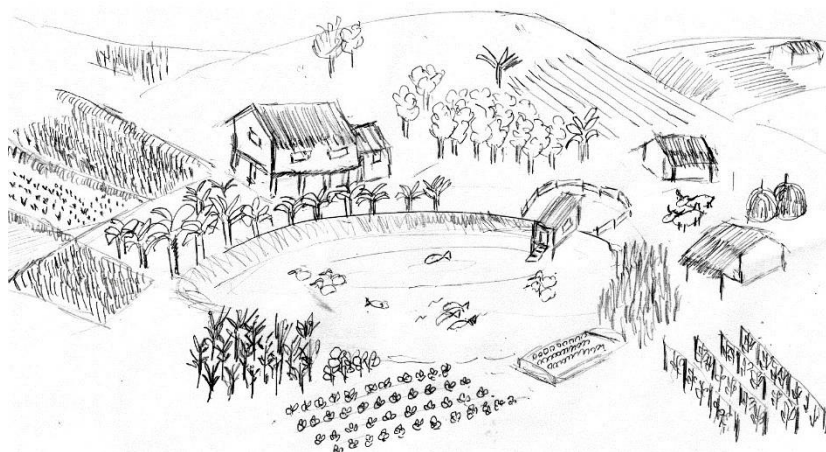Food and Agriculture
Organization of the
United Nations

Ecosystem approach to aquaculture management

HANDBOOK

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Contents

Acknowledgements

Abbreviations and acronyms

ASEAN Association of South East Asian Nations

BGI Blue Growth Initiative

CCA Climate Change Adaptation

CCRF Code of Conduct for Responsible Fisheries

DRM Disaster Risk Management

EA Ecosystem Approach

EAA Ecosystem Approach to Aquaculture

EAA Ecosystem Approach to Aquaculture Management

EAF Ecosystem Approach to Fisheries

EBM Ecosystem Based Management

EIA Environmental Impact Assessment

FAO Food and Agriculture Organization of the United Nations

GAqP Good Aquaculture practices

GEF Global Environment Facility

GRUN Gobierno de Reconstrucción y Unidad Nacional

ICM Integrated Coastal Management

ICZM Integrated coastal zone management

INPESCA Instituto Nicaragüense de la Pesca y la Acuicultura

IPCC Intergovernmental Panel on Climate Change

IWM Integrated Watershed Management

LME Large Marine Ecosystem

MAC Management Advisory Committee

MAGFOR Ministerio de Agropecuario y Forestal

MARENA Ministerio del Ambiente y de los Recursos Naturales

M and C Monitoring and Control

MOU Memorandum of Understanding

MPA Marine Protected Area

MU Management Unit

NOAA National Oceanic and Atmospheric Administration, USA

PI Program Integrator

PM and E Planning Monitoring and Evaluation

PSC Project Steering Committee

RENAPRODER Reserva Natural Delta del Estero Real

SEAFDEC Southeast Asian Fisheries Development Centre

SME Small and Medium Enterprises

SPC Secretariat of the Pacific Community

TOT Training of Trainers

TVET Technical Vocational Education and Training

VC Village Committee

The EAAM course aims to provide skills and tools to develop in stakeholders and facilitators the necessary know-how to develop an EAAM plans targeting sustainable and climate change resilient aquaculture. The course will provide the necessary knowledge on how to:

- manage aquaculture under holistic approaches;
- address aquaculture issues and challenges;
- apply Climate Change Adaptation and Disaster Risk Management strategies
- reduce user group conflicts;
- work cooperatively with other stakeholders;
- empower communities towards political changes
- help unlock financial resources to implement plant

Participants will gain the necessary knowledge about EAAM concepts and will apply their acquired learning onto an EAAM plan template to develop a draft plan for their area. They will understand the principles of EAAM, how to foster cross-sector coordination, how to develop, implement and monitor a plan by applying adaptive management, and will also practice the crucial skills of effective communication, facilitation, and conflict management.

Overall course objectives

Participants will understand the concepts and needs for an Ecosystem Approach to Aquaculture Management (EAAM), and learn skills and knowledge to develop, implement and monitor an "EAAM plan" to more sustainably manage the aquaculture sector.

Target audience

This Essential EAAM course targets aquaculture departmental officers, economic development and environment staff, as well as related development agencies and planning staff, at either local, district, provincial or state levels who are responsible for administering or managing the aquaculture sector of their competence.

Scope and context

This course can be applied to any aquaculture system. The handbook focuses on both inland and coastal ecosystems with the main focus on climate change adaptation and disaster risk management (FishAdapt). By changing the focus and examples from the previous training on Ecosystem Approach for Fishery Management (EAAFM) the work has been contextualized to the main issues and drivers that affect the aquaculture sector. Nevertheless the approach to management planning and the training methodology and dynamics follow almost similar patterns.

Course structure

The course is divided into two main sections, the first explains what EAA is and why it is an elective instrument to sustainably manage aquaculture in complex contexts that include nature conservation, agriculture and sustainable development. The successive part focuses on the development of EAA plan by providing a step-by-step guidance on the planning, design, implementing and monitoring steps. Critical aspects in conflict management, review and adaptive management are also considered to provide a comprehensive set of tools to the development officers.

Training methodology

The course is highly participatory. To complement input from the trainers, participants will work in pairs, in groups and individually on specifically designed exercises. The exercises are designed to

consolidate learning. The trainers will try, as far as possible, to work with real, local examples and will therefore rely on active participation from trainees.

Learning and feedback

Daily monitoring and reviews ensure that feedback from participants is integrated into course design, where possible. Pre- and post-course assessment, as well as a quiz, will enable the trainers to assess progress.

Course materials

Each step of the EAAM process is explained in dedicated modules in this course Handbook. The Workbook may be used to write notes for each stage. The linked Toolkit provides the "People" and "Technical" tools which can be used at different stages in the EAAM process. After successfully completing the course, participants will receive an electronic version of the Handbook, PowerPoint presentations and the Toolkit, together with any additional resources.

Trainers

The trainers have been trained by internationally experienced participatory facilitators. They are supported by personnel with extensive regional fisheries management knowledge.

EAAM course objectives and timetable

The course provides a broad knowledge of the concept and the needs for an Ecosystem Approach to Aquaculture Management (EAAM), skills and knowledge to develop, implement and monitor an EAAM plan to more sustainably manage capture fisheries.

Starting from the description of ecosystem on its broad sense the course will provide a broad understanding of the different steps necessary to develop an implantation plan targeting the sustainable management of the aquaculture at either local, national or regional level.

Seventeen units will build trainees' capacity and provide necessary insights to address cross-cutting issues in the development of a participative plan. A series of skills will be developed through interactive approaches to allow future easier management of communities and coordination of different sectors.

Module 1. Introduction: the ecosystem approach in aquaculture in the context of Climate Change and sustainable development

      Goal: grow an understanding of ecosystems
           Share the main drivers of sustainable development and climate change
      Activity: introduction/expectations, brainstorming on sustainability and climate change

2. Threats and issues in aquaculture

      Goal: Identify the threats and issues faced by aquaculture and associated ecosystems.
      Activity: Discuss issues and threats for aquaculture and associated ecosystems. Keep the outputs for later activities.

3. Aquaculture management and ecosystem approach

      Goal: Realize that a broader management approach is required to address sustainability and threats and issues in aquaculture
           Acknowledge the nexus between ecosystems and human societies;
           Describe the concept of the ecosystem approach (EA);

Explain some of the benefits of using an EA.

Activity: Discuss the role of aquaculture management in your country. Sort the threats and issues identified in module #2 into those that (i) can be addressed by existing aquaculture management and (ii) others

Plenary brainstorm: Discuss the benefits of taking an ecosystem approach

4. Why do we use the ecosystem approach to aquaculture (EAA) and what are its principles?

Goal: Explain the principles of using an EAA and its linkages with CCRF

Explain how EAA fits with other approaches

Understand the need to find a balance

Activity: Balancing different societal objectives

5. Moving towards EAAM - Case study/ies

Goal: Determine where aquaculture sector in own country is moving towards EAAM

Identify key national challenges to adopt EAAM

Aknowledge the process of EAAM is made of different and timely actions

Activity: Case studies

6. EAAM plans - the link between policy and action

Goal: Recognize the need for effective planning and plans to translate policies into actions.

7. EAAM planning and implementation process

Goal: Describe the key steps of the EAAM process and how to plan, implement and monitor EAAM;

Identify the planning steps in the EAAM process

8. Startup A - Preparing the EAAM

Goal: Address the initial step of building an operative EAAM team to move the initial steps the work and stakeholder identification

- Identify the EAAM team and facilitators
- Develop Startup work plan
- establishing liaisons with prospective partners;
- identify roles of partners
- organizing and attending meetings, training and awareness-raising sessions;
- collection of baseline data and information on the management unit;
- meeting with local leaders, government officials, etc. and obtaining approvals
- stakeholder analysis and choice criteria

Activity: stakeholder analysis, matrix, Venn diagram

9. Startup B - Stakeholder engagement

Goal: Apply participatory approaches for stakeholder engagement;

EAA in Practice

10. Steps 1.1, 1.2 and 1.3 Scoping and definition of the ecosystem boundary (spatial, time and political scales)

Goal: develop scoping, elaborate vision and agree on shared goals

1.1 define the boundaries

1.2 develop and agree on shared visions

1.3 scope the EAAM area/zone

Activity: mapping

Visioning
Scoping criteria/data choices

11. Steps 2.1, 2.2 and 2.3 Identify and prioritize issues and goals

Goal: identification, risk assessment and scoring of issues
2.1 identify issues
2.2 define goals
2.3 prioritize issues
Activity: use of Component trees, problem trees and impact/threat matrix

12. Reality check I

Goal: Identify the constraints and opportunities (CO) in meeting the EAAM area/zone goals;
Use facilitation skills with co-management partners in focus group discussions (FGDs);
Use conflict management to resolve diverging priorities/expectations in EAAM.
Activity: CO analysis, FGDs, conflict mapping

13. Step 3 Develop objectives, indicators and benchmarks

Goal: identification of objectives, indicators and benchmarks
3.1 develop management objectives
3.2 Develop indicators and benchmarks
Activity: develop objectives from high rank issues, identify indicators from baseline data

14. Steps 3 Management actions, compliance, finance and finalize EAA plan

Goal: finalize the EAAM plan by agreeing on the actions and finance support
3.3 agree management actions and how stakeholders will comply with these;
3.4 Include financing mechanisms in the plan;
3.5 Bring it all together – finalize the implementation plan.
Activity: Agree management actions, and relevant compliance and enforcement actions.
Identification of the financing mechanisms to support the plan

15. Step 4.1 Formalize, communicate and engage

Goal: Develop an implementation work plan;
Summarize what is meant by formal adoption of the EAAM plan;
Develop a communication strategy.

16. Reality check II

Goal: Check on the status of the EAAM plan implementation;
Consider whether implementation is in line with the principles of EAAM;
Consider whether implementation is in line with enabling legislation and supporting environment
Revisit the constraints and opportunities in meeting your EAAM zone goals

17. Steps 5.1 and 5.2 Monitor, evaluate and adapt the plan

Goal: Monitor how well management actions are meeting goals and objectives;
Plan what has to be monitored, why, when, how and by whom;
Evaluate monitoring information and report on performance;
Review and adapt the plan

Glossary of terms

Acidification: Ocean acidification refers to the process of lowering the oceans' pH (that is, increasing the concentration of hydrogen ions) by dissolving additional carbon dioxide in seawater from the atmosphere, or by other chemical additions either caused by natural processes or human activity.

Adaptive management: A systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. The basic steps of adaptive management are to implement actions, monitor their effectiveness; analyse, use and adapt; and then capture and share learning. Active adaptive management occurs where management options are used as a deliberate experiment for the purpose of learning (Millennium Ecosystem Assessment, 2006).

Aquaculture management areas: Are clusters of farms that join common management practices and share a common waterbody or water sources.

Aquaculture zone: it consists of a hydrological system which is suitable for aquaculture that encompasses part of or an entire catchment area from the source of a waterway to the estuary, water body (lake or dam), coastal area, or off the coast area, that has been allocated to develop aquaculture

Artisanal fishery: A small-scale fishery carried out using traditional fishing boats and gears. See small-scale artisanal fishery.

Benchmark: A standard against which something can be measured or judged. It can describe where you want to go (target), where you have come from (baseline) or where you do not want to be (limit).

Benthic: Of, relating to, or occurring at the bottom of a body of water; bottom-dwelling or benthic organisms are important in marine food webs and include many species, such as crabs, lobsters, clams, mussels, scallops, and seaweeds that are harvested for food or other uses by humans.

Biodiversity: The variation of life at all levels, ranging from genes to ecosystems. It is more than a count of species and can be characterized by extinctions, reductions or increases of some species, invasions and hybridizations, degradation of habitats and changes in ecosystem processes.

Biota: The combined flora and fauna of a region. It is one component of an ecosystem.

Climate: The weather averaged over a long period of time (typically 30 years). Climate is what you expect; as opposed to weather, which is what you get (IPCC, 2001).

Climate change: A change in the state of the climate that can be identified (e.g. using statistical analysis) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer (IPCC, 2007).

Climate change adaptation (CCA): Actions taken to help communities and ecosystems moderate, cope with, or take advantage of actual or expected changes in climate conditions. Adaptation can reduce vulnerability, both in the short- and long-term (IPCC, 2007).

Code of Conduct for Responsible Fisheries (CCRF): A voluntary guide developed by the Food and Agriculture Organization of the United Nations (FAO) that provides a set of principles on how to develop fisheries and aquaculture sustainably.

