Food and Agriculture Organization of the United Nations

ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT TRAINING COURSE (INLAND FISHERIES)

VOLUME 2: INLAND FISHERY CASE STUDIES

Cover image: Emmanuela D'Antoni, "Inland Fisheries" (FAO, 2003).

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PREPARATION OF THIS DOCUMENT

This Ecosystem Approach to Fisheries management (EAFm) inland fisheries training course is a development of the Essential-Ecosystem Approach to Fisheries Management (E-EAFm) training course, which was developed over several years starting in 2012. The consortium of institutions and projects which developed the course consisted of: the Food and Agriculture Organization (FAO) of the United Nations, the National Oceanic and Atmospheric Administration (NOAA) and IMA International.

The Essential-Ecosystem Approach to Fisheries management (E-EAFm) training course and E-EAFm Training of Trainers Course are rooted in, and closely follow the EAF Guidelines and Tools produced by FAO from 2003 onwards, through the EAF-Nansen Project (and tested and applied mainly in Africa and the Caribbean). In mid-2012, IMA International was invited to explore and coordinate the potential and opportunity for harmonizing or merging regional EAFm capacity development processes.

A first EAFm curriculum development 'writeshop' was held in November 2012 in Phuket, Thailand. This was followed by a second 'writeshop' in Manila, Philippines, in January 2013. A training package was produced and used as course material for a first "Essential EAFm" pilot-training and training-of-trainers in Kota Kinabalu, Malaysia, in June 2013. Based on the experience gained from this pilot training, the course material was further improved and finalized.

The drafting team for the original E-EAFm training handbook included Rusty Brainard (NOAA), Silvia Capezzuoli (IMA International), Simon Funge-Smith (FAO), Chris Grose (IMA International), Adel Heenan (NOAA), Rudolf Hermes (BOBLME), Paulo Maurin (NOAA), Megan Moews (NOAA), Chris O'Brien (BOBLME), Robert Pomeroy (USAID-CTSP) and Derek Staples (Fisheries Management Consultant). Nygiel Armada, Robert Pomeroy and Derek Staples drafted the original written modules for this course. Additional input was provided by Janna Shackeroff, Robert Schroeder, Jarad Makaiau and Max Sudnovsky (all NOAA) and Magnus Torell (SEAFDEC). Figures used and adapted with permission from the United Nations Environment Programme (UNEP) and the International Collective in Support of Fishworkers (ICSF).

The original coastal/marine-focussed E-EAFm has been modified for application in a number of countries and regions by FAO, SEAFDEC, The Nature Conservancy and USAID funded projects.

The modification for application of the E-EAFm handbook and training materials to inland fisheries contexts, was undertaken by Simon Funge-Smith (FAO), Rick Gregory (FAO), John Jorgensen (FAO) and Silvia Capezzuoli (IMA International) during 2018-19.

The EAFm Inland fisheries training course was piloted in Mangochi, Malawi in March 2019, supported by the FAO/GEF project "*Building climate change resilience in the fisheries sector in Malawi*". The training material was finalized in May 2019.

ABSTRACT

This Ecosystem Approach to Fisheries management training course (Inland Fisheries) is designed as a complete training course for the sustainable management of inland fisheries using the ecosystem approach. It is targeted at middle-level fishery and environment officers, extension workers, facilitators and other stakeholders engaged in the planning and management of inland fisheries.

This training course is designed to be applicable to many inland fishery contexts around the world (including overlapping freshwater fishery and aquaculture systems). It is also intended to be adapted to suit specific local contexts.

This the first of three volumes, developed for the training course:

VOLUME 1: HANDBOOK FOR TRAINEES

VOLUME 2: INLAND FISHERY CASE STUDIES

VOLUME 3: TRAINING COURSE PRESENTATIONS & VISUALS

VOLUME 4: TRAINING SESSION PLANS

This volume is VOLUME 2: INLAND FISHERY CASE STUDIES and contains five example case studies of how EAFm approaches can support the management of inland fisheries. These case studies are intended for use in Module 5 of the training course.

CONTENTS

Case study 1: Lake Victoria fisheries and environement

Lake Victoria case study

Photo: Martin VanDer Knapp

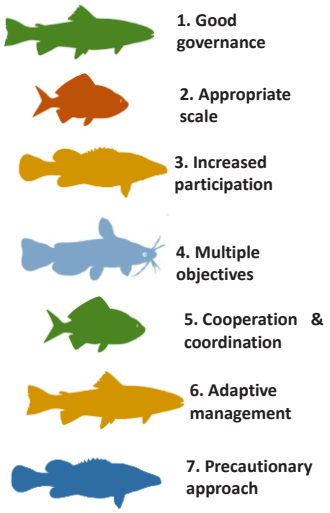
5. Moving towards EAFm 1

2

Session objectives

After this session you will be able to:

- Recognize how countries around Lake Victoria adopted EAFm principles and moved towards EAFm (case study)
- Determine where your country is at in moving towards EAFm
- Identify challenges your country faces in moving towards EAFm



5. Moving towards EAFm 2

Lake Victoria case study

Photo: Martin VanDer Knapp

5. Moving towards EAFm 1

Session objectives

After this session you will be able to:

- Recognize how countries around Lake Victoria adopted EAFm principles and moved towards EAFm (case study)
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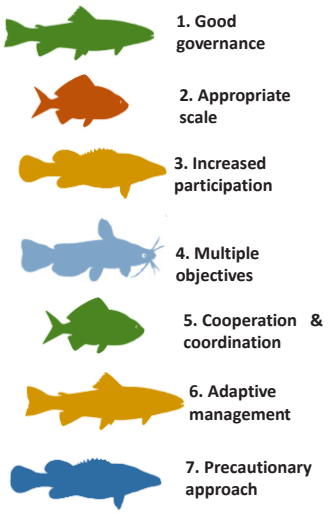


5. Moving towards EAFm 2

Overview – Lake Victoria case study

Uganda, Kenya and Tanzania moving from conventional fisheries management towards EAFm in Lake Victoria (since 1990)

The session will discuss how:

- fisheries management, laws and policies have moved toward EAFm
- seven EAFm principles are becoming adopted into fisheries management

5. Moving towards EAFm 3

Introduction to the Lake Victoria

- Lake Surface area 68 800 km^2
  - Basin population >35 million
  - Lake area shared
    - Republic of Kenya (6%)
    - United Republic of Tanzania (51%)
    - Republic of Uganda (43%)
- Lake is relatively shallow
  - land-based nutrient runoff has effect on water quality
- Largest inland water fishery in Africa

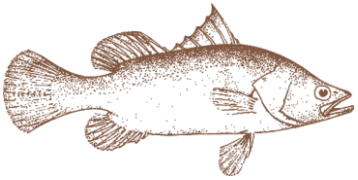
5. Moving towards EAFm 4

Ecology: Drivers changing Lake Victoria

- Introduction of Nile Perch and Tilapia species
- Rapid growth in basin population
- Lake is relatively shallow, major impacts on water quality
  - Land-based nutrient & sediment runoff
  - Watershed degradation & deforestation
  - Lost shoreline wetlands, less sediment trapping
  - Industrial, urban pollution
  - Reduced water inflows, lower rainfall and industrial/urban abstraction

