Implementing the ecosystem approach to aquaculture

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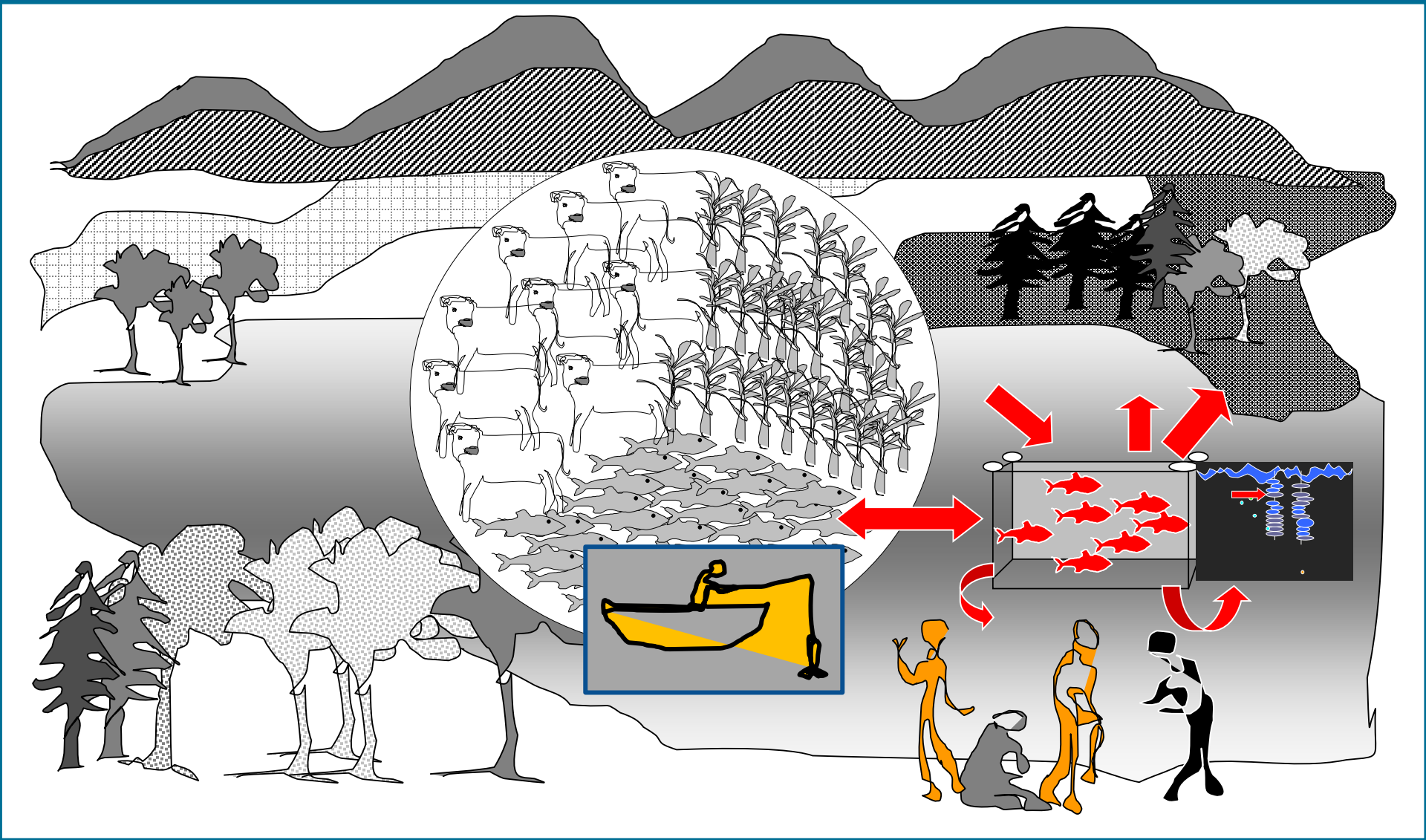
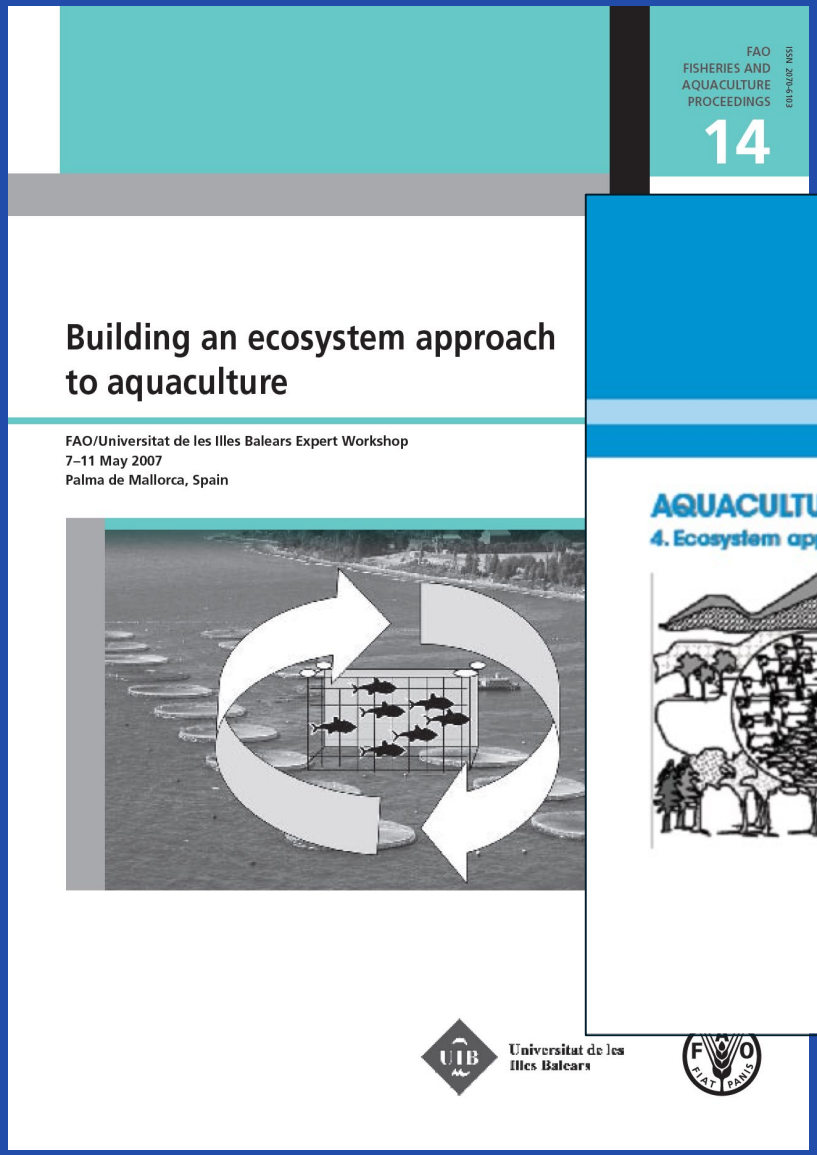
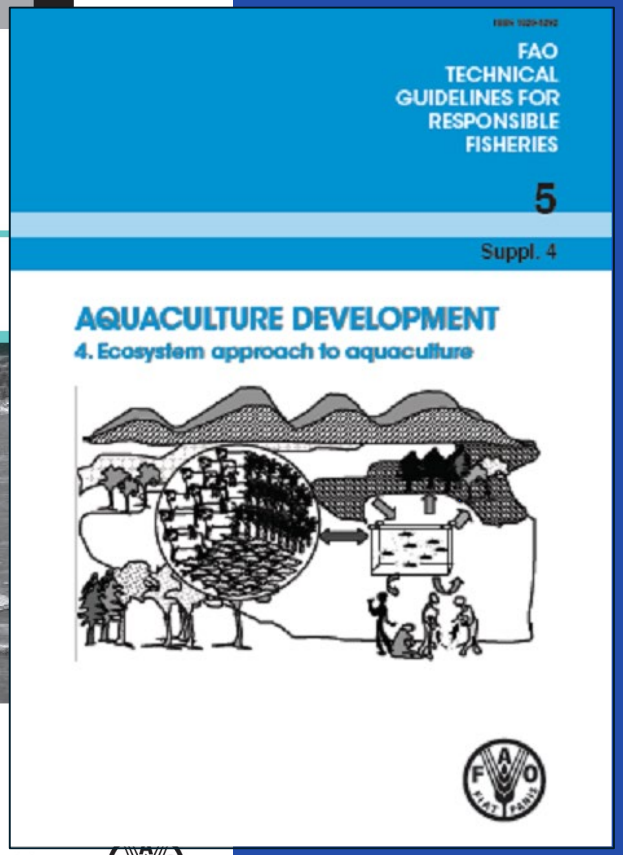
- Developing aquaculture as a sustainable business requires clear objectives and national (and local) policies. Also requires a global perspective specially in the case of mariculture
  - Capacity to properly balance the economic, the social and environmental objectives (very difficult!),
    - It is relevant to protect and preserve the aquatic ecosystems that are common property
    - Requires ensuring that revenues reach the local areas and improve food security and development
    - Must ensure the sustainability of assets for the investors, e.g. user rights, water availability etc.