Community based management (CBM): Management planning and implementation carried out by the people in a community.

The Convention on Biological Diversity (CBD): Signed by 150 government leaders at the 1992 Rio Earth Summit, the Convention on Biological Diversity is dedicated to promoting sustainable development. It recognizes that biological diversity is about more than plants, animals and microorganisms and their ecosystems – it is about people and their need for food security, medicines, fresh air and water, shelter and a clean and healthy environment in which to live.

Development: Improving human well-being (see below). Note that in sustainable development, it is the development that needs to be sustained.

Ecological well-being: The state of the ecosystem in terms of health, biodiversity, supportive structures and habitats and food webs.

Ecosystem: A relatively self-contained system that contains plants, animals (including humans), micro-organisms and non-living components of the environment, as well as the interactions between them (SPC, 2010).

Ecosystem approach (EA): A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (CBD, 2000). Often used interchangeably with ecosystem-based management.

Ecosystem approach to aquaculture (EAA): is a strategy for the integration of the activity within the wider ecosystem such that promotes sustainable development for both present and future generations, equity and resilience of interlinked social-ecological systems.

Ecosystem approach to aquaculture management (EAAM): is an holistic approach to aquaculture management that takes into account all the different components operating within a specific boundary that characterize the aquatic animal production. The EAAM includes not only the environmental but also societal aspects of development and governance that cover different sectors involved in the management of natural resources.

Ecosystem approach to fisheries (EAF): The purpose of an ecosystem approach to fisheries is to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems. An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries.

Ecosystem approach to fisheries management (EAFM): EAFM is an holistic approach to fisheries management that represents a move away from fisheries management systems that focus only on the sustainable harvest of target species, towards systems and decision-making processes that balance ecological well-being with human and societal well-being, within improved governance frameworks i.e. it is a practical way to achieve sustainable development. It addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems.

Ecosystem goods and services: The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services, such as spiritual and cultural benefits; and supporting services, such as nutrient cycling or waste degradation, that maintain the conditions for life on Earth.

Environmental impact assessment: is the evaluation of the possible impacts to the environment of any proposed project or development plan. EIA considers into the evaluation both the beneficial and adverse effects to inter-related socio-economic, cultural and human-health impacts.

Facilitator: A person who manages the interactions of other people to achieve an acceptable outcome for all.

Food security: The availability of consistent and sufficient quantities of food, access to appropriate and sufficient foods and consumption or appropriate use of basic nutrition and food preparation.

Food web: A system of interlocking and interdependent food chains.

Good aquaculture practices: Guideline containing set of methods to promote sustainable aquatic animal farming through the prevention or mitigation of adverse negative effects and the reduction of environmental impacts.

Goal: A goal is the long term outcome that management is striving to achieve. It often refers to a group of inter-related issues.

Good governance: See below for definition of governance. Good governance is governance that includes (i) consensus, (ii) participation, (iii) accountability, (iv) transparency and (v) follows the rule of law and is (vi) responsive, (vii) equitable and inclusive and (viii) efficient and effective.

Governance: Effective institutions and arrangements for setting and implementing rules and regulations. It includes the planning and implementation mechanisms, processes and institutions through which citizens and governing groups (institutions and arrangements) voice their interests, mediate differences, exercise their legal rights and meet their obligations. Good governance also includes adequate resources and arrangements for compliance and enforcement.

Habitat: The environment in which fish and other living marine resources live, including everything that surrounds and affects their life, e.g. water quality, bottom vegetation, associated species (including food supplies).

Human well-being: The state of the society in terms of health, education, food security, political voice and influence, living environment and economic security and safety.

Indicator: A variable, pointer, or index that measures the current condition of a selected component of the ecosystem. Indicators provide a link between objectives and action when they are compared to benchmarks.

Integrated management: The process of simultaneously and synergistically working towards multiple objectives and goals, rather than undertaking separate activities in parallel or sequentially. Integration is carried out at the scale of priority geographical or management areas. For governance, integration means working across sectors.

Integrated coastal management (ICM): An ecosystem approach to managing a coastal area. It is a continuous mechanism that involves a systematic process for managing competing issues in marine and coastal areas, including diverse and multiple uses of natural resources. ICM puts into practice effective governance, active partnerships, practical coordinating strategies, sustainable financial resources and strengthened technical institutional capacities. Under ICM, decisions are taken for the sustainable use, development and protection of coastal and marine areas and resources.

Integrated multitrophic aquaculture (IMTA): Is a type of aquaculture that combines in a single farm area different species from various trophic levels, fish, seaweed and shellfish. Extractive crops, such as seaweed and shellfish use the wastes from finfish, thus providing ecosystem functions by limiting the impact of pollutants.

Integrated watershed management (IWM): A rational framework for the development of management strategies for water resources.

Management goal: A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established timeframes for achievement (see vision and objectives).

Management actions: Specific actions (controls) applied to achieve the management objective.

Management unit (MU): The area of the ecosystem that is considered for management under an ecosystem approach to aquaculture management.

Mariculture: Cultivation, management and harvesting of marine organisms in their natural habitat or in specially constructed rearing units, e.g. ponds, cages, pens, enclosures or tanks. For the purpose of

FAO statistics, mariculture refers to cultivation of products in seawater even though earlier stages in the life cycle of the concerned aquatic organisms may be cultured in brackish water or freshwater.

Monitoring and Evaluation (M and E): the process of evaluating the performance of management actions for adaptive management. Participatory M and E is when stakeholders are involved in this process.

Management objective: What is intended to be achieved through management actions.

Objective: What is intended to be achieved? An objective should be linked to indicator(s) against which progress can be measured. Positive or negative change resulting from the achievement of an objective is an outcome. See vision and goal.

Outcome: The change in status, attitude or behaviour that results from a set of management activities. An outcome should be able to be tracked through measurement and/or observation over time.

Precautionary approach (or principle): An underlying element of the broader framework of sustainable development. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. The two ramifications of the precautionary approach are:
1. Lack of data and information should not be used as an excuse for not taking action.
2. Where there is uncertainty, management actions should be more risk averse.

Promoting agency: The agency that takes the lead in promoting a new concept, such as EAAM.

Resilience: The ability of an ecosystem to maintain key functions and processes in the face of (human or natural) stresses or pressures, either by resisting or adapting to change.

Risk: A function of probability and consequence. Risk assessment is the process intended to calculate or estimate the risk to an object or system. The process includes identifying the severity of a hazard (its impact) and likelihood of it happening.

Scoping: the assessment or investigation that targets the effects of a proposed action or project to a community, business or ecosystem for both environmental and socio-economic aspects.

Small-scale artisanal fishery: The fishery sub-sector usually operated by fishers with either no fishing vessels or small fishing vessels, using more traditional fishing gear. Vessels are usually owner-operated and, if powered, powered by small inboard or outboard motors.

Stakeholders: Any individual, group or organization who has an interest in (or a "stake"), or who can affect or is affected, positively or negatively, by a process or management decision.

Sustainable development: Development (improvement in human well-being) that meets the needs of the present without compromising the ability of future generations to meet their own nee

Sustainable aquaculture management: aquaculture management that promotes the production of aquatic products that brings socio-economic benefits with no environmental harm to the production for future generations.

Sustainable use: The sensitive use of natural resources that does not lead to any long-term decline and loss of biodiversity, thereby maintaining its potential to meet the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability: Short hand for sustainable development.

Trophic: Relating to nutrition; trophic level: one of the hierarchical strata of a food web characterized by organisms which are the same number of steps removed from the primary producers.

Vision: A vision is the top-level aspiration of what the future will look like if management is successful. See goal and objective.

Vulnerability: The degree to which a human or natural system is susceptible to, or unable to cope with, adverse effects of climate change and/or ocean change, including climate variability and extreme events. Vulnerability is a function of the character, magnitude and rate of change and variation to which a system is exposed, its sensitivity and related adaptive capacity.

Well-being: A concept that refers to the state of a system (e.g. ecosystem or social system). See ecological and human well-being.

Zoning: a defined hydrological system that is suitable for a specific production. See aquaculture zoning.

Module 1 - The ecosystem approach in aquaculture in the context of Climate Change and sustainable development

Module objectives
- Grow an understanding of ecosystems
- Share the main drivers of sustainable development and climate change

Overview

This module aims to give a broad understanding of the concept of *ecosystem* and *sustainability* according to their main definitions. Ecosystem characteristics vary depending on their main components and scales. There are three main levels that can be considered, 1) local, 2) national 3) global. Likewise sustainability is determined by an even equilibrium between its components that need to be fully acknowledged to effectively plan and future development processes.

Ecosystem definition

A simple definition of ecosystem is:

The complex of living organisms, their physical environment, and all their interrelationships in a particular unit of space. (Encyclopaedia Britannica)

An ecosystem in does not only include the living creatures (plants, animals, humans) that interact each other in a specific space but also the non-living components (earth, soil, water, weather, sun, climate) that interact and continuously modify the system. Being humans part of an ecosystem, there are many factors that add into the complexity, especially if we enlarge the scale of the system from local to global. A series of factors can be considered to determine the elements and the functioning of a specific ecosystem:

- The different components
- the resources
- the flows of materials and resources
- The environmental conditions and their effects to the system
- The interaction of human activities into the system
- The changes from local to global
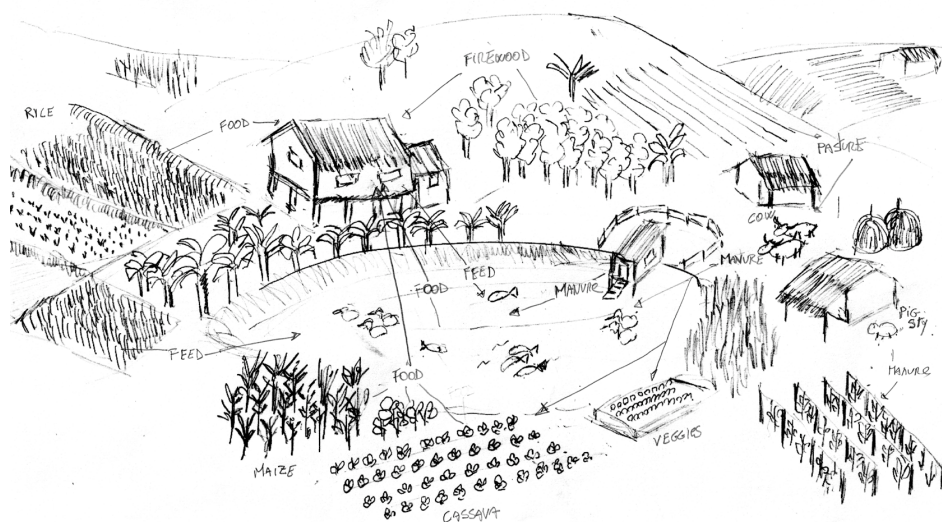
Figure 1.1 A rural integrated aquatic ecosystem © Edoardo Pantanella

Sustainability

Sustainable development is defined as: "*development that meets the needs of the present, without compromising the ability of future generations to meet their own needs*."

The statement clearly summarizes the evolution of the concept of sustainability that not only focuses on the improvement of a condition, but also on the identification of the needs and the guarantee that resources are accessible in the future.

Sustainability considers three main areas:

- Environmental sustainability is intended as a process of maintaining or improving the integrity of the life support system of the ecosystems;
- Economic sustainability is the maintenance of the stocks of capital or assets in order to produce a non-declining set of benefits or a constant stream of benefits;
- Social sustainability concerns the conservation of social and cultural diversity, promotion of human development and inclusion.
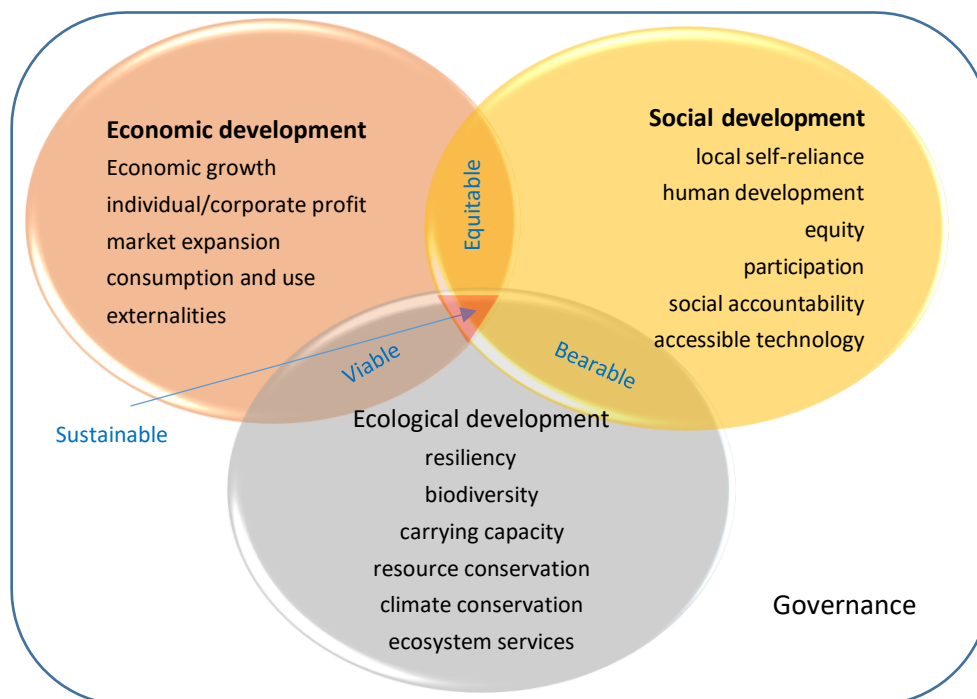
Figure 1.2 Sustainable development

Economy, society and environment are interlinked. A long-term management thus should not act independently but must integrate these three dimensions.