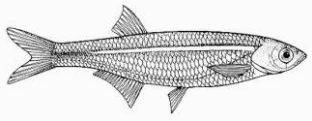
5. Moving towards EAFm 5

Fisheries: of Lake Victoria



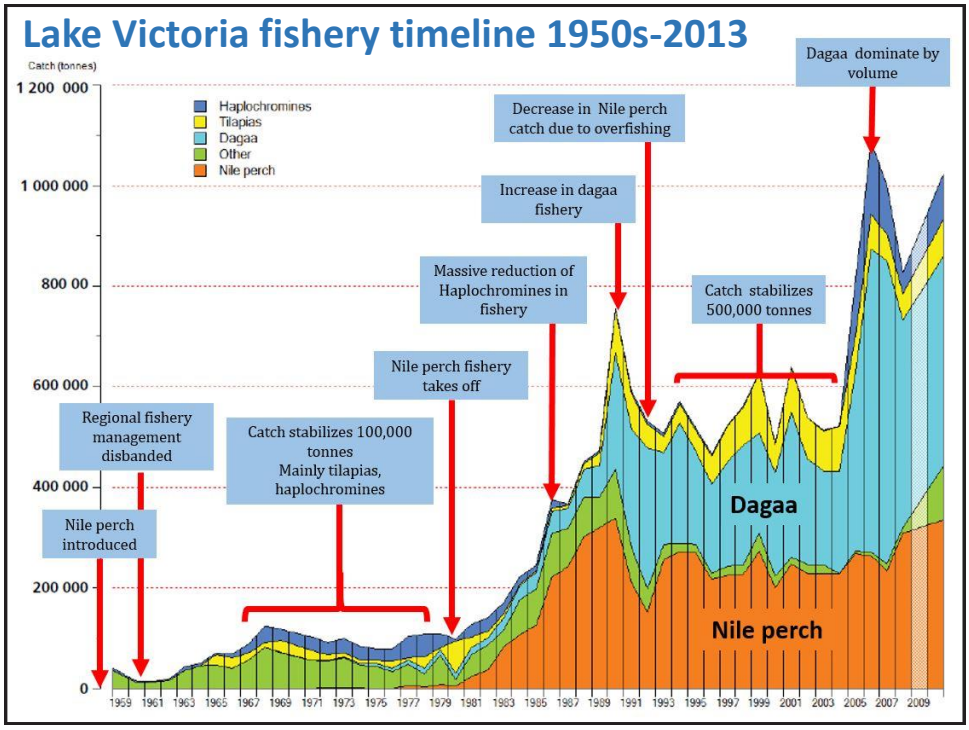
Dominated by three species

- Nile perch
- Nile tilapia
- Dagaa/Mukene/Omena



> 95 % of the total fish catch

5. Moving towards EAFm 6



Livelihoods and socio-economics

- Fish production relatively stable
- Nile Perch international (export) & local value chains
- Contributes 2-3% of national GDP (Kenya, Tanzania, Uganda)
- 3 million people involved in fishery, (800,000 directly)
- Many small scale fishers in small-pelagic fishery
- Dependent women processors and marketers
- Emerging cage-based aquaculture

5. Moving towards EAFm 8

Governance: balancing income & livelihoods

Maximize commercial incomes and export earnings from the Nile Perch fishery and aquaculture?

or…

Sustain the livelihoods of hundreds of thousands of small-scale fishers & value chain participants, who are dependent on the fishery?

5. Moving towards EAFm 9

Development of regional management

- 1994 Lake Victoria Fishery Organization established
- Co-management units start to be established
- 2004 Protocol for Sustainable Development the Lake Victoria Basin developed ratified
- Second phase of LVEMP (2009-2017) prioritizes environmental threats in the Lake
- 2016 3rd fishery management plan recognizes need to balance food security and income generation

5. Moving towards EAFm 10

Moving towards EAFm – 7 principles

1. Good Governance

- LVFO Fishery management plan, harmonizing policies and regulations
- Regional cooperative management framework
- Rights based management >1,000 Beach Management Units (BMUs)
- BMU given legal power to manage their fisheries resources
- User-pays principle (in LVB Commission agreement)

2. Appropriate scale

- 3 countries trans-boundary cooperation: goal of lake-wide management

3. Increased participation:

- Meaningful community representation in decision-making
- Active in fisheries development sector, both responsibilities and benefits
- Preferred entry point for community development intervention
- Take a role in enforcement, tenders for revenue collection, data collection, improvement in fish handling, hygiene and sanitation
- Gender and equity: Women and youth

5. Moving towards EAFm 11

Moving towards EAFm – 7 principles (2)

4. Multiple objectives

- Fisheries & Environmental protection
- LVEMP focus on aquatic habitat health & water drainage basins
- Looking for practical way to avoid environmental impacts
- LVFO monitors environment related to fisheries and aquaculture

5. Cooperation and coordination

- Links between fisheries and environment agencies?
- Cooperation between countries

6. Adaptive management

- Several iterations of FMPs, each drawing on experiences from past efforts

7. Precautionary principle…..not observed

- Risks not considered when Nile Perch introduced- Lesson learned!

5. Moving towards EAFm 12

Case study 2: Lake Malawi/Lake Malombe, Malawi

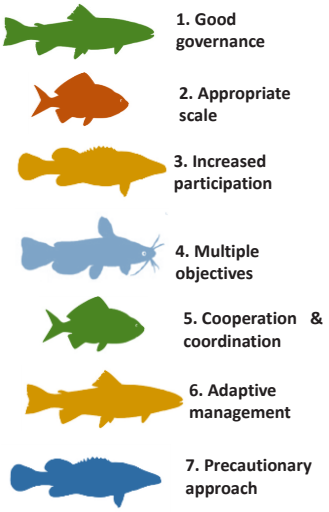
Lake Malawi-Malombe case study

5. Moving towards EAFm 1

Session objectives

After this session you will be able to:

- Recognize how Malawi has adopted EAFm principles and moved towards EAFm (case study)
- Determine where your country is at in moving towards EAFm
- Identify challenges your country faces in moving towards EAFm



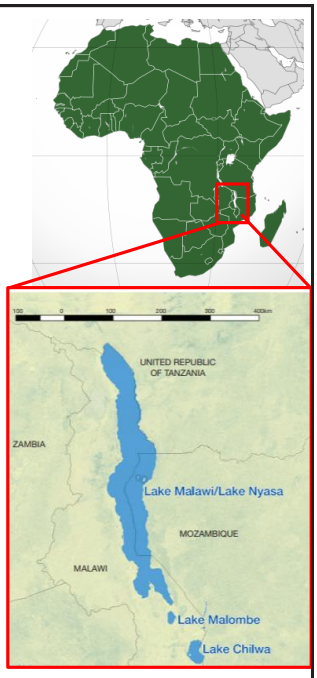
5. Moving towards EAFm 2

Overview: Lake Malawi-Malombe case study

For several decades, Malawi has been moving towards increasing community participation in fisheries co-management

The session will discuss how:

- fisheries management, laws and policies have moved toward EAFm
- seven EAFm principles are becoming adopted into fisheries management



Source: Kolding et al.(2019).Freshwater small pelagic fish and fisheries in major African lakes and reservoirs in relation to food security and nutrition

5. Moving towards EAFm 3

Introduction

This presentation describes EAFm trends for three parts of the southern Lake Malawi system

- SE and SW arms of the main Lake
- Lake Malombe, which lies to the south
- the connecting channel, known as the Upper Shire

5. Moving towards EAFm 4

Ecology: Lake Malawi

- Lake Malawi, known as Lake Nyasa (Tanzania), Lago Niassa (Mozambique)
  - Southernmost of the African Great Lakes in Rift Valley
  - Surface area 29 600 km^2
  - 4th largest fresh water lake (volume), 9th largest (area)
- 706m deep at its deepest point.
  - Far south of the lake is shallower < 200m deep
- Evaporation = 80% of the water loss from the lake
  - considerably more than Shire River outflow at southern end
- Water layers stratified and do not mix

5. Moving towards EAFm 5

Ecology: Lake Malawi (*cont.*)

- SE and SW arms diverse ecosystems : rocky areas, submerged and emergent aquatic vegetation, small islands, and flooded zones
- Important breeding areas/habitats
  - Submerged and emergent vegetation
  - Tributaries flowing into the SE arm and lake - Cyprinid and *clarias* catfish species migrate upstream to spawn in rainy season
  - Shallow water, shoreline: Usipa reported to breed in waters 1-2m deep, along shore of the SW (Morioka & Kaunda 2005)

Threats

- unprecedented extreme weather events
- prolonged heavy wind action
- reduced water levels
- extreme low and high temperatures and unpredictable rainfall patterns

5. Moving towards EAFm 6

Ecology: Lake Malombe

- The third largest water body in Malawi after Lakes Malawi and Chilwa.
  - Surface area = 390km^2 (30km x 15 km)
  - Average depth = 5m.
  - Catchment 3 387km^2
- Bottom substrate is muddy, water is usually turbid
  - Deepest sections follow the path of the original Shire riverbed
  - Shallowest areas are located along the western and south-eastern shoreline

5. Moving towards EAFm 7

Ecology: Lake Malombe (*cont.*)

- Important breeding areas/habitats
  - Vegetation within Lake Malombe and Upper Shire important formany species including *Oreochromis karongae*
  - River inlets/outlets and shallower sections of the lake important nursery habitat
  - Many Lake Malombe fish use remaining emergent and submerged aquatic vegetation areas, and river inlets and outlets during their juvenile and adult stages

Threats

- In recent years dense beds of submerged and emergent aquatic vegetation reduced.
- Affected Chambo stocks by reducing the available breeding habitat