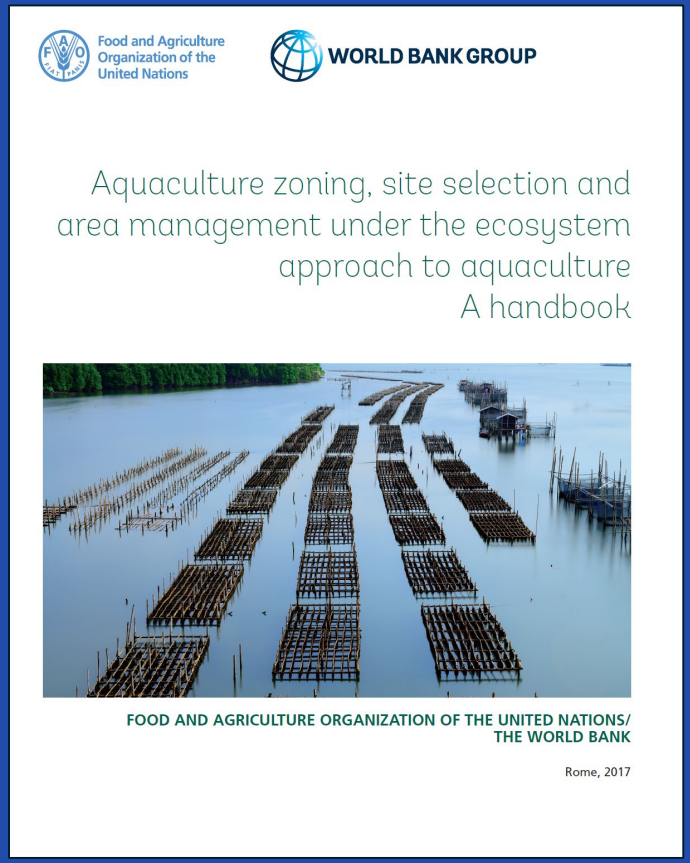
The ecosystem approach to aquaculture (EAA) as a relevant strategy to achieve sustainability objectives of the sector



The Ecosystem Approach to Aquaculture was coined by FAO in 2009







- **"An Ecosystem Approach for Aquaculture is a strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems".**

The strategy can be implemented in a water body, in a country, in a region etc. although ecological and social boundaries have to be considered

