



# Evolution in an instant: adaptation of fisheries and aquaculture to climate change

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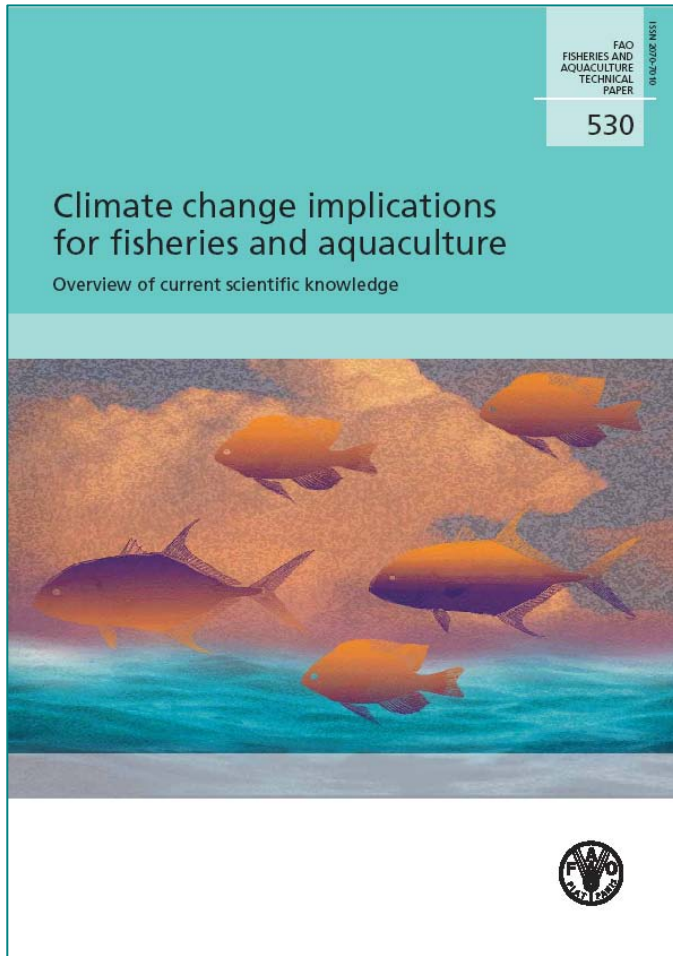
International Symposium "Climate Change Effects on Fish and Fisheries: Forecasting impacts, assessing ecosystem responses, and evaluating management strategies"  
26-29 April, 2010, Sendai, Japan

# Outline

- Impacts of climate change on Fisheries
- Key features of Ecosystem Approach to Fisheries (EAF)
- How EAF can address climate change

## Impact of Climate Change

- ❑ changes in currents, water mass distribution; acidification of oceans; rise in sea level
- ❑ degradation and disruption of marine and coastal ecosystems; loss of habitats (mangroves, coral reefs, pelagic food webs, shifts in distribution, species displacement)
- ❑ increased frequency / intensity of extreme events: cyclones and their associated storm surges and inland flooding
- ❑ added to: overfishing, pollution, conflicts over resource use, poverty and other existing vulnerabilities
- ❑ effects on people (wellbeing / health), infrastructure and other assets
- ❑ effects on ecological structure and productivity of the resource (e.g. wind-driven or upwelling ecosystems)
- ❑ CC will add to vulnerabilities and hamper the sector's ability to cope and contribute to social and economic development



- **Physical and ecological impacts** of climate change relevant to marine and inland capture fisheries and aquaculture (*M. Barange and I. Perry*)
- Climate change and **capture fisheries**: potential impacts, adaptation and mitigation (*T. Daw, W.N. Adger, K. Brown and M.-C. Badjeck*)
- Climate change and **aquaculture**: potential impacts, adaptation and mitigation (*S.S. De Silva and D. Soto*)

[www.fao.org/fisheries](http://www.fao.org/fisheries)