5. Moving towards EAFm 8

Fisheries: Artisanal fisheries of Lake Malawi

- Artisanal fisheries contribute 85 – 90 % of total fish landings
- Multi species/multi gear fishery
- Annual fish catch in Southern Lake Malawi
  - 1970-1980 Chambo dominated catches (declined in the early 1990's)
  - Catch 22 000 metric tonnes (2007 – 2011)
  - Declined to 18 000 tonnes (2012 – 2015)
  - 3 fish groups now dominate catches (Haplochromines, Usipa and Mlamba)
- Fisheries under pressure:
  - open access
  - increasing local population
  - few options for alternative livelihoods outside of fishing.
  - environmental degradation.
  - boom in the construction of resorts

5. Moving towards EAFm 9

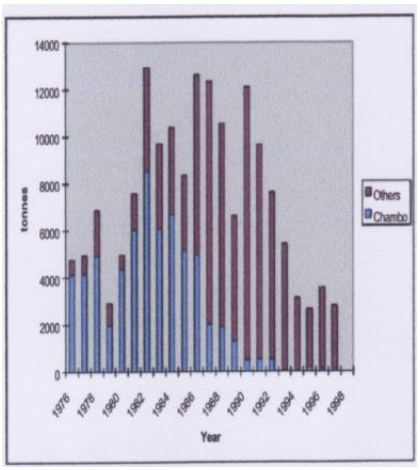
Fisheries: Commercial fisheries of Lake Malawi

- Trawling and purse seining ('ring nets') in southern part of Lake Malawi.
  - By 2016, 32 pair-trawlers & 8 stern-trawlers (catches dominated by haplochromine cichlids)
- Decline in annual landings from >3 000 tonnes (mid-1980s) to <1 000 tonnes (present)
  - increased commercial fishing effort & use of large HP vessels
  - encroachment of trawlers into artisanal fishing grounds and during closed seasons
  - undersized cod end mesh
  - increased number of unlicensed fishing gear operators
- Situation exacerbated by
  - high post-harvest losses due to poor handling and processing
  - environmental degradation & climate change impacts
  - transitioning of the fishery from multi-species to a fishery dominated by a single species- Usipa
  - 2 ornamental fishing operations (Mbuna, highly coloured cichlids).

5. Moving towards EAFm 10

Fisheries: Artisanal fisheries of Lake Malombe

- Only artisanal fishing - no trawlers
- Current fish production from Lake Malombe estimated at around 4 500 metric tonnes/year .
- Fisheries of high local importance.
- Catches declining
- Multi-species and multi-gear fishery.
- Dominant species Haplochromines (Kambuzi and Mbaba)
- 90% of the total landings Chambo catches declined significantly during the period 1975-1998. Now <1% to the total catch..
- Other landed fish species include Mlamba, Usipa and Sanjika.



5. Moving towards EAFm 11

Livelihoods and socio-economics: Employment

Lake Malawi

- SE and SW arms provide full-time fisher livelihoods for around 16 000 people.
- 40 000 other people involved in support activities such as fish trading, boat building fish gear construction.

Lake Malombe/ Upper Shire

- Number of fishers 755 (2010) – 5 398 (2016)

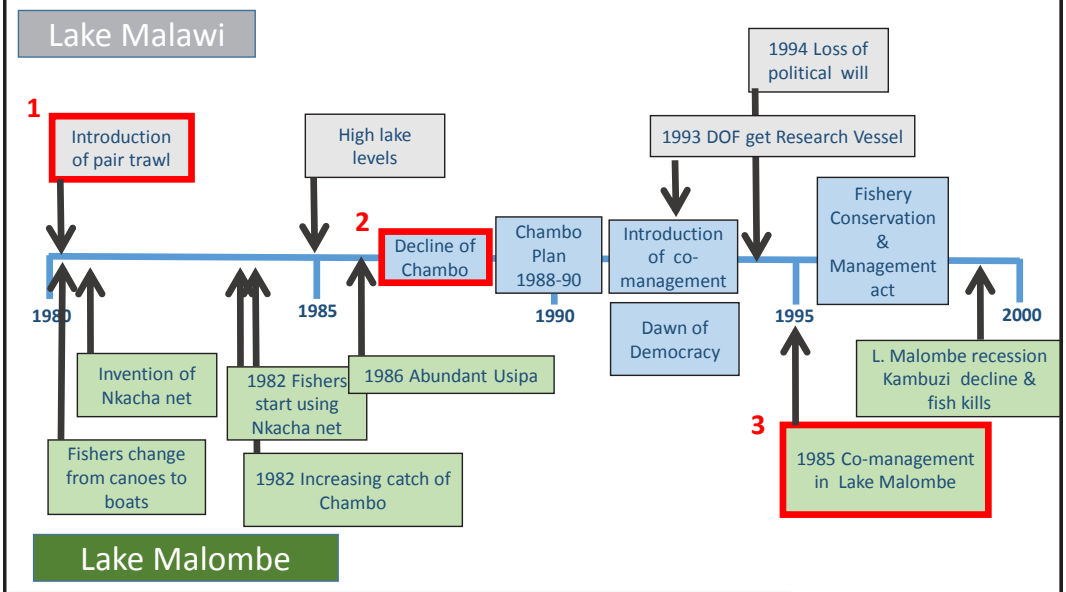
5. Moving towards EAFm 12

Livelihoods and socio-economics: Issues

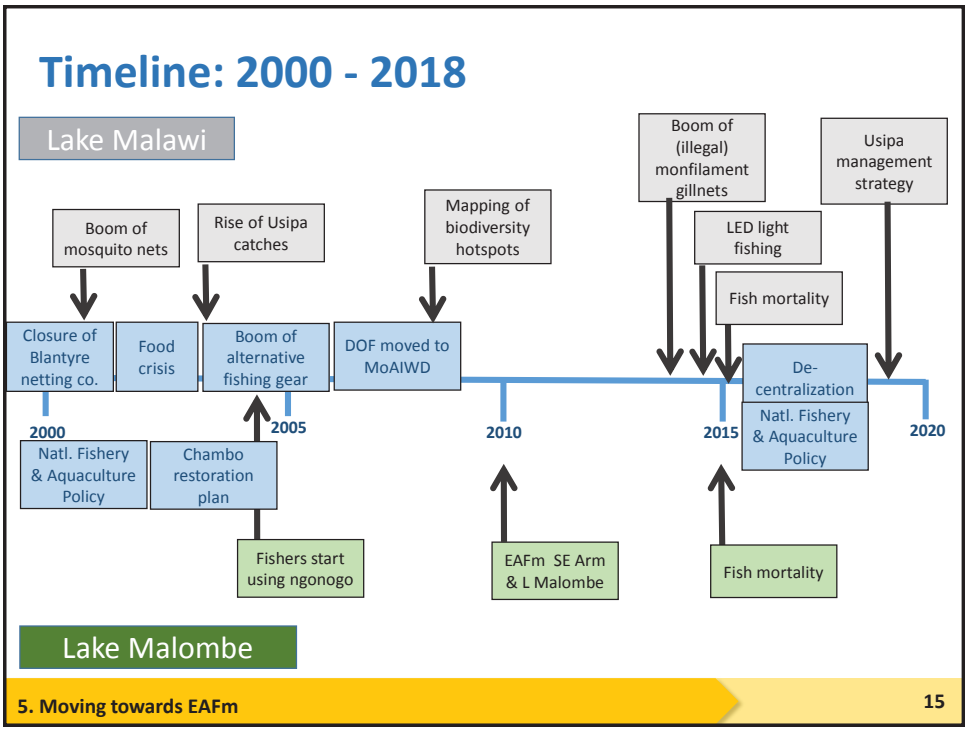
- Conflicts
  - Lake Malawi: Conflict between trawler operators and artisanal fishers
  - Lake Malombe/ Upper Shire: Nkacha fishers active throughout the year;
  - Closed season violations common, fuelling conflict
  - Theft of fishing gears; destruction of fishing gears by nkacha (seines)
- Health: HIV/AIDS Infection rates in fishing communities are higher than national average
- Gender: Fishing on Lake Malawi is dominated by males, but women engaged through ownership of fishing gears as well as engagement in fish trading and processing
- Child Labour: school age children frequently engaged in fishing, fish processing and marketing
- Livelihood viability now threatened by climate change

5. Moving towards EAFm 13

Timeline: 1980 - 2000



5. Moving towards EAFm 14



Governance: Promoting fishery co-management

- Malawi Government objectives
  - Allow fish stocks to recover to mid-1980 levels, when production was highest
  - Recovery of fishery, to base mainly on sustainable harvest of high value Chambo
- Fisheries co-management introduced
  - Pre-1993, fisheries management approach influenced by principles of conservation
  - Still applied to commercial fisheries; fixed no. of fishing units allocated to fishing zones
- Post-1993, increased community participation in fisheries co-management
  - Fisheries extension service strengthened through Participatory Fisheries Management approach
  - Recognition of Local Fisheries Management Authorities
  - e.g. Beach Village Committees (BVCs), River Village Committees (RVCs) & Fisheries Associations (FA)
  - BVCs act as intermediaries between fishing communities and DoF for co-management
- Introduction of sanctuary areas with the aim of improving breeding and nursery conditions for the commercially important fish species.