Sustainable development calls for long-term structural change in our economic and social systems in order to reduce the consumption of the environment and the resources to an affordable level.

Global interdependency should lead to reduction of environmental impacts and improvement in the quality of life.

Activity: describe an ecosystem with its different components and determine changes and integrations depending on the scale. Identify possible cause-effect scenarios.

Determine what are the main drivers to guarantee sustainability in your given ecosystem

Module 2 - Threats and issues in aquaculture

Module objectives
- Identify the threats and issues faced by aquaculture and associated ecosystems

Overview
The threads and issues in the aquaculture sector vary depending on the system boundaries: local, watershed or global levels can be differently affected due to the progressive complexity and degree of interactions of each ecosystem component, in which the time scale will also play an important role. Issues can be grouped into three main clusters: 1) ecological well-being; 2) human well-being; 3) governance.

The concerns listed below represent common causes undermining the development of aquaculture. Additional issues could be spotted case by case depending on the type and scale of ecosystem and the degree of development.

Ecological well-being

Impacts on aquaculture

Pollution

- Pollution from human or industrial activities poses serious issues on the production of aquatic animals that can be affected by contaminants, chemicals, which eventually results in high mortalities. Effects can be noted from cage aquaculture in rivers, or in the use of contaminated water from canals for pond aquaculture
- Presence of biological or heavy metal contaminations in water can raise concern about food safety of fish farmed in common water bodies
- Agriculture run-off is a very common problem for the contamination of water streams with fertilizers and/or pesticides, particularly where water serves aquatic animals
- Illegal fishing with chemicals is also another risk factor for aquaculture operations that are located downstream where the action is taken
- Presence of excessive nutrients in the seawater is a very high risk factor for the occurrence of noxious algal blooms that would result in the loss of fish from aquaculture cages

Environmental damages

- The unregulated development of agriculture affects the ecosystems in which aquaculture thrive. This is particularly valid for deforestation, which is followed by erosion and siltation of water bodies.
- Lack of natural ecosystems would also prevent the natural recruitment of wild seeds (i.e. crabs, shrimps)
- Increased turbidity as consequence of erosion makes the quality of the water unsuitable for optimal aquaculture productions.

Diseases

- Lack of monitoring and control of fish could ease the spread of diseases among countries, thus affecting the production of particular species in watersheds
- The proximity of natural stocks to cage operations increases the risks of disease/parasite transmission between wild and farmed animals

Competition for natural resources

- In some countries the use of water for aquaculture is restricted, since it agriculture has priority in its use. This from one hand would raise problems of water quality due to the presence of

contaminants (pesticides) and on the other hand it prevents the use of nutrient-rich wastewater for crop irrigation.
- Restrictions in cage aquaculture can be also derived by water authorities that reduce access to allow navigation
- In many countries the political agenda of government is mainly focusing on the production of energy or mining activities. This would limit the development of aquaculture in dams due to security reasons or increase the risk of contamination by chemicals and heavy metals (oil spills, mercury contamination from gold extraction)
- Indiscriminate fishery or unregulated management of by-catch may also limit the availability of fish meal and fish oil for aquaculture

Impacts on the ecosystem

Environmental damages

- Environmental disruption of natural habitats for the creation of areas for aquaculture, as observed for the construction of ponds in mangrove areas, or the effects on benthic organism in cage aquaculture
- Deforestation of mangrove areas also affect the biology of food chains with negative effect to the whole fauna. Recruitment of natural shrimp larvae is affected by the lack of natural food and planktonic organism thriving in forested areas.
- Effects on soil is observed in intensive aquaculture in coastal areas with progressive acidification
- In some particular watershed the excessive use of shellfish and seaweed can cause a reduction of planktonic organism whose limited availability may hamper the wild fauna
- The progressive intensification of aquaculture operations and the shift to fed management requires a much larger use of feedstuff that need to be produced to support animal growth, this would affect the freshwater resources to support plant growth and the competition with agriculture for human food productions.

Carrying capacity

- Carrying capacity is not commonly determined at local level and this arises problems on the efficient use of resources and impacts on the environment
- As a result aquaculture operations could exceed the local assimilative limits thus creating pollution and perturbation to the ecosystem as a whole.

Pollution

- In case of large scale intensive farms aquaculture operations modify ecosystem functions by releasing organic loads that affect local benthos and oxygen in the water.
- Water released from aquaculture operations may not be sufficiently monitored thus resulting in discharge of nutrients into the environment. The degree of discharge may either have a beneficial effect on common water bodies by promoting primary production to the benefit of wild aquatic animals or favour eutrophication.
- Lack of water treatment or waste management plans in farms can exacerbate the release of pollutants into the environment.
- Intensive aquaculture can also be the source of residues. Antibiotics and chemicals could in fact being released in the environment following farming operations.
- Inefficient feeding management can results in increased feed conversions ratios (FCR) and increased wastes

Inefficient use of resources

- Lack of integration with other sectors (agriculture, forestry) prevents the use of by-products such as feed ingredients and nutrients for irrigation, which result in waste of resources and increased pressure on the environment.

- Integrated aquaculture systems are not prioritized in current aquaculture systems, thus improving the impact of pollutants into the environment.

Impact on wild animals

- Escapees of farmed animals into the wild can bring genetic contamination of wild stocks
- Concentration of aquaculture operations in specific zones and high stocking densities could facilitate the outbreak of disease and parasites that can be transmitted to wild populations with extreme health consequences
- The unregulated use of therapeutants is the cause of the build-up of resistance in parasites
- Excessive harvest of wild population to stock aquaculture ponds can eventually bring to overexploitation of resources and consequent loss of biodiversity
- Destruction of local habitats to favour aquaculture operations can result in disruption of natural recruitment of fish and crustaceans
- Excessive use of fish meal and fish oil to support the aquaculture of carnivorous species has negative effects on wild stock, which result in overexploitation of fishery and loss of biodiversity

Climate change

Increased temperatures

- Increase of temperatures is one of the most important drivers in favouring diseases in fish. The elevated level of stress combined to reduced oxygen concentrations are in fact con-causes for the burst of outbreaks.
- One of the consequences of the increase of temperatures is the reduction of the oxygen solubility, which would reduce the carrying capacity of the system and disadvantage some trophic chains
- One clear effect of increased temperatures is the rise of the ocean levels. Although it is a slow process there are not currently solutions to reduce the greenhouse emissions into the atmosphere. High levels of the seas would bring to loss of lands (submersion) and inclusion of salt water in inland areas. This would not only limit the production of plants that serve as feedstuff to aquatic animals, but would also limit the farming of freshwater fish species.

Acidification of oceans

- Although the increase of pH in the seawater affect more the natural fauna (seabeds, corals) the changes of the ecosystem characteristics would impact aquaculture that eventually depends on local ecosystems and the availability of catch fish for feeds

Loss of biodiversity

- Any ecological change due to climatic conditions would challenge every species and push out those who have more difficulties to adapt. In the case of aquaculture a major shift to species tolerant to higher temperatures or mutated environmental conditions is expected.

Climate unpredictability

- Lack of rain or delay in rainy season would affect the availability of water for aquaculture
- The changes of rain patterns or increase of temperatures would change the spawning periods of the aquatic animals, whose recruitment would not match the stocking periods required by aquaculture farmers
- The change in climate and the increases of temperatures would also favour the occurrence of extreme weather events with their destructive effects to both aquatic and terrestrial ecosystems.

Human well-being

Food access

Food demand

- Increase of the population on earth is pushing agriculture and livestock outputs, however not always the demand meets the offer with resulting pressures on supply of local fish that are competitively request from international markets and the increase of prices due to excess demand for some species.
- The economic development that is observed in many countries pushes populations towards dietary shifts from vegetarian to animal based proteins. In this group there is also aquaculture, which has experimented a constant growth in demand.
- The presence of globalized market pushes the consumers towards carnivorous species that pose a much higher pressure on natural ecosystems due to the need to feed the aquatic animals with animal proteins (fish meal, fish oil). A shift towards omnivorous or herbivorous species would be desired to keep the food production within sustainable limits.

Food security

- With the current technology and production techniques the output from traditional extensive ponds is not sufficient to meet the demand of local populations. Therefore a shift towards more productive assets is needed.
- In some cases the occurrence of disease, extreme climate phenomena has reduced the harvests thus impacting small producers livelihoods
- Global competition and shift in fish consumption patterns has pull down the prices of some staple fish species, thus depriving farmers of the necessary income to support their families.

Workforce

- The number of workers in rural areas is progressively reducing due to migration of youngsters and adults in urban areas or abroad. Salary from industries or services are apparently more appealing and more stable than daily wages obtainable from uncertain rural economy. This has progressively reduced the number of workers who can actively work in farms

Education

- The level of education of farmers is low, this is particularly true for older generations. In addition rural economy does not benefit from technical and vocational education and training (TVET) that can improve capacities and skills in workers in order to improve productivity and create job opportunities.
- There is still a big technological divide between and within countries. Lack of knowledge on modern farming techniques and use of technologies prevents farmers from increasing their productivity

Access to technology

- Technological advances, such as the introduction of aerators, updated hatchery and nursery technologies, cage culture equipment, improved materials, cell phones and use of cold chain, have enabled farmers to increase their productivity and to shift to more profitable productions.
- There is uneven access to technologies due to the costs that need to be done. This would create disparities between wealthy and big farmers who can afford the costs and Small Medium Enterprises (SME) that may have more difficulties to afford investments

Gender

- Women play a prominent role in supporting farming activities, particularly at small scale level, as well as processing and marketing fish and are often highly engaged in collecting of near-shore aquatic resources to stock aquaculture systems.

- Management actions which are introduced to increase aquatic animal outputs may impact on women's livelihoods and ability to provide income for their families/households.
- Women's views are important for achieving support for aquaculture management planning and may be a strong force for advocating sustainable aquaculture and compliance with management actions.

Conflicts

Conflict for natural resources

- Increasing aquaculture production results in conflicts between resource users, such as land and water, or in the access of juveniles. These conflicts are very pronounced between small-scale farmers and large-scale industrial operators who could benefit from higher political power or vertical integration.
- Conflict among stakeholders for the use of natural resources for tourism, navigation, mariculture, coastal development, etc. Conflicts could lead to increased request for jurisdictional approaches.

Political conflicts

- Existing conflicts between political or ethnic groups could lead to the displacement of people from their lands, losses of the eligibility for aquaculture licenses or land leases for aquaculture productions.
- In many countries ethnic groups living in a country may not be completely acknowledged as citizens, which make them not eligible to access government services or certificates.
- Displacement of people due to conflicts creates lack of workforce, which limits farmers opportunities to expand their production

Climate related threats to resilience and vulnerability to natural disasters

- Coastal communities are vulnerable to natural disasters (storms/cyclones, tsunamis, etc.) and longer-term climate change and variability (e.g. sea level rise, ocean acidification, changes in sea circulation patterns, impacts on coastal infrastructure; changing agricultural production and water supplies) that could have significant long-term destabilizing impacts on socio-economic systems.
- Broader climate variability issues related to this include: destabilization of rural populations, increased migration and access to freshwater

Governance

Aquaculture policies and laws

- In some cases the local laws cannot satisfactorily manage the sustainable development of the aquaculture due to the aging of regulations and the lack of timing updates to new environmental standards, technologies or production methods.
- Reviews are in general very long and legislation may fail to quickly regulate the sector to the new needs or to properly develop tax or incentive mechanisms to favour virtuous circles towards sustainability.
- Aquaculture management plans, legal/institutional changes often take several years before tangible results are achieved. Any failures in commitment or changing priorities can undermine these plans before they have sufficient time to achieve success
- Although fisheries and aquaculture belong to the same ministry, the laws that regulate the two sectors are different and do not consider possible shifts from sector to the other. Reduction of the pressure from fisheries and support to livelihood of small fishing

communities could be easily regulated to favour more sustainable approaches to natural resources.

- Compliance with international regulations/guidelines concerning production standards, food security, export standards are not completely and timely secured. This deprives the aquaculture from open the market to important economic areas.

Monitoring and enforcement

- Lack of enforcement often undermines many initiatives and emphasizes the importance of having local government support to assist in enforcement (both within jurisdictions and between adjacent jurisdictions).
- Local government agencies and natural resource management may do not have legal authority. This means that there may not be an effective system for enforcement and compliance, or even an ability to punish offenders

Decentralization or management of aquatic resources

- Many countries in the region have gone through or are going through decentralization processes, but in some cases these processes have often been poorly planned and implemented also due to the lack of governance linkages.
- Although local governments are now responsible for aquaculture and coastal resource management, they often do not have a broader vision and may not have the institutional capacity or be able to address issues that are external to their jurisdictions
- Under decentralization policies, local governments often have responsibility for managing natural resources and aquaculture. In some cases, local government offices may not have the technical skills or financial resources needed to plan and manage the sector adequately.
- In some cases the management of natural resources is implemented by different ministries that have different visions, objectives and suffer from lack of coordination.
- The priority given to the aquaculture and energy sectors or extractive industry limits the expansion of the aquaculture industry that could instead find synergies from the common uses of water bodies or advantages from the control of chemical and residues.
- The environmental plans for the restoration of natural resources may not fully consider the socio-economic impact of their project, thus leaving great concerns on their sustainability.