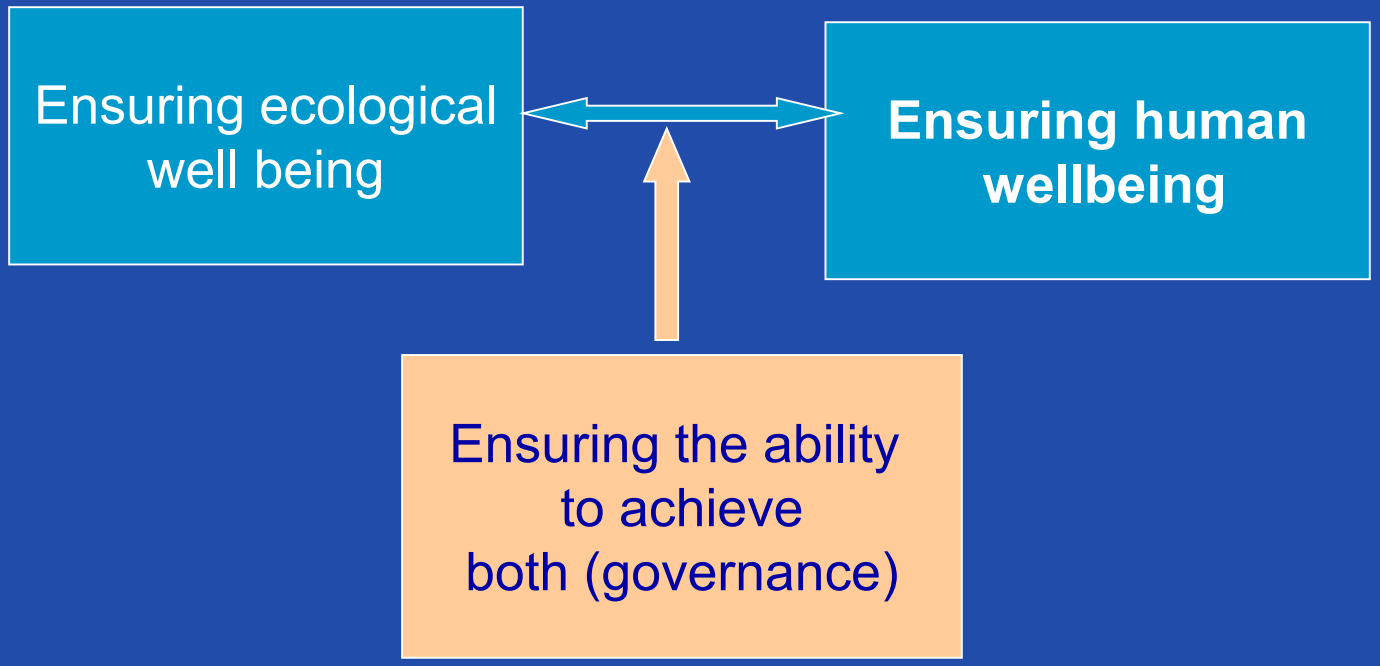
The EAA is guided by three main principles:

1. **Aquaculture should be developed in the context of ecosystem functions and services (including biodiversity) with no degradation of these beyond their resilience**

2. **Aquaculture should improve human-well being and equity for all relevant stakeholders.**

3. **Aquaculture should be developed in the context of other sectors, policies and goals as appropriate.**

The Strategy has these three objectives at the core



1. Initiation and Planning
Scoping and Baseline Data
Broad Objectives

- Defining the management area/unit
- Basic information about the aquaculture system in that unit
  - Stakeholder analysis
  - Institutional analysis
- Agreement on general objectives by all stakeholders

2. Identify and prioritize Issues
Component Trees
Risk Assessment

- Issues and problems identified, prioritized and agreed upon by the stakeholders

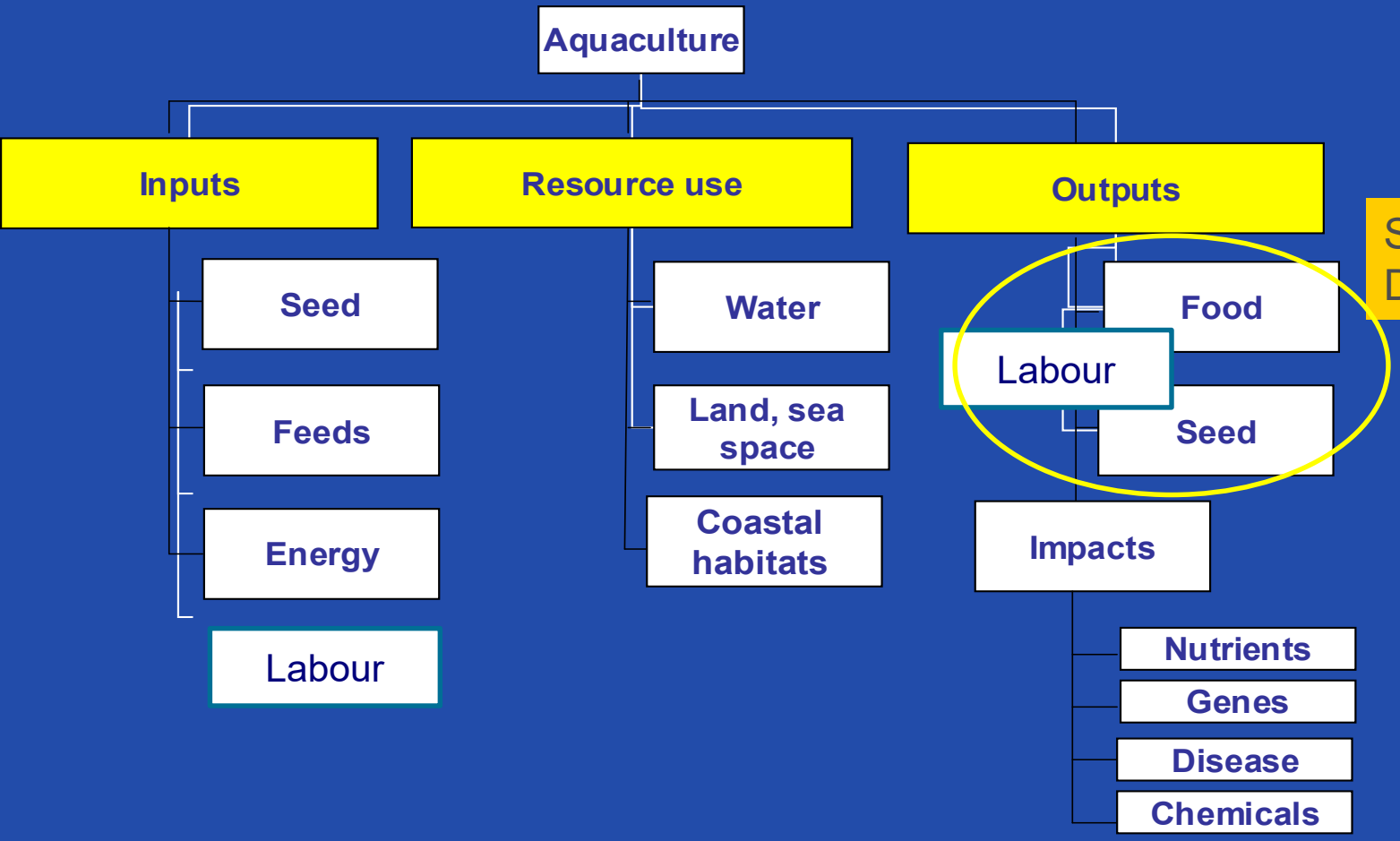
3. Develop Management System
Set Operational Objectives
Select Indicators
Evaluation/Selection of Mgmt Options