Moving towards EAFm – 7 principles

EAFm principle	Malawi/ Malombe - How it is being implemented
Good Governance:	Devolution of some fisheries management functions to local government Usipa management strategies in place in Lake Malawi
Appropriate Scale	SE and SW arms of Lake Malawi suitable scale for for EAFm Lake Malombe considered very suitable for EAFm
Increased participation	Relatively long history of local fisheries co-management institutions such as the BVCs and Fisheries Associations established and functioning.

5. Moving towards EAFm 17

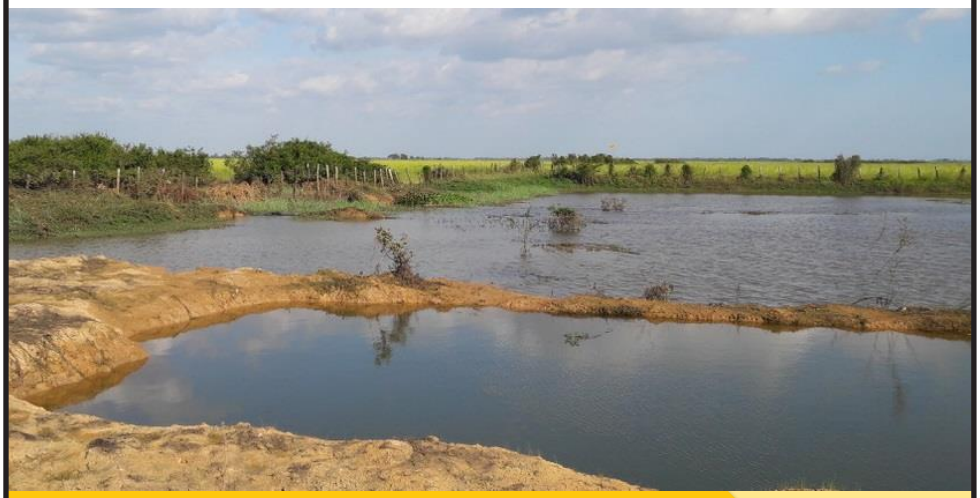
Moving towards EAFm – 7 principles (cont.)

EAFm principle	Malawi/ Malombe - How it is being implemented
Multiple objectives	Conservation and livelihood management objectives Malawi Government objectives to persuade the fishing community: • To allow fish stocks to recover to levels experienced in the mid-1980" and secondly • To restore the recovered fishery to one based mainly on the high value Chambo, which should be harvested sustainably thereafter • Recognition of importance of habitats
Cooperation and coordination	DoF has a number of partnerships with other institutions for natural resource co-management Potential for trans-national management of Lake Malawi
Adaptive Management	Management decisions supported by historical biological studies/data
Precautionary principle	Rules in place regarding introductions of exotic Nile Tilapia

5. Moving towards EAFm 18

Case study 3: Community fish refuges, Cambodia

Strengthening Community Fish Refuge & Ricefield Fisheries, Cambodia Case study

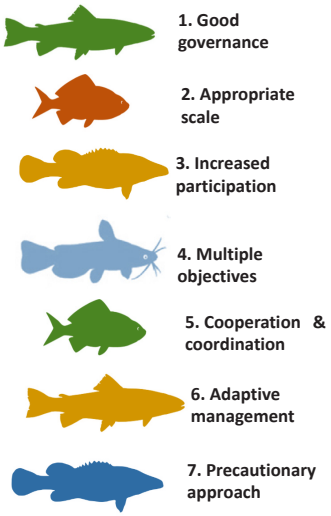


5. Moving towards EAFm 1

Session objectives

After this session you will be able to:

- Recognize how Cambodia has adopted EAFm principles and moved towards EAFm (case study)
- Determine where your country is at in moving towards EAFm
- Identify challenges your country faces in moving towards EAFm

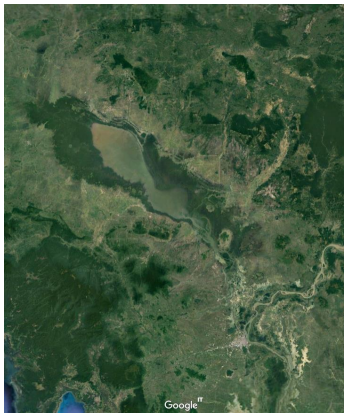


5. Moving towards EAFm 2

Cambodia: Strengthening Community Fish Refuge & Ricefield Fisheries Co-management

The session will discuss

- The emergence of community fisheries refuge (CFR) and ricefield fisheries co-management in Cambodia as an example of EAFm.
- How Government policies have changed to incorporate RFF
- The important roles that INGOs have played.
- Opportunities for strengthening RFF and CFR co-management using EAF principles.



5. Moving towards EAFm 3

Ecology: Cambodian ricefield fishery system

- During the monsoon season, rain-fed and deep-water rice-ecosystems cover about 1.8 million hectares in Cambodia
- In Cambodia, many rural farming families are engaged in small-scale fishing in and around rice fields.
- A practice that is probably as old as rice farming itself.
- For many decades the science of ricefield fisheries 'fell between two stools'- capture fisheries & aquaculture,

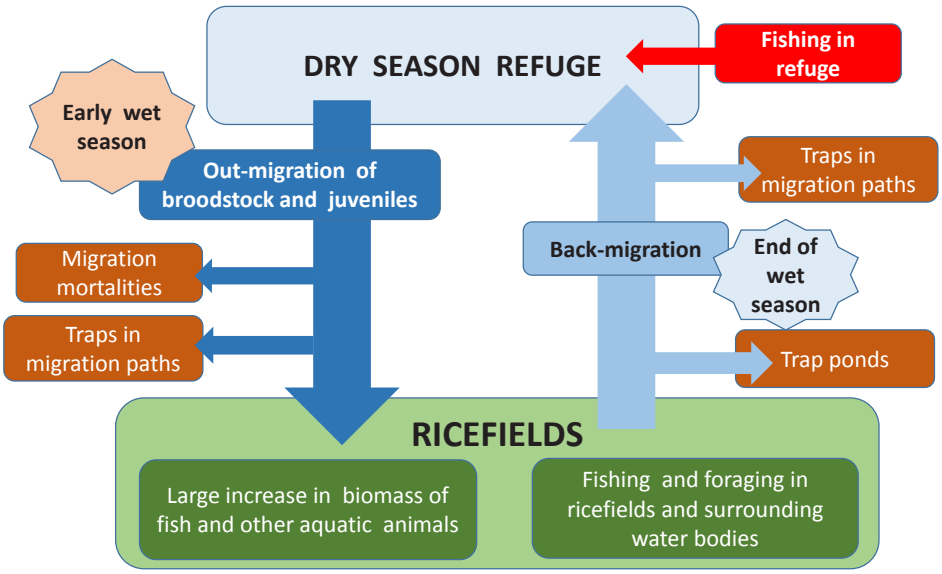
5. Moving towards EAFm 4

Ecology: Cambodian ricefield fishery system *(cont.)*

- The movement of wild fish between flooded areas is thought to play an important part in the overall productivity of the ricefield fisheries.
- Productive CFR/RFF systems should contain
  - Dry season refuge areas,
  - Channels for out-migration and back-migrations of fish
  - Rice fields and adjacent water areas.

