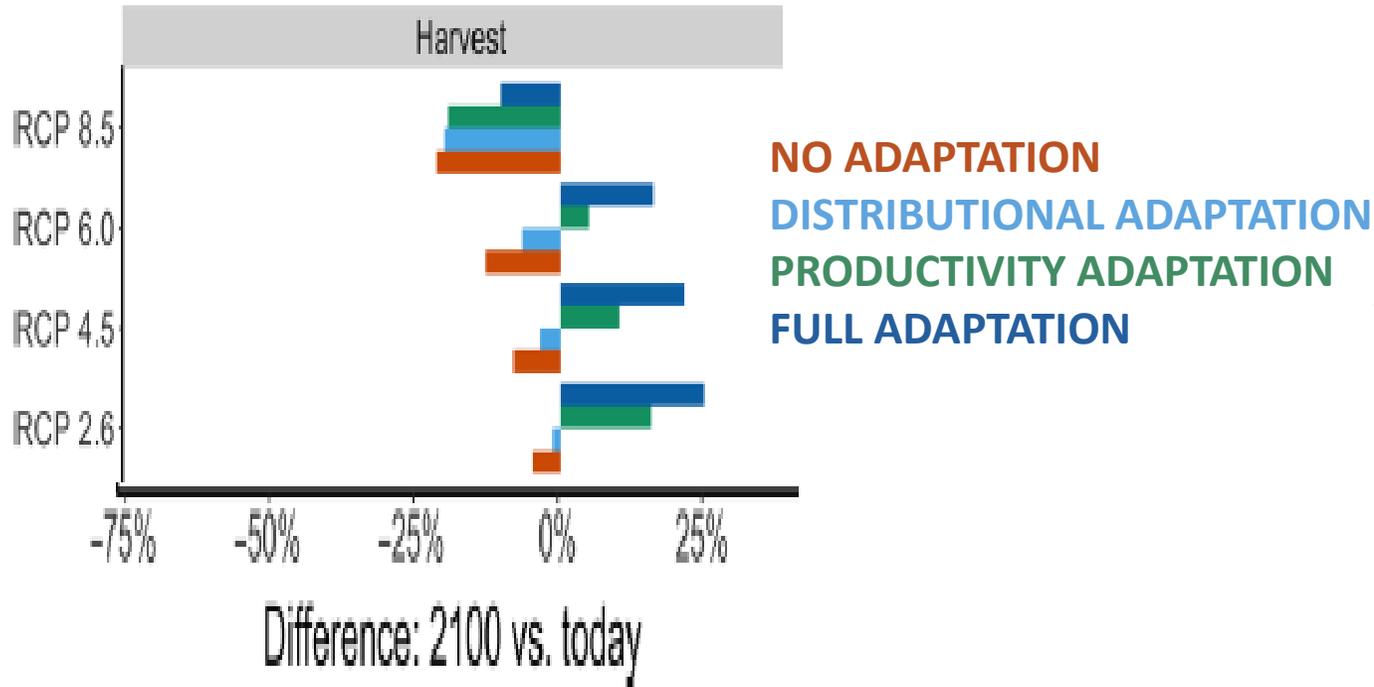
- Adaptation is placed and context based
- Adaptation should be viewed as an on-going and iterative process
- We adapt to the possible rather than the probable – our predictive capability for most fisheries is in its infancy
- Effective and timely Adaptation can have very positive results - Maladaptation can lead to terrible outcomes



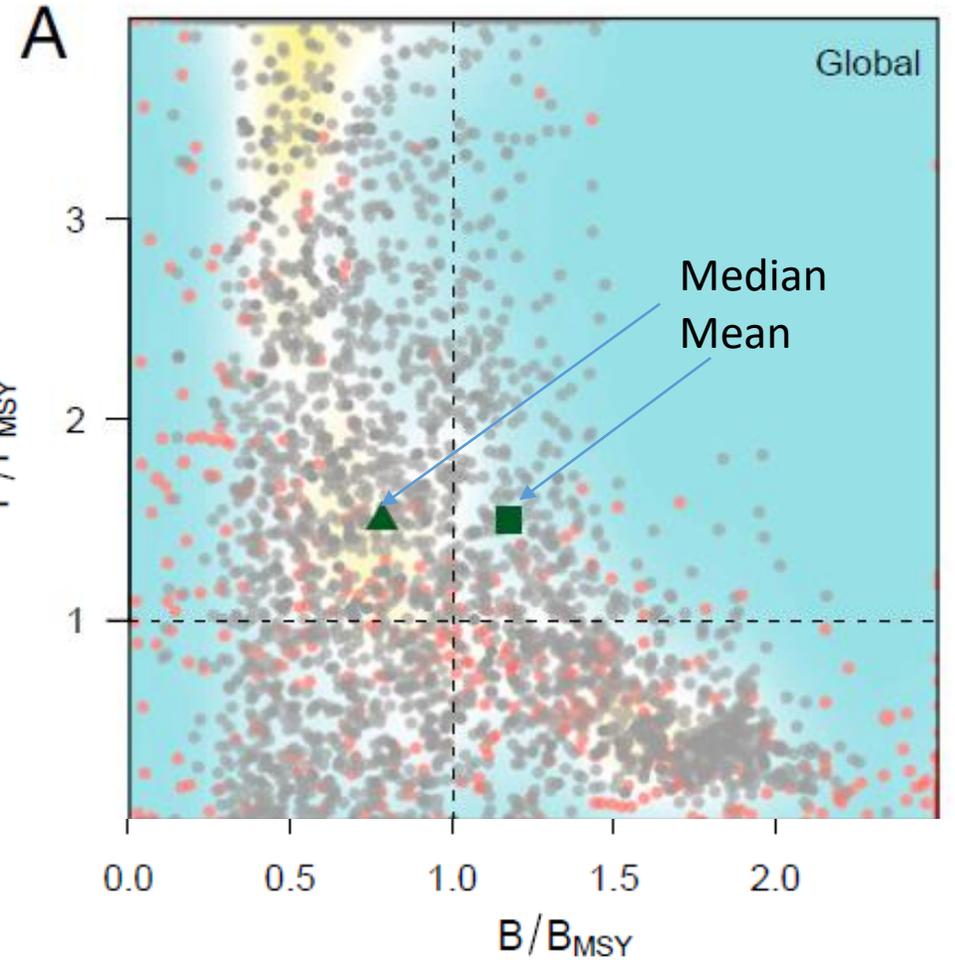
# But can we achieve more than a zero-sum?

Costello et al. 2016. PNAS 113: 5125-5129

## Cost/Benefits of Adaptation



Gaines et al. 2018. Science Advances 29 August



For food production sectors that rely on natural biodiversity and natural production cycles there has never been a stronger encouragement for **serious sustainability management** than climate change



Food and Agriculture  
Organization of the  
United Nations

SUSTAINABLE  
DEVELOPMENT  
GOALS



WE CANNOT ACHIEVE  
ZERO HUNGER  
WITHOUT TACKLING  
CLIMATE CHANGE

2 ZERO  
HUNGER



14 LIFE  
BELOW WATER



WE CANNOT ATTAIN  
SDG14 WITHOUT  
SUSTAINABLE AND  
PROFITABLE FISHERIES