- For each priority problem, operational objectives and indicators identified
- Management options identified (cost-benefit analysis), discussed and agreed upon by stakeholders

4. Implement and Monitor
Finalizing Management Plan
Formalize Management Plan
Review Performance
Report and Communicate

Management Plan

Identification of issues and developing managment plans looking in to Inputs, Resource use and Outputs addressing social, environmental and governance is essential.



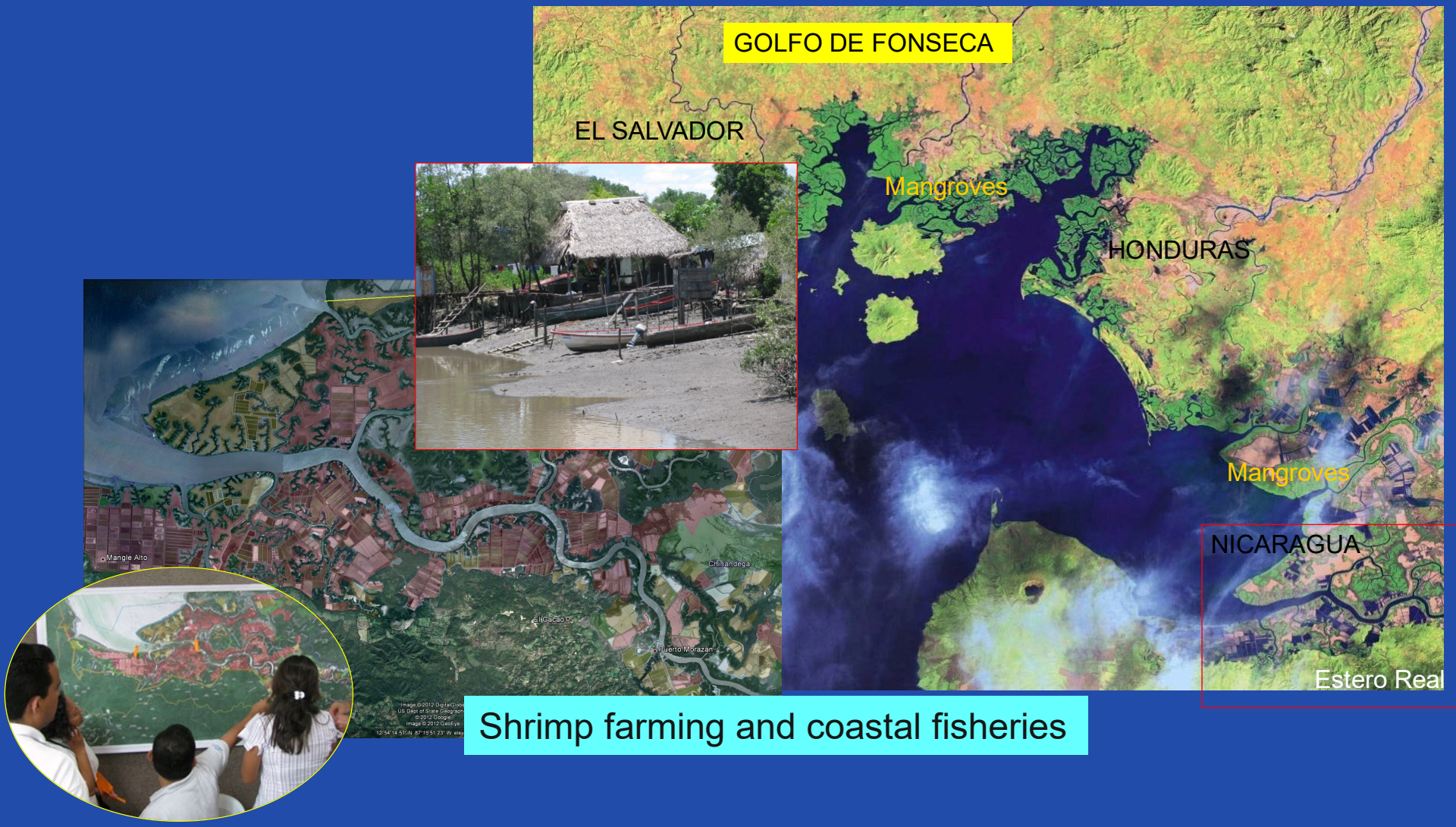
Ecological Dimension

Socio-economic Dimension

Institutional Dimension

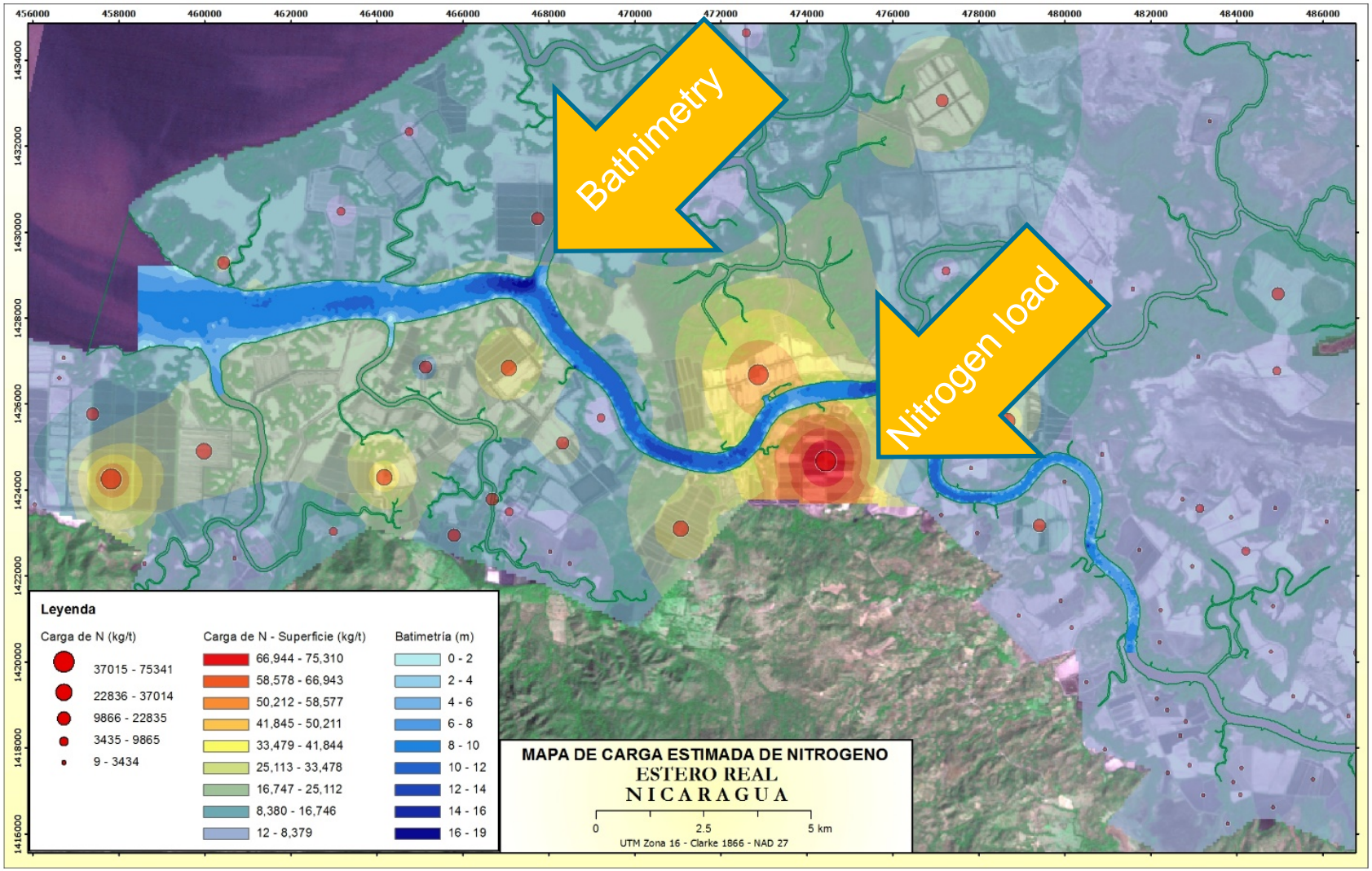
External Forcing Factors

Implementing the Ecosystem approach to fisheries and aquaculture (EAF/EAA) in Estero Real Nicaragua