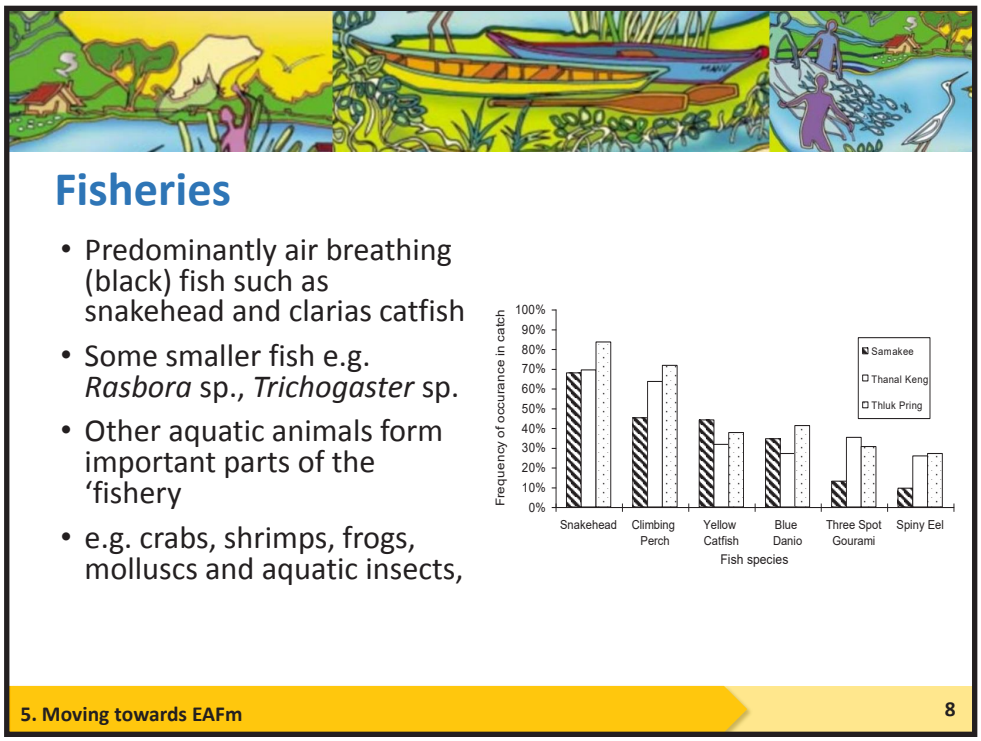
5. Moving towards EAFm 5

Ecology: How ricefield fishery refuges work

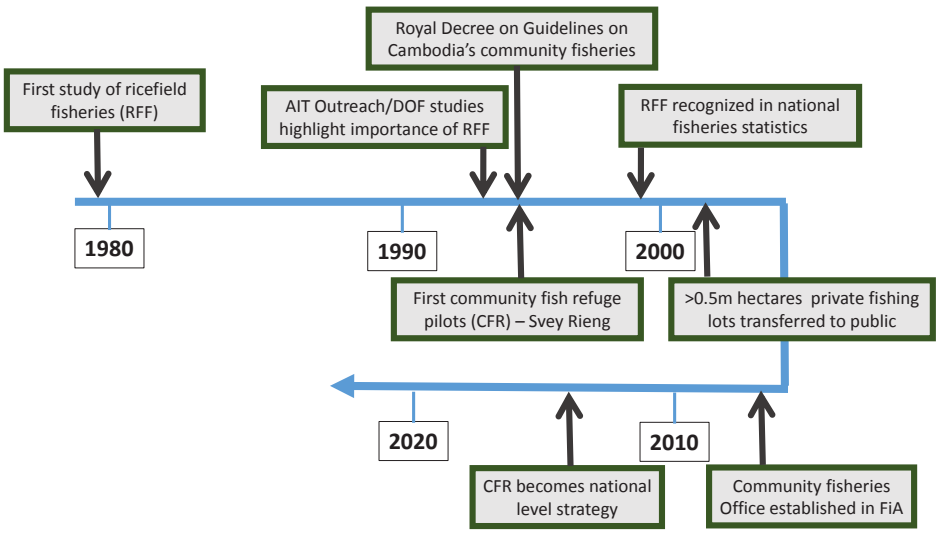


5. Moving towards EAFm 6


Fisheries: in ricefield systems
5. Moving towards EAFm
7


Fisheries
• Predominantly air breathing (black) fish such as snakehead and clarias catfish
• Some smaller fish e.g. *Rasbora* sp., *Trichogaster* sp.
• Other aquatic animals form important parts of the 'fishery
• e.g. crabs, shrimps, frogs, molluscs and aquatic insects,
Frequency of occurance in catch
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Samakee
Thanal Keng
Thluk Pring
Snakehead
Climbing Perch
Yellow Catfish
Blue Danio
Three Spot Gourami
Spiny Eel
Fish species
5. Moving towards EAFm
8

Fisheries timeline



5. Moving towards EAFm 9

Ecology: Threats

- A number of sources;
  - increases in fishing pressure;
  - agriculture intensification;
  - modified ecosystems,
  - loss of flooded forest and bush habitats;
  - irrigation/road infrastructure development, creating obstructions to fish movement.

5. Moving towards EAFm 10

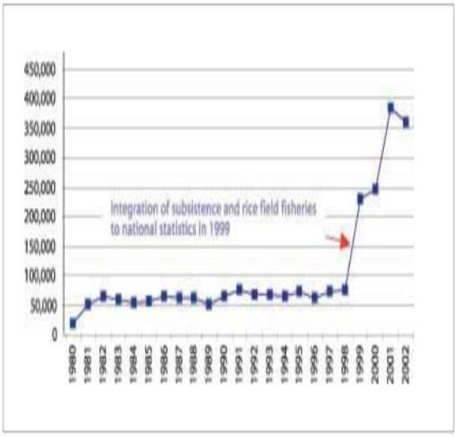
Livelihoods and socio-economics

- Until 1990's importance of ricefield fisheries to rice farming communities largely ignored
  - by governments, researchers and rural development
- Produce by-passes conventional value chains and markets
  - = underestimation of value and importance.
- Studies in Cambodia from 1994 highlighted the importance of aquatic ricefield animals
  - for nutrition
  - incomes, (particularly from trap ponds catches)
- Generally, poorer households involved in ricefield fisheries, including landless households.
- Women and children play major roles in fishing and processing.

5. Moving towards EAFm 11

Governance: Fisheries

- Recognition of RFF contribution estimated for Cambodia fisheries statistics from 1999
- Trap pond excavation remains banned within Great Lake floodplain, between national highways 5 & 6
- Policy target: 1 200 communes (75% of national total) to have sustainable community fish refuges by the end of 2019



5. Moving towards EAFm 12

Moving towards EAFm – 7 principles

EAFm principle	How it is being implemented
Good Governance:	Decentralised governance to community level. Benefits from fisheries spread more broadly
Appropriate Scale	Zone of influence used to scale community fisheries refuge plans. Where ZOI overlap, then appropriate scale can increase.
Increased participation	Communities establish committees for CFR management Involvement of communities in developing ricefield fisheries/refuge plans and monitoring impact of management measures.
Multiple objectives	Most CFR are multi-purpose resources CFR plans include other community demands such as irrigation, livestock watering, drinking water supply.

5. Moving towards EAFm 13

Moving towards EAFm – 7 principles (2)

EAFm principle	How it is being implemented
Cooperation and coordination	Communities CFR ZOI may overlap, creating opportunities for management cooperation .
Adaptive Management	Communities adjust CFR plans based on the prevailing monsoon conditions and on their experience during previous years. Annual meetings held to agree/adjust management plans. Sharing of experiences between communities, encouraged
Precautionary principle	No stocking of exotic fish species. Strict limitations on adult fish taken from the CFR.

5. Moving towards EAFm 14

Strengthen the capacity to deliver.

- There are significant capacity issues, at all levels to address.
- Scientific understanding of how ricefield fisheries systems operate
  - in different locations
  - in differing flooding inundation years
- Capacity of extension workers to be able to work comfortably with both the ecological and social complexity of RFF
- Capacity to effectively measure impact of RFF co-management interventions
- Capacity of communities to organize themselves effectively;
  - to develop meaningful CFR plans;
  - Ensure co-management compliance within the community;
  - and monitor their effectiveness

Key messages of case study

- EAFM is a step by step process; apply lessons learned along the way
  - increasing stakeholder engagement
  - broadening scale and scope of management
  - built on existing fisheries management
  - strengthen governance
- Many fisheries in the world are doing EAFM in part;
- Each country is a different stage of the journey

Case study 4: Ayeyarwaddy delta, Myanmar

Ayeyarwaddy delta, Myanmar Case study

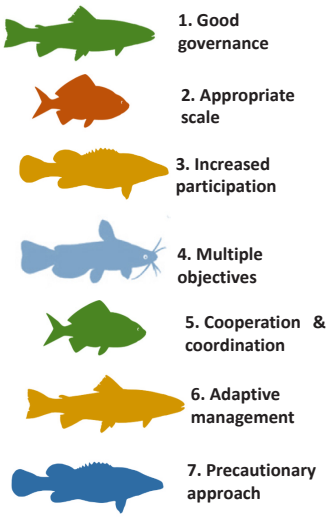
5. Moving towards EAFm 1

2

Session objectives

After this session you will be able to:

- Recognize how Myanmar has adopted EAFm principles and moved towards EAFm (case study)
- Determine where your country is at in moving towards EAFm
- Identify challenges your country faces in moving towards EAFm



5. Moving towards EAFm 2

Strengthening pro-poor fisheries Governance, Ayeyarwaddy Region, Myanmar

- The session will discuss how
- Myanmar's freshwater fisheries laws and policies have been influenced by the EAFm
- The 7 EAFm principles are being adopted into freshwater fisheries management

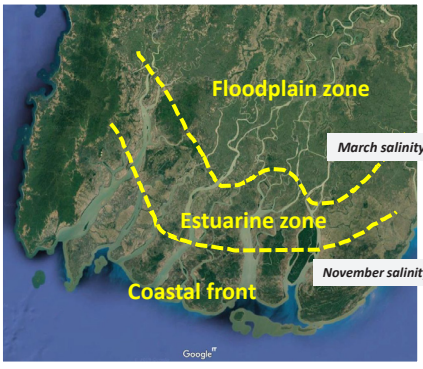
5. Moving towards EAFm 3

Ecology: the delta ecosystem

Ayeyarwaddy Delta

- Extensive river / canal network
- Fish Biodiversity– high
- >388 fish species in the Basin
- 193 (50%) endemic to the Basin,
- 100 (26%) of the endemics are only found in Myanmar.