Access to resources

Land access

- Land legislation varies from country to country. This in some cases bring uncertainties to land ownerships, particularly for minority groups.
- Local governments may restrict the use of land for specific productions. If this is seen a strategy to maintain core productions on the other hand it is difficult to change land use for alternative and more profitable productions. Change land use may be eventually quite a long and bureaucratic process, which leaves farmers in a grey zone of legal uncertainty.

Credit access

- In the majority of cases the access to credit in small farmers is very limited due to the lack of asset to guarantee for the loans.
- The high interest costs that need to be honoured by farmers does not justify the risks that need to be undertaken to invest in higher productivity
- The access to low-interest loans by the government is very limited and the financial support in many cases is bond to the agricultural sector instead of aquaculture. This eventually creates unbalances as fish farmers would not officially farm fish in order to take loans.

- The access to micro-credit is also limited in many countries. Apart the high interest rates the diffusion of micro-credit banks is limited by local legislations that request in many cases financial liability and a banking license to operate.
- There are no other alternatives to access inputs with a credit systems from government hatcheries, nor any trust fund to guarantee the distribution the inputs to worse-off farmers. This eventually forces farmers to rely on moneylenders or middlemen who indeed give support for the purchase of inputs but eventually became price-makers and the only customers of worse off farmers.
- Likewise it is hard to find insurance systems to support production failures in case of diseases or extreme events. Considering the high risks that both agriculture and livestock sectors have in securing output, the adoption of simple insurance schemes would protect farmers from any major risks and let him/her dare higher productive solutions in farming.

Input access

- In many countries there is insufficient production of fry/larvae and feedstuff. These prevent farmers to access these essential quality inputs at reasonable prices, since products need to be sourced and transported from far away.
- Devaluation of the currency is also a negative determinant due to the higher cost of imported goods

Markets

- Falling prices for certain aquatic animal products does not help farmers to meet their break even, thus forcing to go out of business or to face losses.
- In many developing countries there are not alternatives to production. Therefore investments are needed to build up a processing industry to add value to the products and to generate further job opportunities.
- The trade wars between countries can generate distortions for both input or fish products markets. This eventually would lower prices due to excessive offer, which turn to be deleterious for farmers who see their profits drained.

Sustainable management conflicts with production promotion and revenue generation
- Local governments generate revenue based on trade and production, so policies tend to support and drive greater production.
- This often results in decreased environmental control, which is usually in direct conflict with the longer-term sustainability of aquaculture and the preservation of natural environments for multiple uses.

Stakeholder participation
- The aquaculture decision-making may not adequately involve stakeholders, which often leads to lack of support for the management actions developed. These actions may be focused on production or ecological goals.
- Lack of coordination among stakeholders and the decision makers prevents to plan and invest on the whole production value chain in order to develop wisely allocate resources and develop synergies for the quick implementation of development strategies.
- Despite the presence of aquaculture institutes there is not enough coordination to provide better aquaculture management
- There is lack of connection between universities and research centres with the aquaculture production sector, this prevents from developing applied research to objectively meet the need of the sector and academic research may be poorly targeted

Activity: Discuss issues and threats for aquaculture and associated ecosystems, and keep for later activities.

Module 3 - Aquaculture management and ecosystem approach

Module objectives
- Realize that a broader management approach is required to address sustainability and threats and issues in aquaculture
- Acknowledge the nexus between ecosystems and human societies;
- Describe the concept of the ecosystem approach (EA);
- Explain some of the benefits of using an EA

Overview
This module explains the need for an ecosystem approach (EA) to manage natural resources. It firstly sets the context and justification for more effective aquaculture management. It then looks at the different elements of aquaculture management. Finally, it covers the benefits (goods and services) that ecosystems provide and explains how EA can help address the challenges in current aquaculture management.

Introduction and context
Global fish production reached in 2016 about 171 million tonnes and a sale value of 362 million USD. Aquaculture covers 47 percent of the total output for an estimated value of 232 million USD (FAO). Global aquaculture production in 2016 totalled 54.1 million tonnes of finfish, 17.1 million tonnes of molluscs,
7.9 million tonnes of crustaceans and 0.9 million tonnes of other aquatic animals. Other aquaculture products totalled for the same year 30.1 million tonnes of aquatic plants and 37,900 tonnes of non-food products.

While fishery had a pretty constant output since the eighties, aquaculture played the lion's share for its impressive growth to meet the demand for food. The average fish consumption grew in fact from 9.0 kg in 1961 to 20.2 kg in 2015, covering almost 3.2 billion people with almost 20 percent of their average per capita intake of animal protein.

Aquaculture growth is still very high despite those double-digit figures seen in the eighties (11.3 percent) or nineties (10.0 percent) have declined to 5.8 percent in the period 2000–2016.

China, is by far the major producer of farmed food fish. In 2016 it produced more than the rest of the world combined every year since 1991. The other world aquaculture producers after China are India, Indonesia, Viet Nam, Bangladesh, Egypt and Norway. China and Indonesia were by far the major producers of aquatic plants in 2016.

World aquaculture production increasingly rely on freshwater aquaculture. Earthen ponds is the most practiced system, although raceways, tanks, pens and cages are locally utilized depending on the natural environment. Rice–fish culture is commonly practiced in rice production areas, but its adoption is increasing in Asia. Finfish farming still plays the lion's share in freshwater aquaculture with 92.5 percent of the total output (47.5 million tonnes). Asia gives the highest contribution to freshwater fish with 85.6 percent of the total production.

Marine aquaculture, is both practised in the sea or in coastal areas (coastal ponds and gated lagoons). Marine finfish represent only 12 percent of the total finfish production. Asia in this sector covers 56 percent of the total outputs.

The fed aquaculture is nowadays predominant at global level. The unfed species production now accounts for 30.5 percent of the total aquaculture, but it experienced a contraction of approximate 10 percent from 2000 to 2016 due to the faster growth pace of fed aquaculture.

The predominant species farmed are carps, whose species occupy 7 of the top ten most produced fish together with tilapia, Atlantic salmon and other unclassified groups.

In Asia, Central and Eastern Europe and Latin America, filter-feeding carps are typically raised in multispecies polyculture farming systems, which enhance fish production by using natural food and improving the water quality in the production system

Shellfish and algae are defined as extractive species benefitting the ecosystems by removing suspended solids and nutrients from the water, this removal of organic pollutants is eventually converted in profits and represents a valid strategy to maintain sustainability in aquaculture ecosystems.

Depending on the geographic location and economies the farming of fish needs land, water, high density fish installations, feed, which in most of the cases is produced remotely.

Potential negative impacts on natural ecosystems are:

- Increased use of fish meal/oil from depleted fishery sources to feed carnivorous species.
- Nutrient and organic discharge into receiving waters
- Build-up of oxygen-demanding organic wastes onto the sediments and consequent disturbance of the benthic ecosystems
- Eutrophication of water bodies
- Restructuring of biological and/or social environments,
- Use of chemicals and therapeutants with release into recipient waters.
- Increased disease occurrences
- Competition and overexploitation of resources if they are limited
- Genetic contamination of wild animals
- Release of exotic species into the environment

On the other hand fish farming is affected by pollution from agriculture or industrial activities, and suffers the competition for the use of resources. Positives aspects from aquaculture can be seen in the re-stock of endangered species into the wild, or the possibility to integrate aquaculture with fishery in marine areas by developing recruitment zones or favouring alternative livelihood solutions that would reduce the impact on natural resources.

In order to control unregulated aquaculture developments a great number of regulations have been implemented at different levels: control over the exploitation of mangrove areas, definition of maximum production limits, disease control, use of drugs, etc.

However, despite acting regulations it is still difficult to set up a comprehensive framework that can secure the sustainable use of aquatic ecosystems. Technologies have brought intensification and improved the efficiency of the resource used, however there is still a gap between intensive fish farming and sustainability especially when regulations are meant to discipline single farms rather than productive clusters or watersheds. On the other hand farms mainly follow economic criteria to assess the feasibility of an investment, and most of the time the temporal horizon is for short-term rather than long term assessment, which does not account for the socio-ecological impact and the loss of ecosystem goods and services.

Aquaculture management - a quick overview
Overview

Aquaculture management can be imagined as an integrated process aiming at developing aquatic ecosystems for the socio-economic development of the population. It includes different steps:

It includes the activities of (a) scoping/information gathering; (b) analysis; (c) planning; (d) consultation; (e) decision-making; (f) allocation of resources; and (g) formulation and implementation, (e) review. The goal is to create a circular approach to ensure continued productivity of the resources and accomplishment of farming objectives.
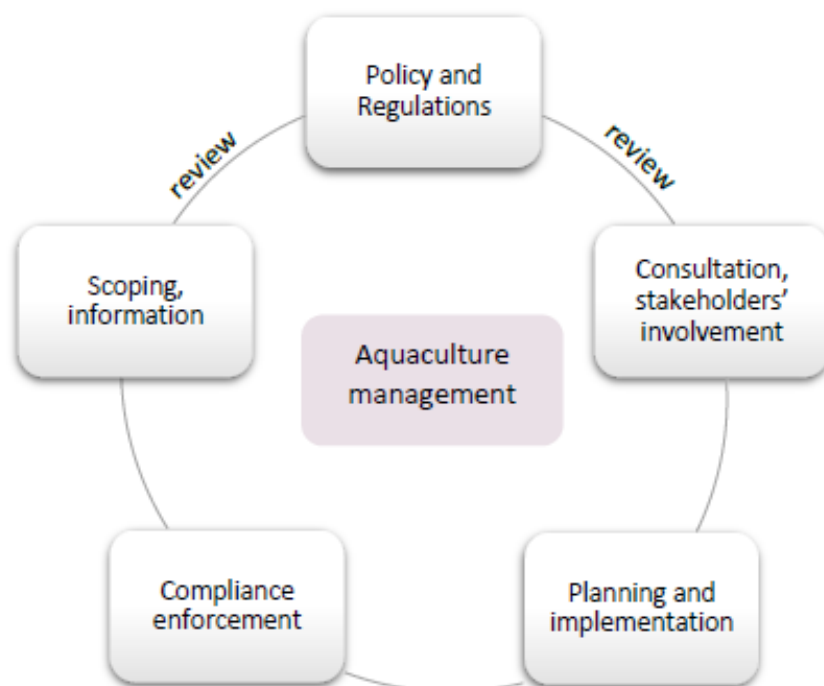
Figure 3.1 Steps in aquaculture management

Aquaculture is mainly managed mainly from a sectoral perspective. There is often a not complete harmonization of the strategies and linkages to maximize production and to benefit from cross-sectorial synergies.

Existing aquaculture management may be characterized by:

- Zoning, leases and licensing
- valued species;
- single sector specific (aquaculture);
- support to restock of fish (farmed, wild)
- management actions on control of discharge limits;
- disease monitoring/management
- food safety and compliance with production/export standards
- extension service

It is important, in a vision of sustainable and reliable productions, to widen the aquaculture management beyond the scopes of farming, but propose inclusive strategies that also take into account interconnectedness and cause-effect approaches.

Defining a picture of the status of the system being analysed helps to identify all the possible linkages, issues and stakeholders involved, this would greatly help to verify viable solutions by enabling a strategy that try to be the most inclusive of all the elements of the mapping (Figure 3.2).
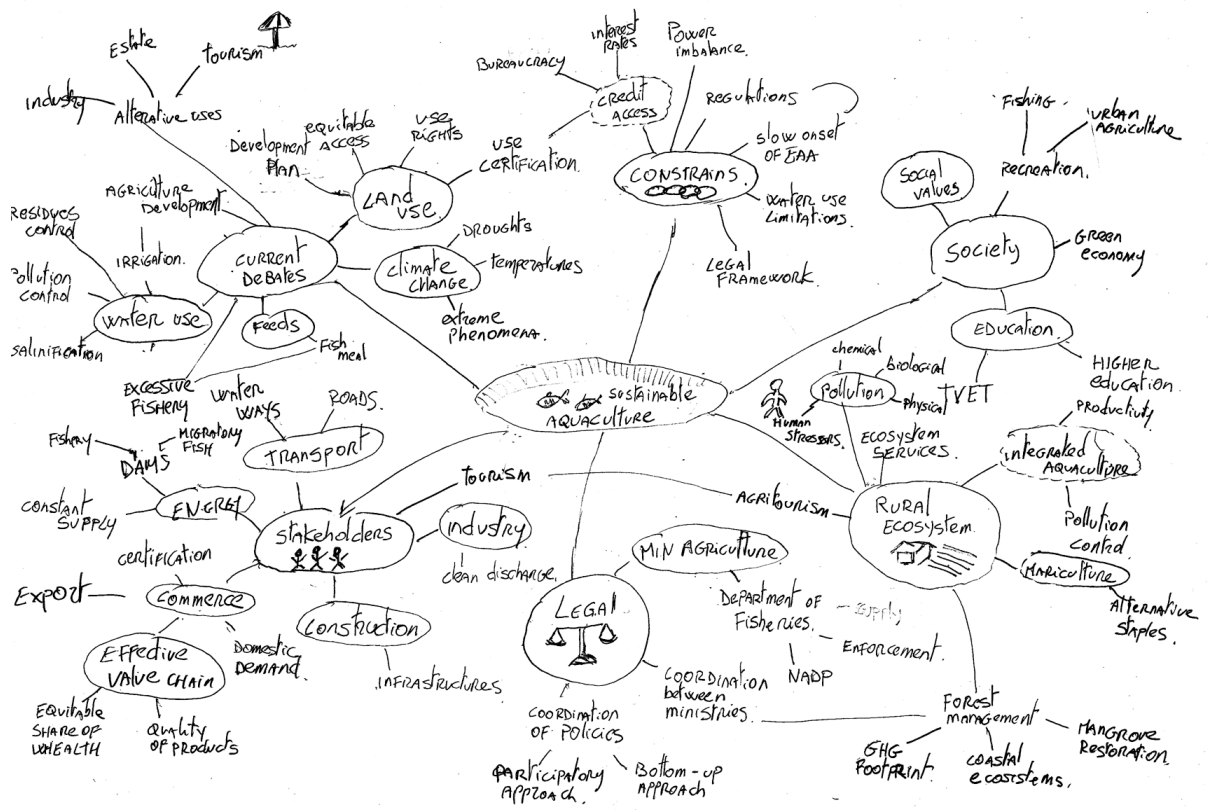
Figure 3.2 An aquatic ecosystem mapping © Edoardo Pantanella

Benefits of ecosystems

What is an ecosystem?