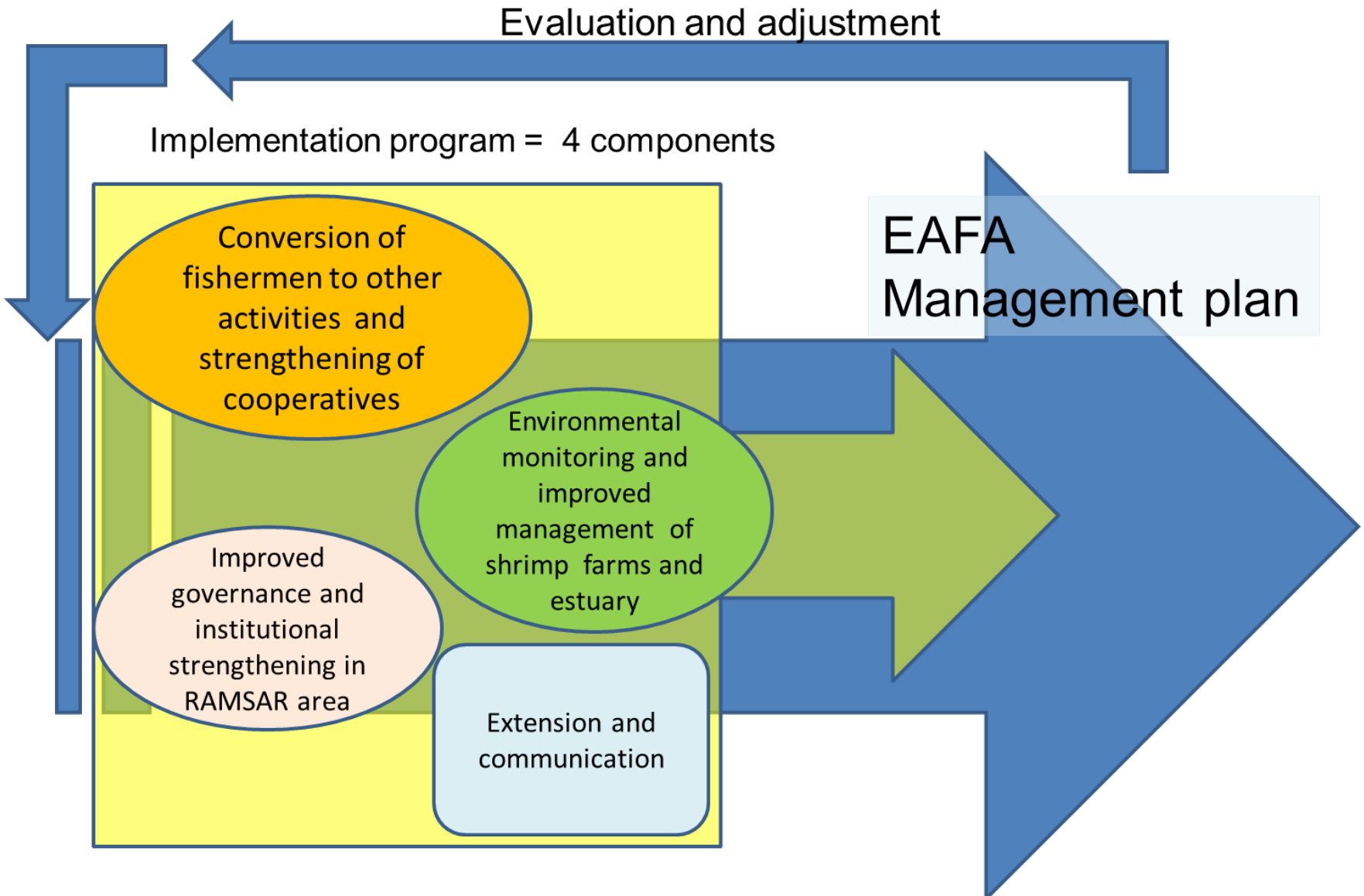


Shrimp farming and coastal fisheries

Often we require key information in order to develop an EAA mangement plan and often we have to include the collection of better information as part of the managment plan



The EAFA management plan for Estero Real had four components



REVIEWS IN Aquaculture

Reviews in Aquaculture (2018) 0, 1–22 doi: 10.1111/raq.12242

The ecosystem approach to aquaculture 10 years on – a critical review and consideration of its future role in blue growth

Cecile Brugère[1], José Aguilar-Manjarrez[2], Malcolm C. M. Beveridge[2] and Doris Soto[3]

1 Soulfish Research & Consultancy, York, UK
2 Food and Agriculture Organizatio
3 Interdisciplinary Center for Aquac

Table 3 Threats and challenges to the implementation of the EAA (order of priority varies within and among different countries/regions) developed in Nicaragua and further validated in different countries

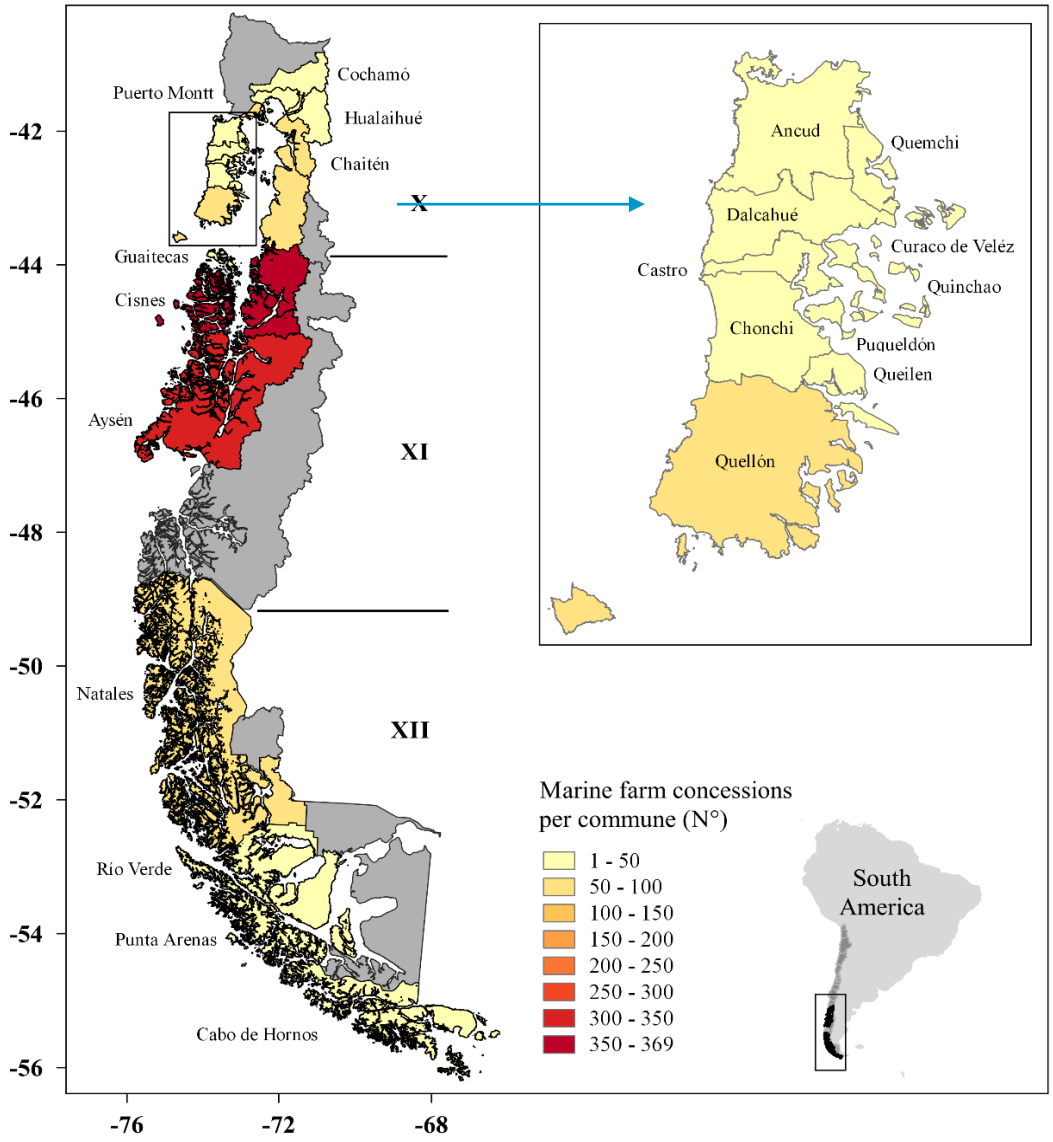
1	Competing development objectives
2	Difficulties with interagency cooperation
3	Ecosystem and administrative boundaries
4	Equity issues
5	Insufficient awareness
6	Insufficient knowledge
7	Lack of or limited technical and human capacity and resources (including monetary)
8	Limited stakeholder participation
9	Poor governance and regulation
10	Unregistered or illegal farms