Ecology influenced by seasonal salt water intrusion and retreat.



5. Moving towards EAFm 4

Ecology: pressures on the system

- Pressures:
  - Intensification of rice farming practices, through inorganic fertilisers, herbicides and pesticides
  - Use of dry season water bodies for irrigation or recession planting
  - Lost floodplain connectivity through roads and embankments, (including aquaculture pond embankments
  - Natural resource degradation and decline in fisheries production
- Have triggered demands from small-scale fishers for sustainable resources co-management

5. Moving towards EAFm 5

Fisheries

- Large and migratory species of commercial significance,
  - Catfishes (*Wallago attu* and Pangasius species),
  - Hilsa, *Tenualosa ilisha* – anadromous- one of the Ayeyarwaddy's most economically important fish species.
  - *Catla catla, Cirrhinus cirrhosus, Labeo calbasu, Lates calcarifer, Pangasius pangasius, Rita sp., Silonia silondia. Chana striata, and Clarias* sp
  - Declining catches have triggered demands from small-scale fishers for sustainable resources co-management.

5. Moving towards EAFm 6

Livelihood and economic contribution

- Delta fisheries exploited by large and small-scale fishers and farmers.
  - Many fishers are full-time and landless
  - Poverty rife in fishing communities
- Important generator of food, employment and wealth
  - Domestic, regional & export markets
- Processing of fish source of income for rural households
  - Women play important roles
- Increasing calls from fishers for
  - more equitable sharing of access to natural resources
  - sustainable resources co-management

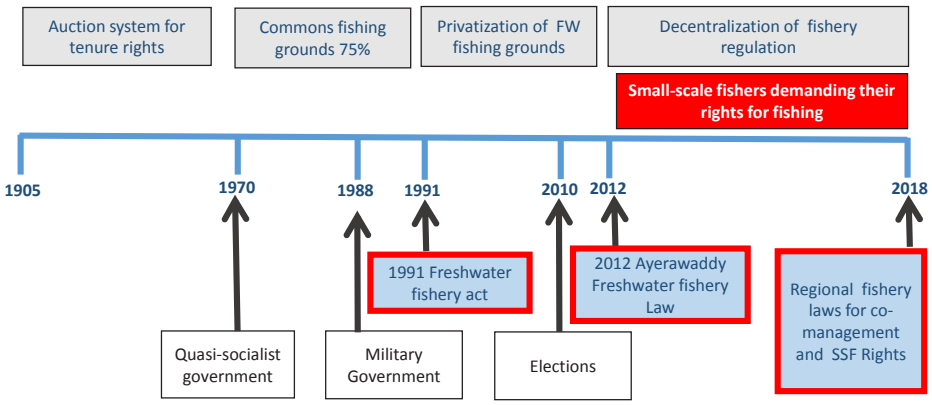
5. Moving towards EAFm 7

Governance: fishery reforms

- Historically, fisheries governance focused on revenue generation
- Gradual reduction in small-scale fisher access to traditional fishing grounds
  - Since 2012, freshwater fishery governance has steadily improved
  - New laws and pro-poor policies introduced in several states and regions
  - Following successful pilots, fisheries co-management being rolled-out
  - Small-scale fisher access to fishing grounds is improving
- The integration of EAFm into this transitional process could
  - strengthen community fisheries co-management capacity
  - provide way for fisheries officers to engage effectively with community fisher organizations

5. Moving towards EAFm 8

Timeline: 1905 - 2018



Source: NAG (2011) Tender process analysis

5. Moving towards EAFm 9

Moving towards EAFm – 7 principles

EAFm principle	How it is being implemented
Good Governance:	Changes in policies and laws attempt to redress gross stakeholder inequalities, and chronic resource degradation
Appropriate Scale	Myanmar's decentralization of inland fisheries governance allows fine tuning of legislation and policies to local conditions and contexts.
Increased participation	At the heart of the governance reforms has been the organization of community and stakeholder groups with an interest in improving fisheries governance, and facilitating their active involvement in policy and law developments.
Multiple objectives	The approach aimed to meet the following objectives • Pro-poor fisheries governance mainstreamed by Government • Improved livelihoods and incomes for small-scale fishers • Stronger community organisations and community leaders • Sustainable natural resources management • Increased transparency, reduced corruption in revenue from fisheries

5. Moving towards EAFm 10

Moving towards EAFm – 7 principles (2)

EAFm principle	How it is being implemented
Cooperation and coordination	Creation of community associations and networks allowed for consistency in approach and the coordination of lobbying efforts. This was essential given the isolation of the many remote and disparate fishing communities in the Delta.
Adaptive Management	Process to develop a legal framework providing more equitable and sustainable benefits a process of trial and error lasting >10 years. Lessons from other countries, (e.g. Cambodia, Thailand) crucial in showing alternative governance systems in operation, and facilitated the flexible approach adopted by law and policy makers.
Precautionary principle	Reforms proposed and subsequently agreed, did not attempt to displace the existing leasehold and tender systems. Sought to increase stakeholder benefits in lower value fisheries. Preceded by extensive piloting by CSOs to demonstrate how community co-management approaches could benefit poorer fishing households and improve local natural resources management.

5. Moving towards EAFm 11

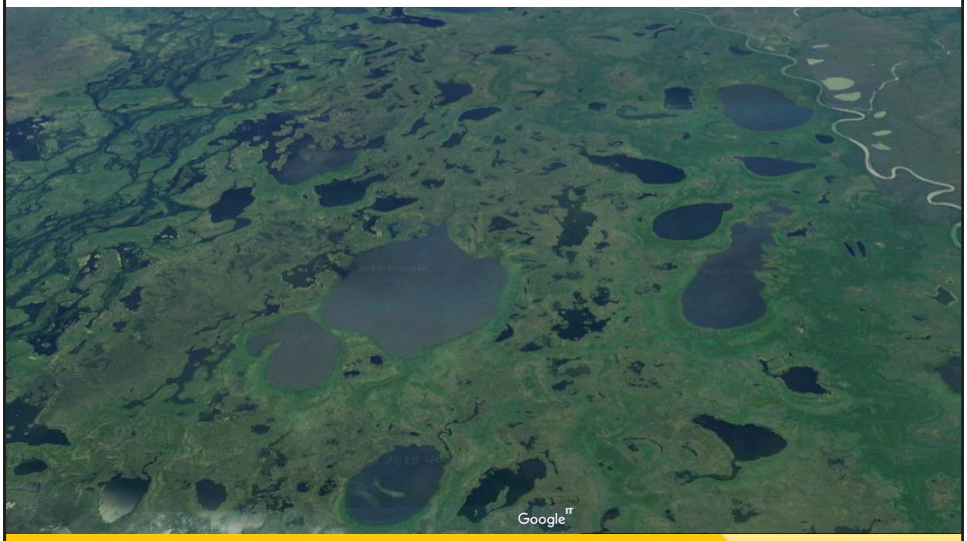
Strengthen the capacity to deliver

- NGOs and CSOs leading the capacity building of community fisheries organizations
- Conservation in resource management plans generally weak.
- The integration of EAFm could improve the extension capability and impact of the DoF,
  - Provide tools for fisheries officers to engage effectively with community fisher organizations
  - Strengthen community co-management capacity leading to more sustainable fisheries and their equitable use