"*An ecosystem can be defined as a relatively self-contained system that contains plants, animals (including humans), micro-organisms and non-living components of the environment, as well as the interactions between them.*" SPC, 2010.

The definition of an ecosystem starts from its boundaries, its extension, and considers not only the living organism, but also the physical components that determine the specific characteristics of the system. Obviously for aquaculture there is the need to differentiate between different types of ecosystems, marine, freshwater, coastal, estuarine, each with its specific characteristics that require a proper and dedicated planning and management.

It is worth remembering that in every ecosystem:

- Each component is linked to the other
- Every change has a cause-effect to the rest of the elements
- New characteristics emerge from the combination of single components

For example, farming above the carrying capacity of an aquatic ecosystem has drastic effects on the release of organic pollutant and thus to the water quality (eutrophication), with consequent pressures on wild fishes and benthic organisms.

Ecosystem services and benefits

It is important to recognise the multiple benefits that aquatic ecosystems provide to human societies. These benefits can be called "ecosystem services" and include:

Provisioning
- Aquatic habitats for wild animals/fauna
- Food from fish
- Aquatic plants
- wood
- water
- Livelihood and incomes
- Trade
- Transport

Regulating
- control of climate
- protection against natural disasters
- resilience against variability and change
- alteration of hydrologic cycles
- atmospheric deposition of contaminants

Supporting
- nutrient cycles
- food webs for plants and animals
- oxygen production

Cultural
- spiritual/cultural values
- recreational benefits
- tourism

In the aquaculture context the farming of fish depends on surrounding and supporting ecosystems that are affected by human activities and natural processes.

Aquaculture can impact aquatic and land ecosystems by:

- Releasing pollutants favouring eutrophication
- Causing physical damage to benthic habitats
- Conflicts with other resource users
- Disruption of natural ecosystems (e.g. mangroves)
- Disruption of local hydrology-geology
- Changing species composition
- Introducing farmed or exotic species into the environment
- Amplifying the dissemination of pathogens and diseases

The ecosystem approach and sustainable development

The ecosystem approach is now accepted as the management approach applicable to a range of scales, sectors and multi-sectoral approaches. This term "ecosystem approach" (EA) was first coined in the early 1980s, but found formal acceptance at the Earth Summit in Rio in 1992, where it became an underpinning concept of the Convention on Biological Diversity (CBD) that defined it as:

"A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way."

The application of the EA helps to balance the three objectives of the CBD: conservation; sustainable use; and the fair and equitable sharing of the benefits arising from the utilization of genetic resources.

In effect, the EA can be thought of as the way to implement sustainable development, a concept that replaced earlier policies of development based on economic growth only. As mentioned in Module 1 sustainable development is defined by Brundtland (1987) as:

Development which meets the needs of the present without compromising the ability of future generations to meet their own needs

Note that "development" in this definition refers to the improvement in human well-being and that it is this development that needs to be sustainable. This means that we need to find a balance between ecological well-being and human well-being, so that development does not degrade the natural resource base on which it is dependent, but avoids overprotection of resources that prevents development. This balance between human and ecological well-being is achieved through good governance.

Figure 3.3 Ecosystem approach components

It is widely accepted that "well-being" is a concept that refers to the state of a system (e.g. ecosystem or social system). Specific aspects of the two dimensions of well-being and what is meant by good governance are outlined below

Ecological well-being, with regard to aquatic/aquaculture ecosystems, comprises at least five major aspects:

- healthy ecosystems that maximize goods and services;
- biodiversity that leads to ecosystem resilience;
- supportive ecosystem structure and habitats (incl. connected watersheds);
- healthy oceans, coastal areas and watersheds;
- food webs based on diverse sources of primary production and sustainable feeds.

Ecosystem health is often expressed using indicators in terms of measurable characteristics that describe:

- ➢ key processes that maintain stable and sustainable ecosystems (e.g. there is an absence of blue-green algal blooms);
- ➢ key indicators for water or organic pollution in the water or sediments
- ➢ zones of human impacts do not expand or deteriorate (e.g. a reduction in the spatial extent of sewage nitrogen); and
- ➢ critical habitats remain intact

Human well-being refers to all human components that are dependent upon, and affecting, the ecosystem. Human well-being reflects the various activities or achievements that constitute a good life. It is also accepted that well-being is a multidimensional concept that embraces all aspects of human life. Income, on its own, although an important component, cannot adequately capture the breadth or complexity of human well-being.

Eight aspects of human well-being are:

- Material living standards (income, food and wealth);
- Health;
- Education;
- Personal activities (recreation and work);
- Political voice and governance;
- Social connections and relationships;
- Living environment (present and future conditions); and
- Economic security and human safety

These aspects are founded on the belief that measuring human well-being goes beyond subjective self-reports and perceptions, and must include an objective measure of the extent of peoples' "opportunity set" and their capacity (or freedom) to choose from these opportunities in a life they value. Both objective and subjective factors are important in the measurement of the eight aspects listed above.

Good governance refers to the effective institutions and arrangements for setting and implementing rules and regulations. Good governance is considered in much more detail in Module 4 *Why do we use the ecosystem approach to aquaculture (EAA) and what are its principles?* In brief, good governance is related to stewardship where individuals, organizations, communities and societies strive to sustain the qualities of healthy and resilient ecosystems and their associated human populations. Stewardship takes the long-term view and promotes activities that provide for the well-being of both this and future generations.

The term ecosystem based management (EBM) is often used interchangeably with EA, but in some contexts, focuses more on the ecological/environmental dimension of sustainable development.

Note that the EA/EBM does not replace sectoral management, i.e. management of aquaculture and agriculture, management of the manufacturing industries, management of mining and petroleum, and management of shipping. If applied correctly it integrates management across (i) different interests within a sector (e.g. production of fish within carrying capacity and its environmental impact); (ii) across sectors; and (iii) takes into account externalities such as climate change.

Plenary brainstorm: Discuss the benefits of taking an ecosystem approach

Benefits of using the EA

There are many benefits of EA. The main ones include:

- Facilitates the trade-offs necessary to balance human and ecological well-being
    - enables consideration of diverse stakeholder priorities;
    - balances production with conservation of biodiversity and habitat protection;
    - helps resolve conflict.

- Allows adaptive management – leading to more effective aquaculture planning
    - can be applied in data poor situations

- Increased stakeholder participation and more transparent planning
  - increased equity in the use of aquatic resources;
  - recognizes cultural and traditional values;
  - protects the fish farming sector from the impacts of other sectors and vice versa.

- Provides a way to consider large-scale, long-term issues (e.g. climate change)
- Increased political support
  - fosters political and stakeholder participation;
  - unlocks financial resources.

Once the benefits that ecosystems bring to human societies and the benefits of the EA are recognized, it is possible to understand the need for managing these ecosystems more holistically (i.e. beyond a focus on fish only). The benefits of an EA when applied in an aquaculture context are discussed in the next Module.

Module 4 - Why do we use the ecosystem approach to aquaculture (EAA) and what are its principles?

Module objectives
- Explain the principles of using an EAA
- Explain how EAA fits with other approaches
- Understand the need to find a balance

Overview

This module explains that an EAAM is the ecosystem approach applied to the aquaculture sector, and is an approach to improve the contribution of aquaculture to sustainable development. EAAM has three components – ecological well-being, human well-being and good governance. An EAAM is discussed alongside other sustainable management approaches; and the key elements that make EAAM different are highlighted.

EAA Principles

Defining EAAM

The Ecosystem Approach follows the mainstream concepts of Sustainable Development that replaced the previous development visions that were only based on economic growth. The balance between ecological well-being and human well-being was considered essential to avoid on one end the destruction of the environment and on the other hand the un-exploitation of wealth to the detriment of humans.

The term "ecosystem approach" was acknowledged in 1992 during the Rio Earth Summit where it became a key concept of the Convention on Biological Diversity (CBD) to strictly link the ecological approach as the elective strategy to achieve sustainable development:

A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.

The FAO's definition of the ecosystem approach to aquaculture (EAA) is longer, but reflects the same concept as the more general definition of the ecosystem approach:

An Ecosystem Approach to Fisheries (or Aquaculture) strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries. (FAO, 2003).

The ecosystem-based aquaculture management (EBAM) has a single sector focus of the ecosystem approach. EBAMs considers the impacts of the environment on health and productivity of cultured organisms and the impacts that aquaculture has on all aspects of the marine ecosystem. EAA instead has a wider horizon and also targets both the socio-economic benefits of aquaculture and post-harvest activities. (Staples and Funge-Smith, 2009)

EAA provides a broad framework that can be used at different scales and also uses tools that can customize EAA by allowing a prioritization process of major issues and the setting of objectives. Within EAA one can give priority to the economic, social and ecological objectives to suit the national policy setting, local conditions and aspirations of major stakeholders. In this way it can support ecosystem-based aquaculture management or wealth-based management, depending on whether the primary focus is on the environment or wealth (Staples and Funge-Smith, 2009).

An important aspect worth remembering is that EAA does not give solutions, but rather helps decision makers and stakeholders to identify them. The centrality of people participation is therefore essential

to identify issues, address and establish a management plan that is perfectly tailored to the aspiration of aquaculture farmers and the local communities involved also in other sectors.

The goal of EAAM is to improve the contribution of aquaculture towards sustainable development. In achieving this three main principles should be followed:

Principle 1

Aquaculture should be developed in the context of ecosystem functions and services with no degradation of these beyond their resilience capacity.

Developing and managing aquaculture while considering the full range of ecosystem functions and services implies the need to define boundaries, to estimate production and assimilative capacity of aquaculture ventures that should adapt to ecological compliant practices in order to maintain the ecosystems both sustainable and resilient.

The type of ecosystem services depend on the management and trade-off between services should be considered.

Principle 2

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

Aquaculture should provide equitable opportunities and sharing of benefits through the whole society. This implies the need that planning be participative and should not be done to the detriment of any group. Aquaculture also promotes improved livelihood and food security to everyone.

Principle 3

Aquaculture should be developed in the context of other sectors, policies and goals.

This principle outlines how aquaculture is strictly related to other activities, thus an integration is indispensable to develop synergies to make the ecosystems more sustainable.

The ecosystem approach (EA) recognizes that:

➢ The human component is an important element of modern agro-ecosystems. Biodiversity management should thus take into consideration the centrality of the human component, which pull for integrated, participatory approaches in the definition and prioritization of issues in any ecosystem management plan.
➢ Human activities are benefitting a wide range of ecosystems services that must not be threatened by damaging ecosystems and their key functions.
➢ Considering the high degree of ignorance of the functioning of ecosystems it is highly important to keep precautionary and adaptive approaches to prevent damages.
➢ Externalities from human, industrial or other activities are costs that need to be internalized to compensate for the losses or damages of the ecosystem services to the society
➢ Management of ecosystem resources should be done in circular way: the wastes from one activity should be resources for another. Reuse would improve system efficiency, productivity and reduce the pressure on the ecosystem and its functions and its services.
➢ Management needs to be "nested" according to the ecosystem scale. Different approaches are in fact needed depending on the size of the ecosystem boundaries
➢ There is a need for analysis and understanding of the broader social, economic and environmental implication of meeting targets and for transparency of decision-making in relation to trade-offs between social, economic and environmental objectives.

Modified from Hambrey, Edwards and Belton (2008)

Moving from existing aquaculture management to EAAM

As described above, the main objective of EAAM is the sustainable use of aquatic ecosystems in synergies with other sectors. EAAM works on existing elements of aquaculture management and improve them with a system approach and broader participation.

Conventional approach	Ecosystem approach
Top-down	Participatory
One objective: production	Multiple objectives
Sectoral	Interaction with other sectors
Farm scale (most common)	Multiple (nested) scales
Predictive	Adaptive
Scientific knowledge	Extended knowledge
Prescriptions	Incentives
Corporate	Public/Transparent

Why an EAAM? – The benefits

The management benefits of an EAAM include:

- System approach on the links between ecosystems and aquaculture;
- Contribution to more effective resource use planning;
- Long term planning that can support countries' sustainable policies
- Participation of stakeholders and trade-offs among different sectors priorities.
  - Gender inclusion
  - Conflict management
- Sustainable management of resources by balancing human and ecological needs;
- Improved management of resources by developing synergies among sectors
- Improved production efficiency by reusing wastes
- more equitable use of natural resources
- multifunctionality of ecosystems
- synergic support to the fishery sector
- precautionary approach
- increased resilience and adaptation against climate change, population growth, environmental pressure
- monitoring and adaptability to changing conditions
- Participation of donors to support the management plan

Activity: Balancing different societal objectives. Watch the video and discuss in groups.