- In most cases aquaculture planning and management has focused on production within a **short time scale** and it has grown with limited or no considerations to the negative added, **cumulative and synergistic impacts** of numerous farming systems (small and large) within one ecosystem.

- The concept of carrying capacity has been increasingly addressed specially in marine cage fish farming and mussel farming but more often focusing on individual farms (certification systems in general also focus on individual farms)

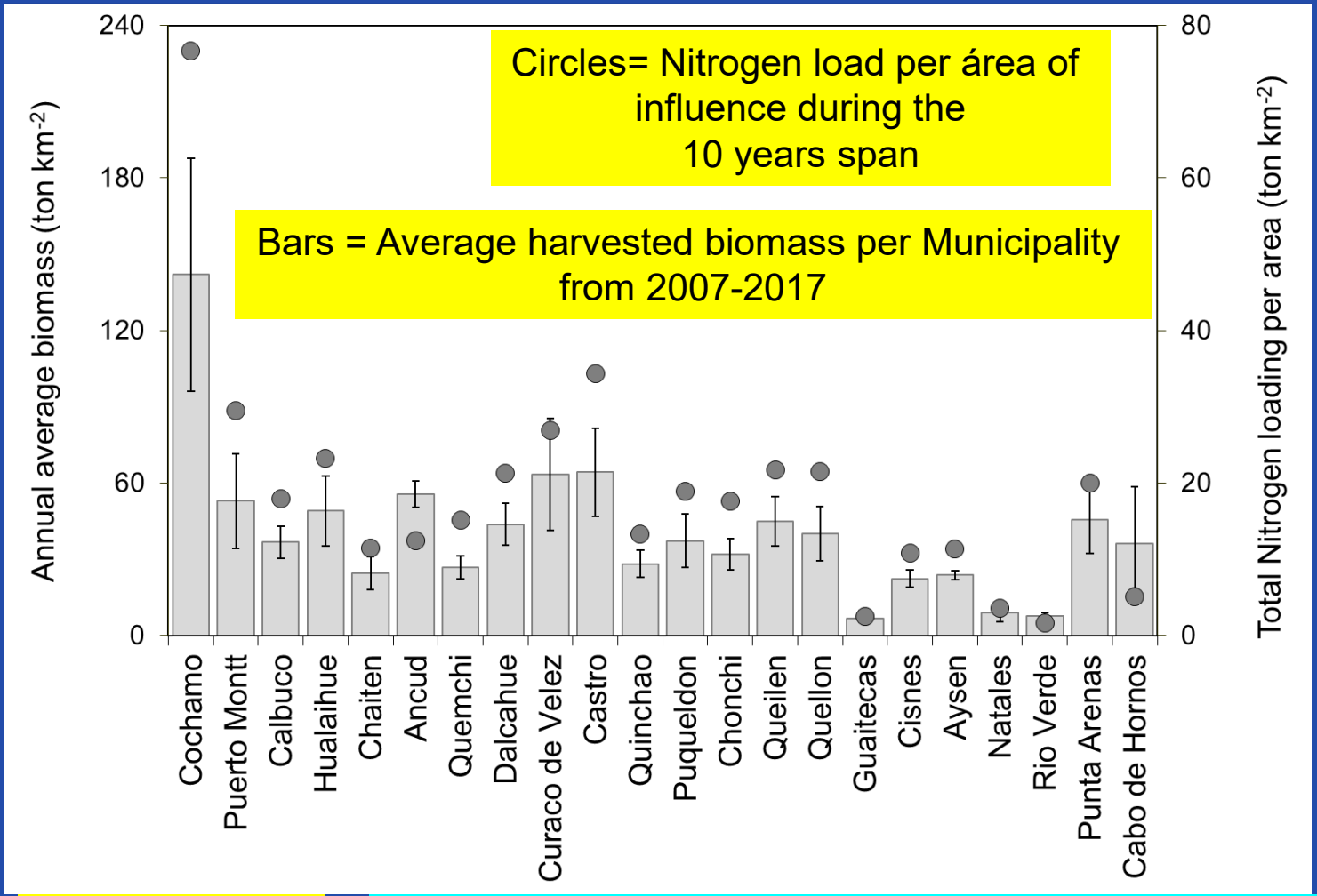
- There is still not enough attention to the social issues and equity in access and distribution of income and this of course goes beyond individual farms

An on going example from Salmon farming in Chile



Spatial distribution of the Municipalities where salmon farming takes places in the three political regions of southern Chile.