5. Moving towards EAFm 12

Case study 5: the fishery of the Brazilian Pantanal

Pantanal case study



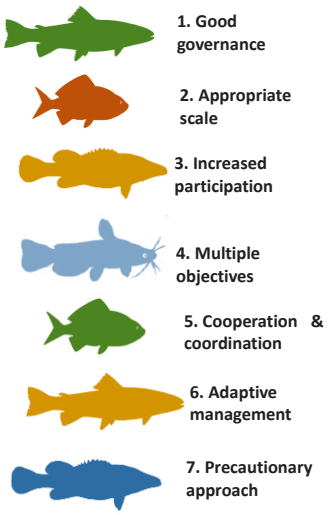
5. Moving towards EAFm

2

Session objectives

After this session you will be able to:

- Recognize how Brazil has adopted EAFm principles and moved towards EAFm (case study)
- Determine where your country is at in moving towards EAFm
- Identify challenges your country faces in moving towards EAFm



5. Moving towards EAFm 2

Overview – Brazilian Pantanal case study

- This presentation describes the fisheries and the outcome of management policies in the Brazilian part of the Pantanal
- National policies have converted fisheries of the Pantanal from a 'food fishery' to a recreational fishery, with impacts on the riparian population.
- At the same time external pressures are affecting the system.
- The session will discuss how:
  - The approach to fisheries management
  - How environmental laws and policies have affected the sustainability of the fisheries

5. Moving towards EAFm 3

Introduction to the Pantanal

- The Pantanal, is a lowland depression in the Upper Paraguay river basin.
  - world's largest continuous wetland
  - Covers ~ 140 000 km^2 (3% of the world's wetlands)
- Situated mainly in two Brazilian states Mato Grosso and Mato Grosso do Sul
  - smaller pockets in neighbouring Plurinational State of Bolivia (10-15%) and Paraguay (5-10%)

Source: Google Earth

5. Moving towards EAFm 4

Ecological: Ecosystem

- The Pantanal is a huge network of grasslands, scrubs, forests, marshes, lagoons, rivers, lakes and marshes
- One of the most biologically diverse systems in the World
- Seasonal shift between a predominantly terrestrial to a mostly aquatic ecosystem
  - Fauna and flora adapted to this dynamic ecology
  - Fish spawn at the onset of the flood and colonize flooded areas for feeding and growth
  - When the water withdraws, the fish seek refuge in permanent waterbodies in mass migrations (a phenomenon known as *lufada)*

5. Moving towards EAFm 5

Ecological (*cont.):* Agriculture

- Colonized by indigenous hunter-gatherers 3000 BC
- Main economic activities: cattle ranching, farming of rice, soy bean, corn, and sugar cane, artisanal fishing, and tourism (principally sportfishing).
- The wet-dry regime and the infertile land unsuitable for intensive agriculture, and the region remains thinly populated
- Surrounding plains are among the most intensively farmed areas in Brazil
  - Subject to high and increasing stress from pesticide use, damming of tributaries, deforestation, and mining of gold, diamonds, iron, and manganese
  - Deforestation on the plateaus, where the rivers feeding the Pantanal originate, cause erosion, high sediment loads and unstable river channels

5. Moving towards EAFm 6

Ecological (*cont.):* Threats to the Pantanal

- There are around 40 dams (mainly for hydropower) in the region and an additional 101 are planned for construction in the headwaters.
- Exotic fish species
  - transferred from the Amazon Basin,
  - escapees have established populations in the wild.
- Several exotics hybridize with native species.
- Possible future threat to the Pantanal ecosystem is the Paraguay-Paraná Waterway Project (Hidrovía)
  - Plan to interconnect Argentina, Bolivia, Brazil, Paraguay and Uruguay by converting the Paraguay and Paraná rivers into navigable canals
- Climate change is predicted to affect the alternating flood and drought cycle over the next decades affecting the Pantanal's delicate ecosystem.

5. Moving towards EAFm 7

Fisheries: Small-scale fisheries

Mato Grosso do Sul

- 1980s: Annual catch: 2 206 tonnes; CPUE ~ 121 kg/fisher/day
- 1994-1999: CPUE 11.5 kg/fisher/day
- By 2016: Annual catch only 187 tonnes
  - Illegal fishing (perhaps 50% of registered commercial catches)
  - subsistence fishing (focussing on non-commercial species).

5. Moving towards EAFm 8

Fisheries: Recreational fisheries

- In 1980's: 17 000 Recreational fishers per year
- Since the 1990's: Recreational fishers have landed at least half of the fish in most years, and in some years up to 80% of the catch.
  - the total value of the recreational fisheries was between USD 35 and 56 million.
  - 1999, Mato Grosso do Sul received 59 000 tourist fishers.
- After the peak, the number of recreational fishers sharply declined and dropped to just 15 000 by 2006

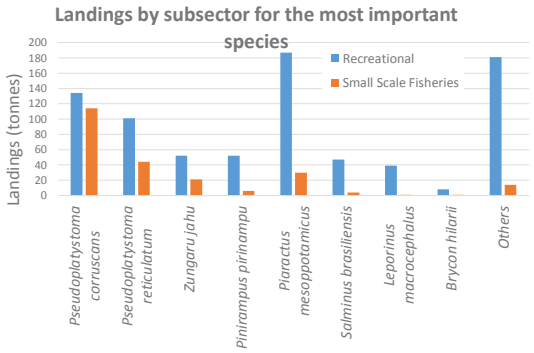
5. Moving towards EAFm 9

Fisheries: Recreational fisheries (*cont.)*

- Decline in number of recreational fishers appears more related to restrictions put on them (ie. catch quotas, compulsory release of fish) than competition with artisanal sector
  - 2000 quota for recreational fisheries reduced from 25 kg/trip to 15 kg/trip
  - 2003 further reduced to 10 kg plus one fish of any size and five piranhas.
  - 2006 only capture of one scaled and one scale-less fish allowed
  - For 2019, quota is 5 kg plus one fish of any size, and up to five piranhas.
- Every time the government has tightened the restrictions on the recreational fisheries fewer people have arrived in the Pantanal.

5. Moving towards EAFm 10

Fisheries: SSF vs recreational landings



Subsistence fishers **tend to capture mostly species that are of little interest to recreational and commercial fishers** such as piranhas

Data from SCPESCA/MS

5. Moving towards EAFm 11

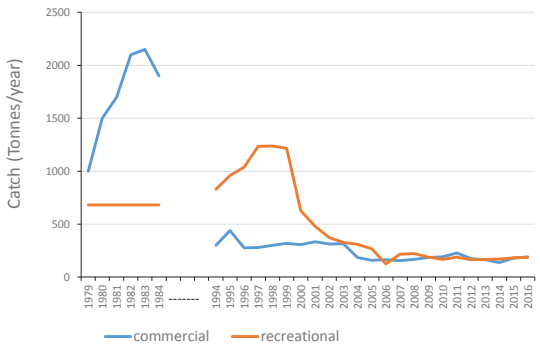
Fisheries: State of fish stocks

- Available studies indicate that *Pacu* (*Piaractus mesopotamicus*) is overfished since 1994, both abundance and size of the fish have decreased.
- The exploitation of the catfishes *cachara* (*Pseudoplatystoma reticulatum*) and *barbado* (*Pinirampus pirinampu*) are near the maximum sustainable level.
- Other species are not overfished.

Mateus, Vaz and Catella 2011.

5. Moving towards EAFm 12

Fisheries: Catches in the Pantanal



Catches by recreational and artisanal fishers in Mato Grosso do Sul (1979 - 2016)

Catches were higher in 1980s and declined by 2000

This is due to restrictions on fishing, to overfishing of the stock.

Data from SCPESCA/MS and Mateus, Vaz and Catella 2011.

5. Moving towards EAFm 13

Economic contribution: Environmental services

Ecosystem services provided by the Pantanal

- valued at 8 133 – 17 490 USD/ha/year (Moraes 2008)

Environmental services include:

- Reduce and delay the flood, and risk of flooding property downstream
- Remove sediment and pollutants including heavy metals
- Ensure water supply by recharging aquifers
- Fishing
- Carbon sink
- Tourism - 150 000 tourists ~ USD 150 million
- Sport fishing is the main tourist attraction valued USD 35 - 56 million per year.