# Fisheries and aquaculture in numbers

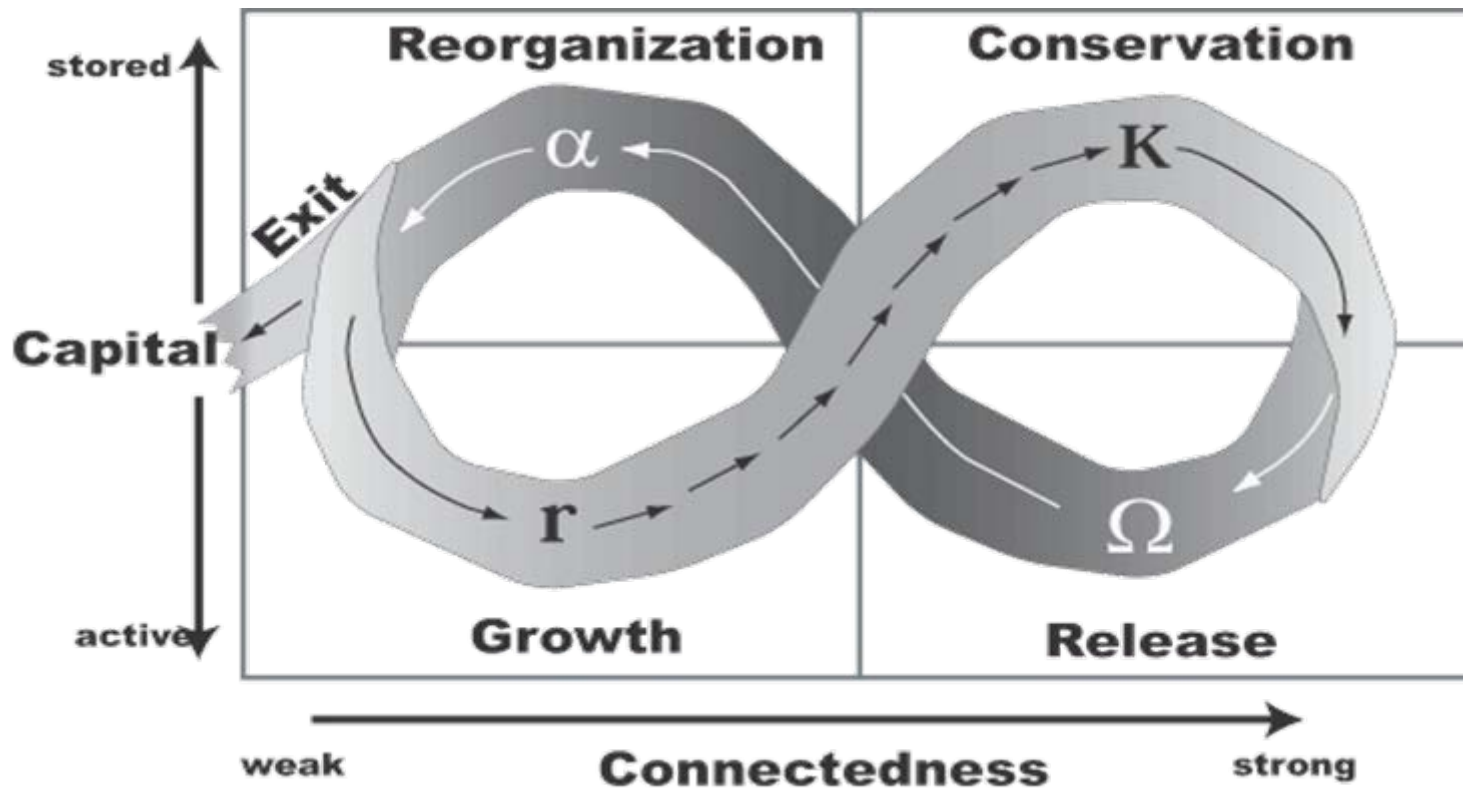
- 44 million fishers & fish farmers, 520 million people – 8 % of the world's population – depend on fisheries

- 144 million tonnes produced in 2006, 110 mt for human consumption; 16.7 Kg per capita



- 15 % or more of animal protein for 2.9 billion people
- 47 % from aquaculture (growing 8.7% per yr), current value US\$78.8 billion

# Resilience Theory and the Adaptive Cycle



Fore loop with relatively predictable dynamics and back loop marked by uncertainty and experimentation (from Walker and Salt 2006)

# Resilience theory, fisheries and climate change

- ❑ In fisheries almost all the emphasis up till now has been on the growth and conservation phases
- ❑ Under the influence of drivers, often 'external' drivers, systems can enter a release phase, disassemble and re-organize in very different forms
- ❑ Climate change is likely to be a powerful driver of change
- ❑ We are coming to accept that humans cannot control ecosystems, and social-ecological stability is the exception rather than the norm
- ❑ Resilience reduces the likelihood of release and increases the likelihood that, in the event of release, re-organization will not result in major changes
- ❑ Resilience requires, above all, diversity (genetic and species), low stress from other factors, 'healthy' and productive populations.
- ❑ Effective EAF (in ecological and human dimensions) should lead to resilient social-ecological systems.