M4
M8
M9
M12

Political support
- Inclusion of local government and activities outside the sector
- Harmonization with environmental departments/ministries
- Liaison with scientists for informed decisions

M9 M11 M12 M13 M14

Governance
- Better enforcement
- Stakeholder compliance with management actions
- Gender inclusion
- CCA inclusion
- Support to all value chain
- cross sectorial management

Support

Communication

Compliance

M4 M12

Scale management
- Decentralization
- co-management and collaboration between government agencies at different levels and key stakeholders

M4
M8
M9
M12

Stakeholder support
- Inclusion of local stakeholders
- Harmonization with other sectors
- Liaison with scientists for informed decisions

Address issues, conflicts M11
-Ensures human well-being is included
-Balances conflicting policy objectives within and between sectors.
-Opens dialogue between users
-identify solutions through conflict management
-Identifies and directs effective subsidies.
-Aligns conservation vs farming objectives.
-identify issues between farmers

M12

M8 M14

Help to provide financial resources
- Helps coordinate input and services from different groups
- Improves communication with decision-makers and donors
- EAAM plan engages with governance and unlock resources

M13 M14

Aquaculture Subsectors
Includes all sub-sectors impacts
-exploitation of wild seeds
-pollution/eutrophication
-fish feed vs local staple fish
-diseases
- uneven equity through value chain

M8 M11

Protect aquaculture vs other sectors
-Subsidies in agriculture.
-Urban runoff and habitat damage.
-Tourism development.
-mining
-Conservation actions limiting aquaculture

M9 M15

Promote communication
Addresses lack of dialogue between aquaculture and other departments or ministries (environment, agriculture, transportation)

EAAM

M8 M11

Protect other sectors vs aquaculture
-Habitat impacts.
-pollution, eutrophication
-integration with agriculture
-impact on fishery
-better integration of conservation and protection actions.
-ecosystem integrity and support services

M10 M17

Data poor scenarios
-Uses traditional and scientific knowledge.
-New information increases understanding of the socio-ecological system

M17

Monitoring and review
- Monitoring and review feedback mechanisms allow new relevant information to be gathered and adaptively incorporated into management cycle

M12 M17

long-term ecosystem sustainability
- long-term horizons allow environmental and social changes into planning process.
- Incorporates projected social changes incorporate impacts of climate change

Figure 4.1 EAAM features and reference training modules

21

Other synergic approaches

The ecosystem approach to aquaculture (EAA) is developed to mainly support Articles 9 and 10 of the FAO Code of Conduct for Responsible Fisheries (CCRF) (Figure 4.3, Figure 4.4).

In 2013 FAO initiated the Blue Growth Initiative (BGI), which operates on the CCRF. The BGI focuses on fisheries; aquaculture; ecosystem services; trade and social protection. It advocates ways to balance economic growth, social development, food security, and sustainable use of resources.

The goal of EAA is to assist countries, governments, decision-makers and policies to develop and implement strategies act to improve the sustainability of the aquaculture sector, the integration of aquaculture with other sectors and the improvement of its contribution to social and economic development.

The EAA builds on the conceptual work carried out to develop the ecosystem approach to fisheries (EAF) as well as initiatives related to integrated natural resource management such as integrated coastal zone management (ICZM) and integrated watershed management (IWSM) and the planning and management for sustainable coastal aquaculture development.

At regional level the EAA also links to the ASEAN Good Aquaculture practices (GAqP) programme. The scope of GAqP is to prevent or minimize the risks of four areas of aquaculture production: Food safety, animal health, environmental integrity and socio-economic aspects. GAqP includes all phases of fish production and post-production for both mariculture, coastal aquaculture, freshwater.

Other instruments and international treaties provide also an orientation framework to the development of sustainable aquaculture plans:

➢ The FAO Code of Conduct for Responsible Fisheries (CCRF) chapters, 9 and 10
➢ The rules of the World Trade Organization (WTO), with reference to the Agreement on the Application of Sanitary and Phytosanitary (SPS) Measures and the Agreement on Technical Barriers to Trade (TBT)
➢ FAO/WHO Codex Alimentarius
➢ The Labour Standards of the International Labour Organization (ILO)
➢ The Convention on Wetlands of International Importance
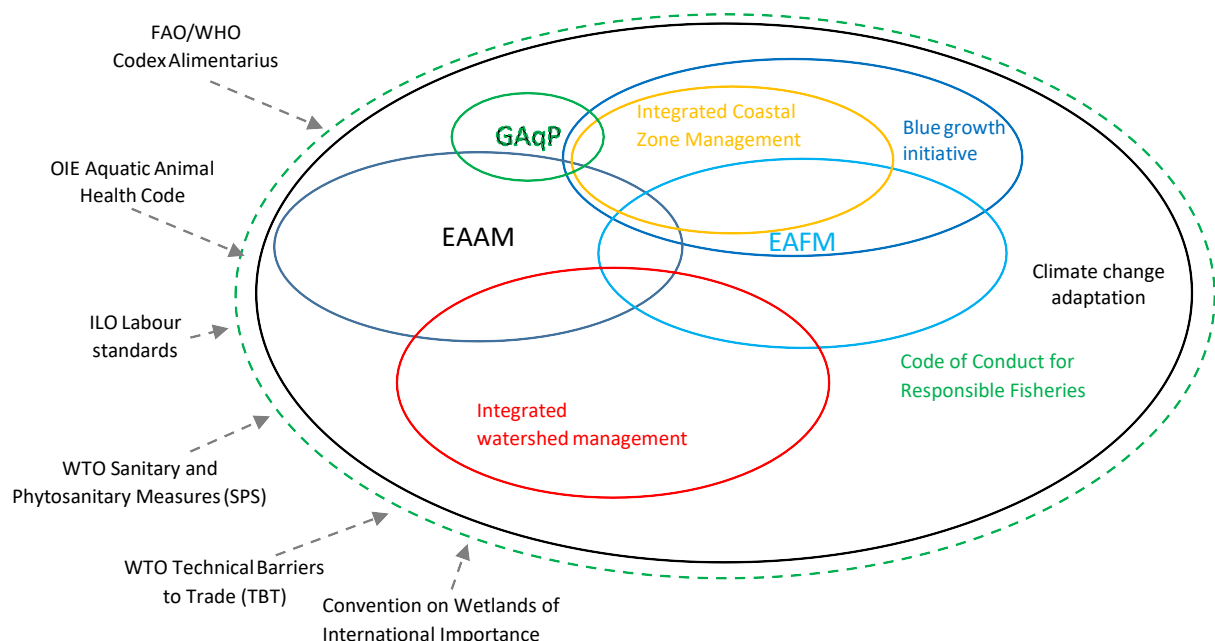
Figure 4.2 EAAM approaches and main instruments

EAAM components

The EAAM principles are based on a set of guiding principles specified in the chapter 9 (aquaculture) and 10 (Integration of Fisheries into Coastal Area Management) of the FAO Code of Conduct for Responsible Fisheries (CCRF).

The main principles and suggested recommendations in the two chapters are summarized in the diagrams below.

Responsible management
Advance impact evaluation of:
- genetic diversity
- ecosystem integrity
- use of best available scientific information

Maintain/develop an appropriate legal and administrative framework

Livelihoods of local communities
- access to fishing grounds
- avoid fishery damages from

Protect transboundary aquatic ecosystems
Responsible aquaculture practices
- At national level
- Cooperation

National aquaculture development

EIA and monitoring
- ecological issues (water use, land, pollution)
- socio-economic issues

Management in respect of other states, international laws
- Responsible choice of species
- Siting
- Management

Transboundary aquaculture development

Aquaculture strategies and plans
- ensure ecologically sustainable aquaculture
- rational use of resources among sectors

CCFR Article 9 Aquaculture Development

Databases and information networks
- data dissemination
- facilitate planning cooperation at national, regional global level

Consult with neighbouring States
- Before introducing exotic species

Monitor the impacts of inputs used in aquaculture
- cooperation

Selection of broodstock and juveniles
- set appropriate procedures

Use of aquatic genetic resources

Responsible aquaculture at production level

Support communities, groups, of farmers

Endangered species
- Research
- Culture techniques
- Rehabilitation

Conserve genetic diversity and maintain integrity of aquatic communities
- cation for exotic species
- caution with farmed strains
- control genetic pollution, diseases

Regulate the use of chemical inputs
- Research
- Culture techniques

Promote active participation
- Farmers
- Communities

Disposal of wastes
- Research
- Culture techniques
- Rehabilitation

Regulate the use of chemical inputs
- to protect humans
- to protect environment

International codes of practice and procedures
- Introductions and transfers of aquatic organisms

Minimize risks of disease transfer with Code of Practices
- for fish genetic improvement
- exotic species
- egg, larvae, fry introduction

Food safety
- keep quality
- improve value with:
  + Postharvest
  + Processing
  + Storage
  + Transport

Improved aquaculture
- Selection of breeds
- Use of appropriate feeds
- Additives
- Fertilizers

Effective health management
- Hygiene
- Vaccines
- Safe use of hormone, drugs, chemicals

Figure 4.3 Code of Conduct of Responsible Fisheries, Chapter 9

Appropriate policy, legal and institutional framework
sustainable and integrated use of resources
- local ecosystems well being
- local community well being

Procedures and mechanisms to settle conflicts
- conflict management at administrative level between users

Appropriate technical capacities and financial resources
- Authorities representing the fisheries sector in the coastal management

Representativeness of fishing communities
- planning and development
- decision making process
- multiple use of coastal resources

Adoption of fisheries practices
- avoid conflict with other users

Institutional framework

Implementation

Cooperation and coordination among national authorities
For coastal areas
- planning
- development
- conservation

Appropriate institutional and legal frameworks to govern
- possible uses of coastal resources
- rights of coastal fishing communities
- sustainable use

CCFR Article 10 Integration of Fisheries into Coastal Area Management

Creation of public awareness
- protection and management of coastal resources
- participation of stakeholders

Interstate cooperation
- Sustainable coastal use
- Environmental conservation

Regional cooperation

Policy measures

Assist decision-making on the allocation and use of coastal resources
- Value assessment
- cultural and social values

Cooperate at the subregional and regional level
- management sub regional or regional level

Promote multi-disciplinary research
- environmental,
- biological,
- economic,
- social,
- legal
- institutional

Take in due account of the risks and uncertainties
- management policies

Adverse transboundary environmental effect

Provide timely information or prior notification to affected states
-

Consult with States as early as possible

Monitoring system
- physical parameters
- chemical,
- biological,
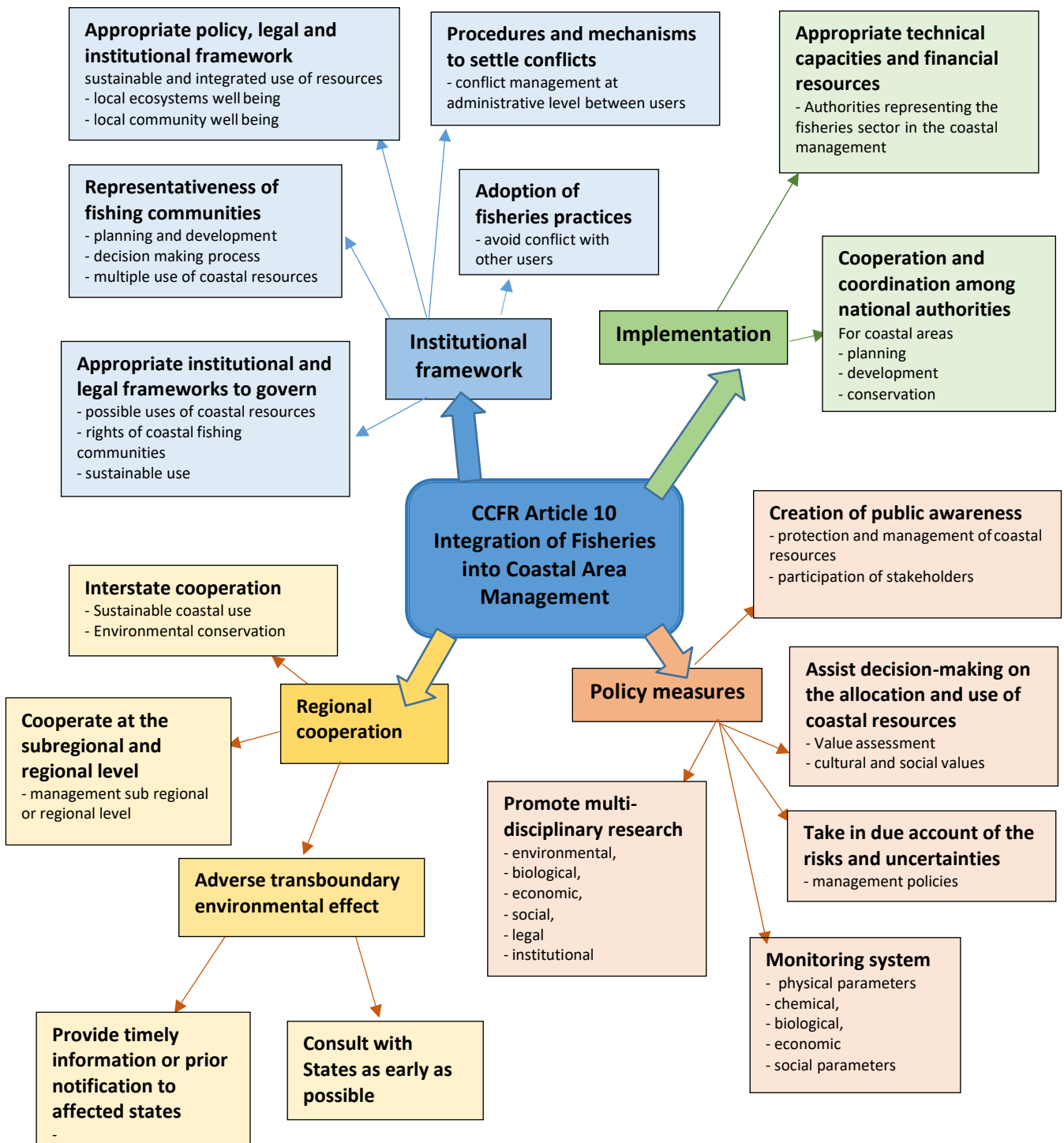- economic
- social parameters

Figure 4.4 Code of Conduct of Responsible Fisheries, Chapter 10

Activity: Progression check – How much your country is implementing CCRF principles?