5. Moving towards EAFm 14

Economic contribution: Income from fisheries related activities in the Pantanal

Type of activity	Necessary investment	Net earnings (USD/month)	
		Low season	High season
Bait gathering	Low	86	292
Bait middleman	Middle	106	862
Artisanal fisherman	Low	90	297
Fisherman owning a boat	High	153	1 323

From Chiaravallotti 2019

5. Moving towards EAFm 15

Governance: Fisheries management

- For management purposes fishers are divided in 3 groups:
  i. subsistence fishers,
  ii. artisanal or professional fishers and
  iii. recreational or sportfishers.
- The second and third group of fishers are regulated,
  - only the second group is allowed to sell their catches
  - the other two may land fish for own consumption only

5. Moving towards EAFm 16

Governance: Fisheries management (*cont.*)

Management regulations include:

i. minimum size for the most important commercial species
ii. control of fishing effort through fish landing (recreational and commercial fisheries), and transportation quotas
iii. a closed season during the reproductive period of commercially important fish species between November and February
iv. establishment protected areas where only catch-and-release is allowed

5. Moving towards EAFm 17

Governance: Fisheries management (*cont.*)

- In Mato Grosso do Sul, three different laws were passed between 1983 and 1994 forbidding the use of all fishing nets
- When the regulations on fishing gear was first introduced the fishers ignored it due to the economic impact it had on them, but enforcement was strengthened
  - Initially cast nets were allowed, but only for *Prochilodus lineatus*,
  - Since 1993, cast nets banned even for this species eliminating any commercial exploitation of this species - previously one of the most important in the commercial fisheries.

5. Moving towards EAFm 18

Governance: Traditional fishing gears

- Range of traditional gears use in small-scale fishery
  - Fixed buoy, buoy, cast nets, set hooks, drift nets/gillnet, bow and arrow, fish light attractor
- All are now illegal or their use severely restricted
  - This has restricted the targeting of some commercially important species
  - Enforcement has been strengthened
  - Today, commercial fishermen in the Pantanal can legally only use hook and line
- There is a catch quota of 400 kg of fish per month

Mateus, Vaz and Catella 2011.

5. Moving towards EAFm 19

Governance: Impact on employment

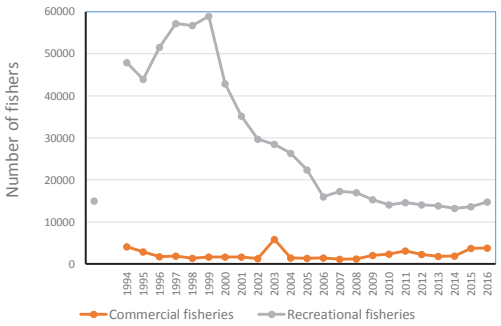
- The regulations forced professional fishermen forced to seek alternatives
  - as guides, and boat drivers
  - capturing and selling live bait to the recreational fishers
  - Bait fishers extract 16 million fish and crabs for sale to recreational fishers
- In the region of Corumbá estimated that 165 fishermen generate a gross revenue of almost USD 3 million per year
- More recently some fish farmers also specialise in producing baitfish

Barletta et al. 2016.

5. Moving towards EAFm 20

Governance: Commercial and recreational fisher numbers

Data from SCPESCA/MS



Declining number of fishers due to restrictions

1994: 4 073 commercial fishers

2016: 3 826 commercial fishers

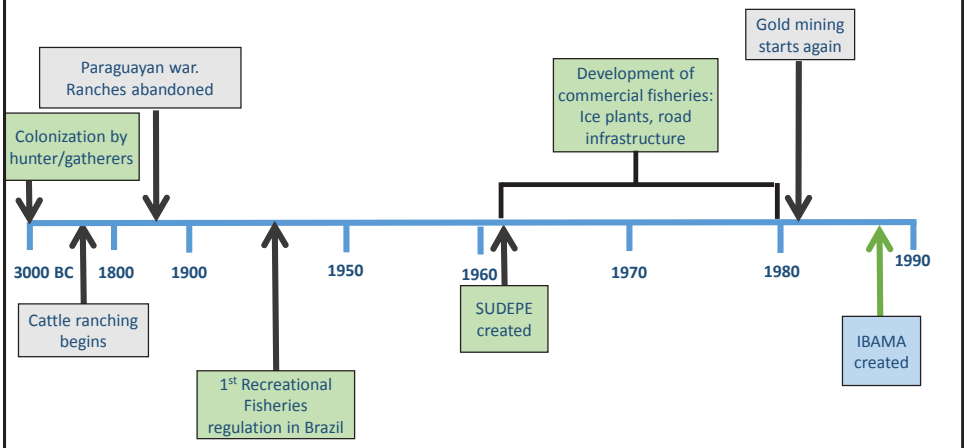
1980s :~15 000 recreational fishers per year

Beginning of 1990s increasing until reaching a maximum of 59 000 in 1999

After restrictions, declined sharply to the current level of about 17 000

5. Moving towards EAFm 21

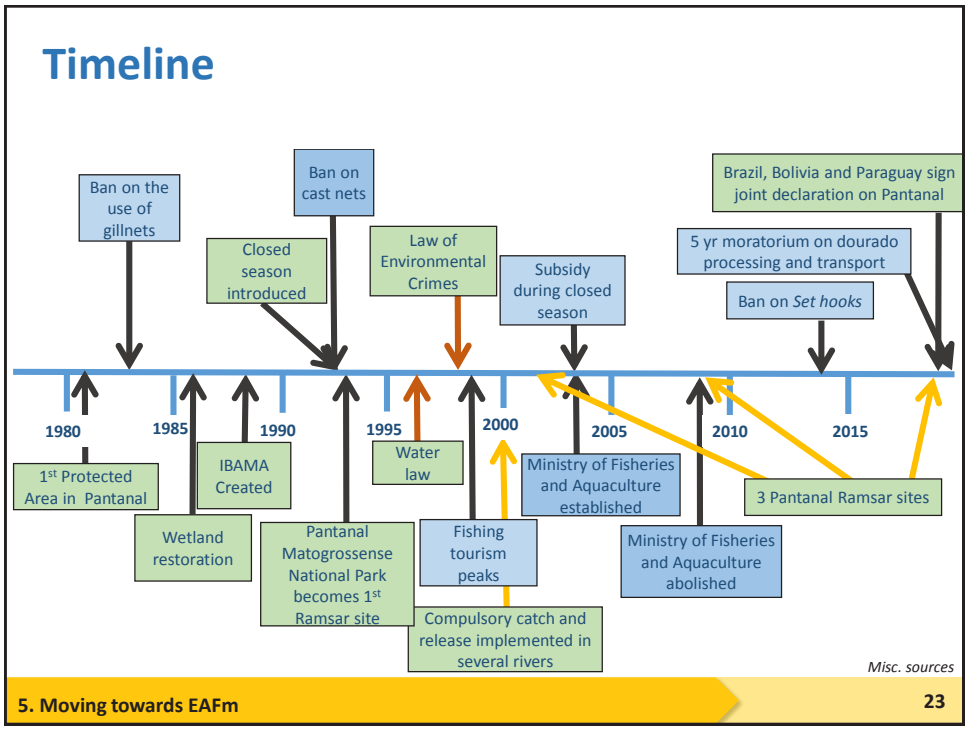
Timeline



SUDEPE: Superintendence for Fisheries Development
IBAMA: Brazilian Institute of Environment and Renewable Natural Resources

Mostly: Carolsfeld et al. 2003

5. Moving towards EAFm



EAF Principle	How it is being implemented
Good governance	There are elements of good governance in the legislation. However, at the local level top-down policies favour the recreational fisheries at the detriment of the artisanal sector.
Rights based fisheries management	Traditional rights based systems still exist in places in the Pantanal. However, these are not considered in the governance system, and do not apply to the recreational fisheries.
Community participation	The efforts to involve communities in decision making processes appear to be small and scattered.
Gender and equity	There is very little information about the involvement of women in the fisheries sector – except as bait fishers.
The precautionary principle	The legislation attempts to maximize size rather than maximum sustainable yield.
Sustainable resource utilization	Fisheries resources are very lightly exploited compared to other wetlands in the world.
Environmental protection	The Pantanal wetland itself remains in good shape, but is under pressure from pressures in the upper parts of the basin. Although environmental legislation is in place, large-projects remains a looming threat potentially reinforced by climate change.
User pays principle	Recreational and commercial fishing is licensed.

5. Moving towards EAFm 24

This Ecosystem Approach to Fisheries management training course (Inland Fisheries) is designed as a complete training course for the sustainable management of inland fisheries using the ecosystem approach. It is targeted at middle-level fishery and environment officers, extension workers, facilitators and other stakeholders engaged in the planning and management of inland fisheries. This training course is designed to be applicable to many inland fishery contexts around the world (including overlapping freshwater fishery/aquaculture systems). It is also intended to be adapted to suit specific local contexts. This volume is VOLUME 2: INLAND FISHERY CASE STUDIES and contains five example case studies of how EAFm approaches can support the management of inland fisheries. These case studies are intended for use in Module 5 of the training course.

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