# Responding to the impacts: adaptation to climate change through broader vulnerability reduction



- Ecological, Economic and Social Resilience → implementation of ecosystem approach to fisheries and aquaculture, principles of the Code of Conduct for Responsible Fisheries
  - Diversification, flexible access rights, insurance
  - Technological innovation
  - Planned adaptation –policy coherence across sectors (water, agriculture, CZM)
  - Disaster preparedness and response



## Key features of the EAF - Principles

1. The EAF is the mechanism to attain sustainable development in fisheries/aquaculture – stressing holistic, integrated and participatory processes
2. None of the principles that underlie the EAF are new. They can all be traced in earlier instruments, agreements, declarations. EAF pull them together formally as tools for the effective implementation of the Code of Conduct for Responsible Fisheries.

# Key features of the EAF - Basic Objectives



- Maintaining ecosystem integrity / ecological well being
- Improving human well-being and equity
- Promoting/enabling good governance

# Key features of the EAF principles in practice

- Apply the precautionary approach
- Use best available knowledge
- Acknowledge multiple objectives and values of ecosystem services
- Embrace adaptive management
- Broaden stakeholder participation
- Understand and use full suite of management measures
- Promote sectoral integration and interdisciplinarity



# Using EAF to identify key climate change issues

Fishery/OU

## 1. Ecological well-being

1.1 Landed

1.2 Discarded

1.3 General Ecosystem

## 2. Human well-being

2.1 Community

2.2 National

## 3. Ability to Achieve

3.1 Governance

3.2 Extra-fisheries changes/drivers

Biophysical changes from CC

Changes in species productivity and distributions

Safety at sea/loss of lives  
Impacts on cost and revenues

Increasing demands on gov't  
Changes in fuel prices  
Obstacles to adaptation

## Using EAF to address climate change (1/3)

### □ Adaptation

1. Creating resilient communities (ecosystem, human, governance)/decreasing vulnerability (impacts, adaptive capacity, sensitivity)
2. Enhancing inter-sectoral collaboration (e.g. integrating fisheries into nt'l adaptation and DRM strategies)
3. Promoting context specific and community-based adaptation strategies
4. Allowing for quick adaptation to change
5. Promoting natural barriers and defenses

## Using EAF to address climate change (2/3)

- Mitigation (increased sequestration and decreased emissions)
  1. Understanding the role of aquatic systems as natural carbon sinks and how fisheries impact this role
  2. Supporting a move to environmentally friendly and fuel-efficient fishing practices (harvest and post-harvest)
  3. Governance/responsible practices → Eliminating subsidies that promote overfishing and excess capacity

## Using EAF to address climate change (3/3)

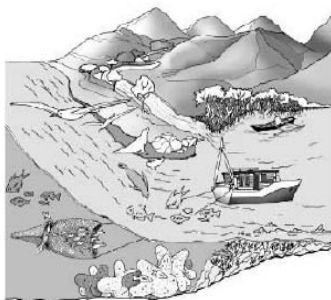
- Mitigation and Adaptation - Understanding synergies and tradeoffs
  1. Safeguarding the aquatic environment and its resources against adverse impacts of mitigation strategies and measures from other sectors
  2. Avoiding “mal-adaptation” (e.g. construction of dams and canals for agriculture)
  3. Benefiting from win-win synergies (mangroves in REDD+, increase energy efficiency = fewer negative impacts on environment)

# FAO Guidance on EAF



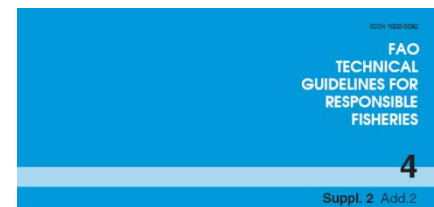
## FISHERIES MANAGEMENT

### 2. The ecosystem approach to fisheries



## FISHERIES MANAGEMENT

### 2. The ecosystem approach to fisheries 2.1 Best practices in ecosystem modelling for informing an ecosystem approach to fisheries



## FISHERIES MANAGEMENT

### 2. The ecosystem approach to fisheries 2.2 The human dimensions of the ecosystem approach to fisheries



1. Technical Papers (EAF/EAA)
2. EAF Toolbox
3. Indicators for EAF
4. Best practices
5. GIS systems for EAF
6. Country level implementation



**Thank you for your attention**

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