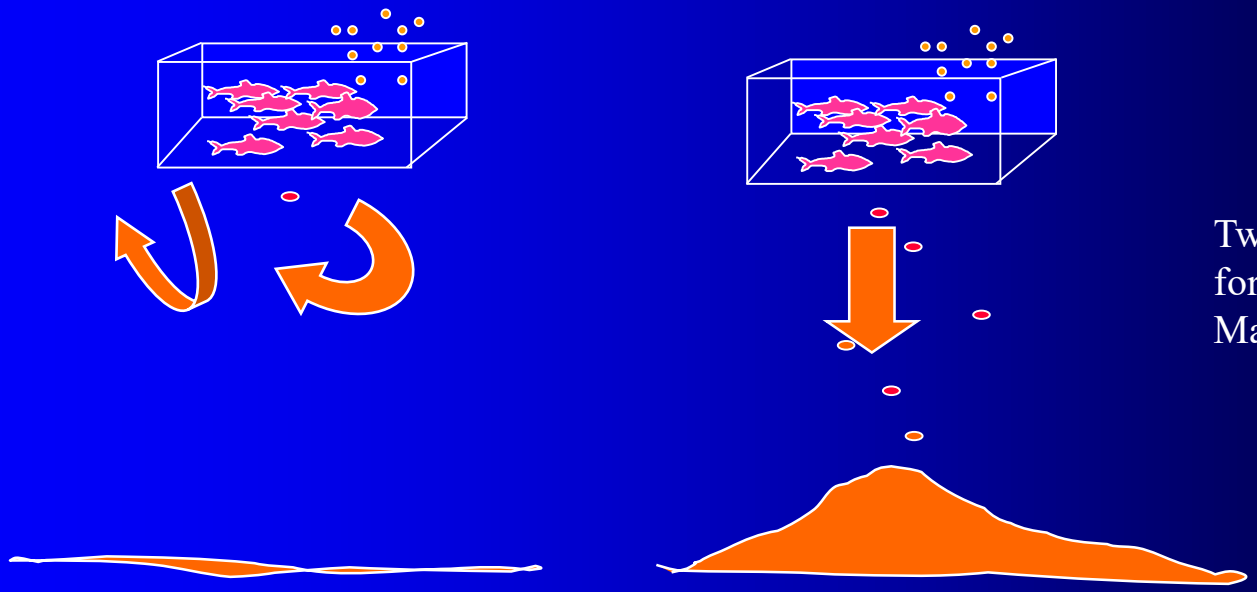
Colours indicate the number of authorized salmon farming concessions in the marine area per commune.



Soto et al 2018, in press

Nitrogen loading per área is a proxy for the pressure of salmon farming on the ecosystem but yet we do not have a measure or indicators of ecosystem impacts

In fact the focus of most regulation has been below or around a farm



Two extreme possibilities for the organic and dissolve Matter after a farm

All material particle and dissolved goes Somewhere else

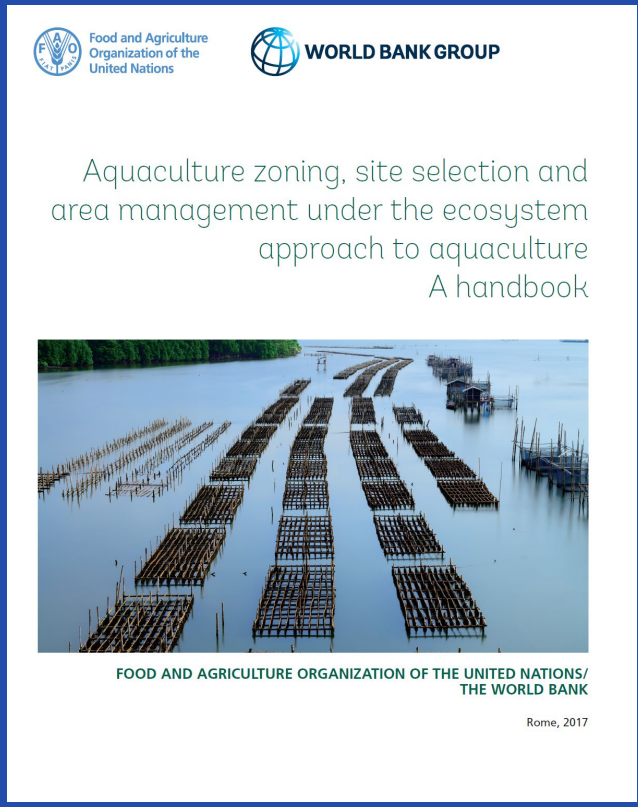
All material stays below or around

Despite increasing interest in integrated multitrophic aquaculture real implementation and assessment at the landscape scale is still very limited

Some key messages and action points

Promote aquaculture spatial planning under the EAA

- The spatial planning of aquaculture (zoning, AMAs, siting of farms) using the EAA addresses the **social**, **economic/productive**, **environmental** and **governance elements**
- These are the "elements" of the carrying capacity to sustain aquaculture in a specific area or water body including fish health and environmental risks, and risks imposed by external forcing factors



Science to support EAA requires

- to be **interdisciplinary**, thus linking environmental, socioeconomic and governance issues and objectives.
- to define the appropriate **ecosystem boundaries** where we want to develop a management plan (an interdisciplinary challenge, specially on open ocean)
- Improve understanding the **pathway** of aquaculture outputs (nutrients, chemicals etc.) within the ecosystem. This is relevant to define carrying capacity
- to define, through open participatory processes **ecosystem level indicators** for aquaculture performance/impacts (environmental, socio-economic, governance)
- facilitate integrated environmental and social monitoring systems

Other action points

- We need innovative tools that allow linking of environmental and socio economic objectives,
- Science and knowledge that supports the common goals must be open and transparent, this also allows to improve public understanding and acceptance of the sector.
- Institutional arrangements and government capacity to address multidisciplinary objectives needs to be supported and strengthened at all levels