Components of EAAM

The EAAM has a holistic approach that considers many factors in order to commit to any plan. Not only are ecological, socio-economic and governance factors implied depending on the scale of the system, but also people inclusion and shared objective play a key role for the planning and management. A holistic system is dynamic and quickly responds or adapts to changes by also avoiding unnecessary risks. The EAAM components can be summarised as follows:

1. Good governance

Governance is the way rules are set and implemented. It includes the mechanisms, processes and institutions through which citizens and institutions find compromises among different priorities, reach agreements, exercise the rule of law and meet their obligations. Governance is often a complex mixture of formal and informal processes that might involve a geo-political entity (e.g. nation-state government), a socio-political entity (e.g. chiefdom, tribe, family, etc.), or any number of different kinds of institutions and arrangements.

Governance comprises:
- key political support;
- legal authority to manage;
- effective institutions;
- coordination arrangements with government, external agents, resource groups and community members;
- community support through participatory processes;
- enforcement and compliance;
- a collaborative decision-making process;
- information and data to support monitoring and learning-by-doing;
- adequate and dedicated resources (personnel, funding, equipment) for management;
- staff skills and commitment;
- consideration of external factors affecting governance
  - market forces,
  - climate change,
  - natural disasters,
  - level of socio-economic or human development

Accountable
Assumption of responsibility for actions, decisions, policies, administration and implementation within the scope of the work

Rule of law
The governing body should enforce equally transparent laws, regulations and codes.

Participatory
High involvement of stakeholders in consultation and decision-making to build the highest consensus and agreement to goals and strategies

Transparent
The actions, decisions and decision-making processes can be scrutinized to avoid any conflict of interest

Good governance

Consensus oriented
Governing body must achieve the highest consensus on policy to include everyone in the policy

Responsive
Capacity and flexibility to quickly review and respond to changes that meet public expectations.

Equitable and inclusive
The decision making process ensures that all the needs of the minorities and most vulnerable groups are taken into account

Effective and efficient
The governing body should produce quality and cost-effective services to citizens and ensure that outputs meet the original plans and goals
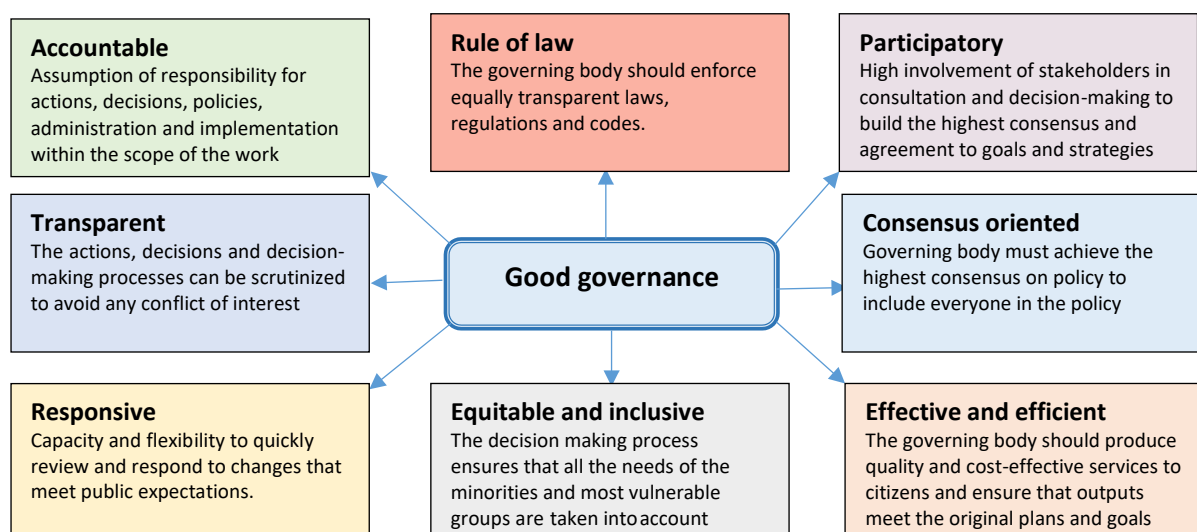
Figure 4.5 Characteristics of good governance

In EAAM good governance is essential to guarantee the perfect equilibrium between ecological well-being and human well-being. This is particular true given the different sectors and priorities from the communities and groups involved in the planning and decision making.

The key of successful governance stands in the inclusion and the agreement among the parties that can be achieved by efficient communication and interaction of the reason of each participants and in the management of differences in a constructive way. One important tool is played by the envisioning process and in building an understanding of the scope of the collaboration.

2. Appropriate scale

The scale define the boundaries of the ecosystem to be considered. The choice is particularly important in aquaculture as the impact of some farming activities are almost not localized in a small context but diffuse in a specific zone or productive area. The scale criteria can be either geographical (spatial), ecological for areas that have the same environmental characteristics, political or temporal.

The farm scale

Farm scale represents the smallest ecological unit for aquaculture planning. Most management practices are developed for this scale and most top-down regulation measures, such as the environmental impact assessment (EIA) of farming practices (i.e. GAqP) are applied at this level, since farmers need to withstand to specific regulations or guidelines and their activities are subject to monitor and control.

The use of farm scale is facilitated by the direct monitoring that can be done on disease occurrence, pollution, mortality, or damages by other human activities or climatic events. Farm scale in general gathers farmers, workers, households and local communities.

The watershed/aquaculture zoning scale

This scale consider clusters of farms that share the same water system. At this level it become macroscopic the impact to the environment of group of farms that can amplify the negative effects of not sustainable practices at farm level (i.e. eutrophication, genetic pollution due to escapees, disease outbreaks). Stakeholders at this level includes farmer, watershed management bodies, fishery sector, agriculture farmers/groups, industry, local authorities, industry, transport sector, tourism.

When watershed become transactional (i.e. Great Mekong Delta) different countries' agencies and governments, international organizations need to be involved, in this case the implementation of the EAAM should be coordinated among a multinational group of participants.

The global scale

Global scale refers to the whole aquaculture industry that deal with a specific commodity. This level gathers wider issues concerning production (feed, fishmeal, trade agreements, etc.), certifications, research, data statistics. Stakeholders involved at this level are global actors such as industries, international organization (FAO, WHO, WTO, ILO) and national governments.

Temporal scales

Time scales are important factors in planning and management of EAA. Aquaculture in fact faces external forcing factors that modify its interactions with the environment, which change during time. Climate change, population growth, industrialization and pollution add uncertainty and it is therefore required to apply a precautionary approach to modify resilience limits.
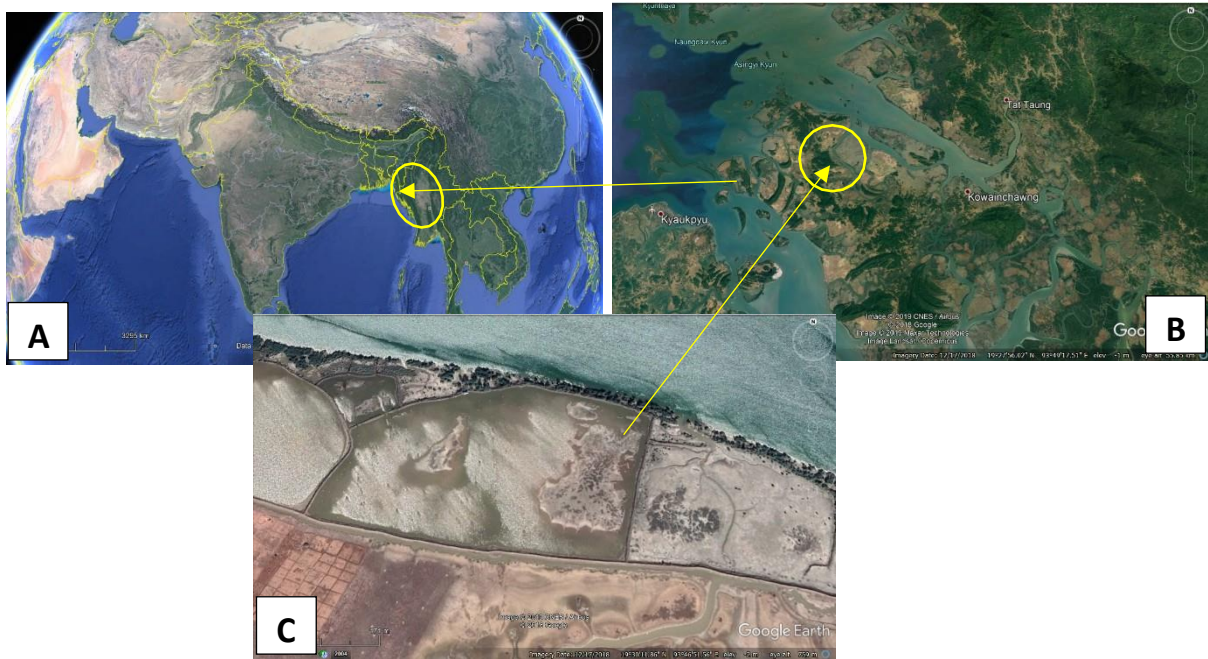
Figure 4.6 Global (A), watershed/zone (B) and local (C) levels   Source: Google Earth

Activity: In many countries, fisheries management has been devolved to the district/municipality level. In your groups, answer the question: "Is the district/municipality the correct scale to manage all fisheries?"

3. Increased participation

Stakeholders are the key element for defining a sustainable EAA plan. One of the foundations of the EAA is in fact the participation of individuals and groups that brings in different needs, issues and priorities. It is fundamental to listen to every representative, especially those who speak on behalf of minority or most vulnerable groups. The choice of the stakeholders should be done according to the inclusion criteria, the ecosystem boundaries (farm, watershed, global have different groups of people) and on the basis of power and representativeness. Different sectors should participate, whose list could comprehend, but not to be limited only, by the following individuals or groups:

- Government departments/GOs (Fishery, Agriculture, Forestry, Water Management, Tourism, Planning, Mines)
- Regional/district/local governments
- Aquaculture farmers, farmers groups
- Local village communities settled at local or watershed levels
- Women groups
- Minority groups
- Agriculture farmers, farmers groups
- Fishermen, fishery groups
- Fish industry/value chain representatives
- Other industries representatives
- Trade representatives
- Transport industry
- Tourism industry

- Construction/mining industry
- NGOs, INGOs
- Scientist groups/environmental agencies

Specific dynamics about stakeholder choice are explained in the training <mark>module 8</mark>

4. Management for multiple objectives

The success of EAAM depends on reaching a balance between conservation and sustainable use of aquaculture within the carrying capacity and resilience limits of the ecosystem, between the ecological, socio-economic and human-related objectives depending on the ecosystem boundary.

EAAM requires commitment to overcome difficulties (both conceptual and practical) in making choices that require trade-offs and compromises between different sectors of the society. This requires long-term political will (backed by sufficient resources) and also short-term economic and social support, particularly for the local stakeholders. However, as noted previously, if successful the benefits could be very significant.

5. Cooperation and coordination

With EAAM there is a need to ensure harmony between management and linkages between and among the governance scales that range from local level to watershed and national governments.

EAAM requires institutional cooperation and coordination because it more explicitly deals with the interactions of the aquaculture sector with other sectors. Cooperation and integration of sectors in a better planed landscape particularly caring for water resources could yield greater benefits.

6. Adaptive management

Adaptive management is *learning by doing.* Decisions are selected to achieve management objectives while at the same time the information gathered increases experience and improves future management outcomes.

Adaptive management involves managing and learning from what has been done by evaluating the outcome of the management action. It is closely linked to the precautionary approach. It is not necessary to wait until all the data and information are available and analysed before taking action. Management actions can be put in place and, providing they are monitored and evaluated, they can be modified based on the lessons learnt from their implementation.
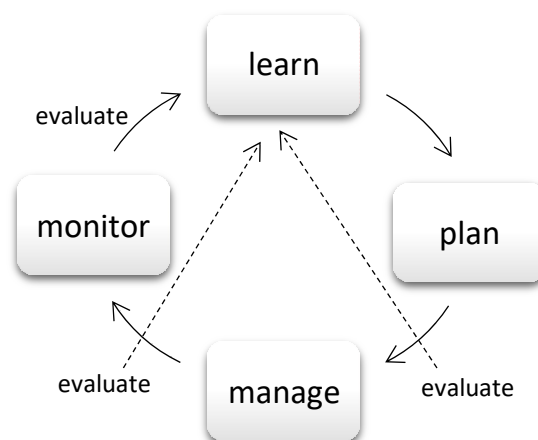

Figure 4.7 Adaptive management

7. Use of the precautionary approach

Where there is a lack of sufficient scientific knowledge or information to permit a sound decision or where the threat of serious or irreversible damage to ecosystems exists, the precautionary approach should be widely applied.

However, a lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental or social degradation.
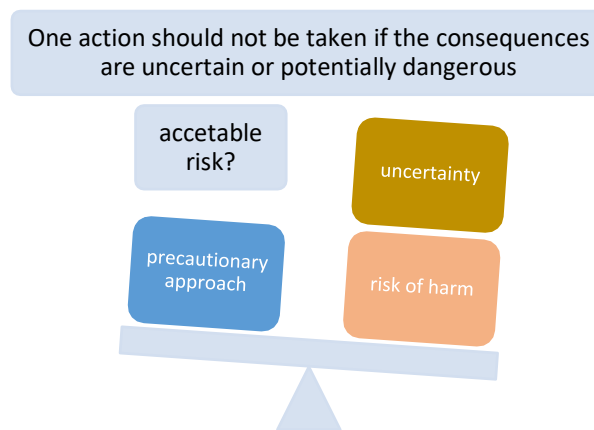

Figure 4.8 Precautionary approach

Actiivity: in groups, revisit threats and issues and cluster them into three EAAM Principles

Activity: working individually, identify EAAM elements you are already doing: identify the gaps, suggest ways to improve. Share your thoughts in small groups

References

FAO 2003. Fisheries Management - 2. The Ecosystem Approach to Fisheries FAO Technical Guidelines for Responsible Fisheries 4 Suppl. 2. Food and Agriculture Organization of the United Nations

Staples, D. and Funge-Smith, S. 2009. Ecosystem approach to fisheries and aquaculture: Implementing the FAO Code of Conduct for Responsible Fisheries. FAO RAP Publication 2009/11. Food and Agriculture Organization of the United Nations

Module 5 - Moving towards EAAM - Case study

Module objectives
- Determine where aquaculture sector in own country is moving towards EAAM
- Identify key national challenges to adopt EAAM
- Acknowledge the process of EAAM is made of different and timely actions

Overview
This module demonstrates how one country has progressively moved to a more ecological approach in the production of shrimps. The nexus between aquaculture and fishery management suggests how an equilibrium between ecology, livelihood and good governance is required to plan any efficient development strategy.

Case study – the Estero Real watershed in Nicaragua[1]

Introduction
The fisheries and aquaculture sector has been taking a leading role in Nicaragua with a sustained growth and a particular social, economic and environmental impact, but poor management has recorded adverse impacts from a social and environmental sustainability perspective, as well as increased the vulnerability and food insecurity.

The national expansion of fish production has been mainly supported by the considerable booming of farmed shrimp. In 2006-2012 the production of shrimp increased by 124.3 percent according to INPESCA.

The Delta of the Estero Real Nature Reserve (RENAPRODER), was established by the Government of Nicaragua in 1983 and recognized by the Convention as a "Wetland of International Importance" since 2003. It has an extension of 84,759.82 ha and a buffer zone of 64,570.12 ha. In 2006 the MARENA's "Nature Reserve Protected Area Management Plan of the Estero Real Delta" was approved.

The Estero Real Delta plays a strategically important role for Nicaragua, by contributing for the country's economy with foreign exchange, employment and food by hosting numerous activities in agriculture, forestry, fishing, and in particular shrimp farming, which has its main area of concentration and growth there.

RENAPRODER currently faces a critical process of deteriorating sustainability due to the improper management of its natural resources over which the Government has explicitly raised its concern and have initiated a series of actions to mitigate such a situation.

With regard to such actions and in pursuing the fisheries and aquaculture sectors, the Nicaragua's Fisheries Institute (INPESCA) and FAO conducted an intensive work of collecting technical data, carrying out diagnostics and exchanging experts' and users' opinions on the situation in the basin, with a view to establish the basis for the formulation and implementation of a fisheries and aquaculture management plan with an ecosystem focus in RENAPRODER.

The studies show that beside the dizzying growth experienced in the last decade by semi-intensive and intensive aquaculture, situations of acute livelihood scarcity for poor and highly vulnerable local populations also engaging in small-scale fisheries and aquaculture activities were noted.

One of the main problems of the small-scale cooperative sector dedicated to shrimp farming is the lack of funding, which is why a large part of the partners are engaged in catching of juvenile shrimp in

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[1] Informe del Taller de Validación del "Plan de Gestión Colaborativa de la Pesca y la Acuicultura con Enfoque Ecosistémico, en el Estero Real" Chinandega, Nicaragua, 13 y 14 de Marzo del 2013 FAO, Informe de Pesca y Acuicultura No 994/3 FIRA/R994/3 (Es) ISSN 2070-7002

the natural winter lagoons, which, added to the number of permanent artisanal fishermen, is causing great pressure to fish and shrimps that move to the area during their juvenile stages.

Cooperatives, mainly composed by small farmers have lost pace during the year for the incapacity to meet demand (undersized product), technical deficiencies, difficulties of taking advantage of adding-value processing activities, poor business management capacity.

On the contrary semi-intensive and intensive medium and large companies are highly vertically integrated and often under oligopolistic or monopolistic structures. These big farms are well inserted into the global market and have procured employment opportunities for local people, especially to women working and earning in their processing factories.

As far as fishing is concerned, one of the extreme serious problems identified is the high mortality of shrimp juveniles and associated fauna from the use of inadequate fishing gears. Additional causes for such reduction may also be ascribed to the pollution from intensive aquaculture (wastes above the carrying capacity) or agriculture (pesticides), as well as illegal fishing from neighbouring country (close proximity with the Honduras border).

Given the lack of other income options the local communities are forced to seek their modest livelihood through fishing practices (shrimp nets) that are often harmful to fisheries resources and the environment.

Studies carried out on the effects of shrimp nets on juvenile shrimps and other species demonstrate that these fishing gears, whose use is legally prohibited in Nicaragua, are one of the factors that have taken part in the collapse of the offshore shrimp fishery and reduction of coastal artisanal fishing in the Gulf of Fonseca.
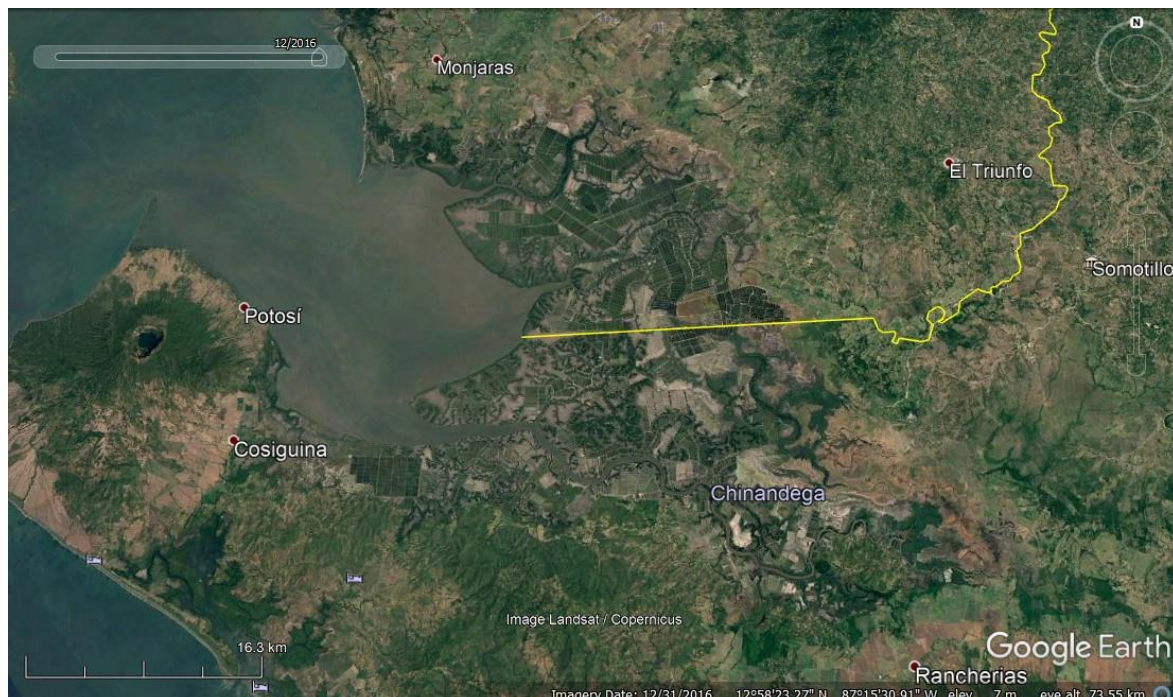

Figure 5.1 Estero Real shrimp aquaculture/fishery area. Nicaragua-Honduras boundary in yellow line
Source: Google Earth

The shrimp nets have considerable negative impact on the sustainability of affected fishery resources, the environment and the ecology of the estuary. It is worth noting that fishermen are aware that their activity with the shrimp nets significantly damages fishery resources and the ecosystem. However they argue of not having any income alternatives available.

Those involved in the fishery are not only traditional fishermen but also other people that have been authorized to operate. Thus for most of the people in the delta catching shrimp is only one of the several activities (small agriculture, rural aquaculture, wood etc.) they use for livelihood. For them, it's not just a part of life but also an activity rooted in the culture of a large part of the communities.

It is therefore necessary to formulate a conversion program that aims to eliminate the use of the shrimp nets by generating additional livelihood options for people involved under criteria of economic and environmental sustainability and social viability.

Part 1 - Development of the Programme for the Elimination of the Use of the Shrimp Nets in the Estero Real

1. Preliminary components of the shrimp net removal and shrimp conversion program

Program objective: Substantial decrease in shrimp juvenile mortality and associated wildlife for the use of inadequate fishing gear in the Estero Real.

Operational objective: Zeroing the number of shrimp nets operating in the Estero Real.

a) Measure of identification of program participants, and design of the mechanisms for participation and consultation.

Activities:

- Adequate economic, cultural and social characterization of groups, communities and individuals to be included in the conversion program.
- Definition of the following mechanisms for participation in the programme:
    - access criteria to recall nets through incentives, linked to a program of micro-enterprises in services and supplies,
    - mechanism for allocating legally constituted artisanal fishermen cooperatives;
    - in the case of aquaculture alternatives, allocation mechanism (including concessions and unused areas) for shrimp, fish and molluscs.
- Intense and regular consultation activities with program participants and development of awareness-raising campaigns about its objectives and its Components.

(b) Measures to Identify Alternative Livelihood Activities for Women who will have to stop operating the shrimp nets.

Activities:

- Developing an incentive program (exchange payment) aiming at the development of micro-enterprises in services and supplies.
- Effective technical and legal identification of available areas where fishermen's could be enrolled into programmes on small-scale aquaculture.
- Formulation of feasibility studies on alternative livelihood activities under the criteria of economic and environmental sustainability and social viability, as a stimulus for the withdrawal of the fishing gears with its corresponding financing. The following activities have been considered:
    - Reforestation of mangroves located in areas granted to private companies;
    - Small-scale culture of fish, shrimp and bivalve molluscs;
    - Development of a comprehensive artisanal fishing project
    - Agriculture
    - Waste management
    - Honey production

-   Sewing shops and bakeries
-   Ecotourism

c) Technical assistance measures

Activities:

• Formulation of technical assistance and training packages with their respective financing. The assistance targets technical aspects of good practice and management of small-scale aquaculture, fisheries and other small initiatives to be promoted and funded on the basis of the programme and the attainment of environmental permits.

Support for marketing and market access for small aquaculture farms and the supply of seed processing laboratories in the framework of negotiating agreements with the semi-intensive and intensive shrimp farming sector.

d) Administrative, legal and institutional measures

- Implementation of existing legislation prohibiting the use of the shrimp nets strengthening the monitoring and control activities under the INPESCA competencies.

Activities: supply of a boat with its human resources, funds for operations in the monitoring, surveillance and control; census and registration of shrimp net operators.

- Strengthening the Local Management Committee (CLM) of the Estero Real to ensure adequate institutional support in the implementation of the programme.

Activities: formulation of a strengthening program of the Local Management Committee (CLM) that includes review and adequacy of its competences, the establishment of a full-time executive staffing and logistical support necessary for their operations; preparation of a legal feasibility study, institutional and financial institutions for the establishment of a fund to enable the CLM to develop its programmes and in particular facilitate its role in the implementation of the conversion program.

e) Funding measures

Activities: Design and implementation of a development strategy on financial services for small-scale farming activities on shrimp and other aquaculture products, fishing and other small-scale activities relevant to the programme of management of fisheries and aquaculture, in the territory of RENAPRODER.

2. Programme development methodology

The programme for the withdrawal of shrimp nets and the conversion of processing activities aims to permanently eliminate the use of an illegal fishing gear that produces a high mortality of shrimp juveniles and associated fauna in an area declared natural reserve.

In its preliminary formulation, the program plans the establishment of adequate incentives for alternative livelihoods for fishermen and communities, who must abandon this fishing activity, as well as granting administrative, legal, institutional support for the proper implementation of the program.

The program has a well-defined, technically well-formulated and measurable operational objective:

-   Bring to zero the use of shrimp nets.

- obtaining the maximum benefit in terms of protecting fisheries resources at a critical stage of their ecosystem,
- sustainable socio-economic rehabilitation from the recovery of fisheries
- minimizing the social cost of withdrawing the shrimp nets.

There are theoretical and practical aspects that need to be considered in the design and implementation, such as:

- the role and influence of existing fisheries in a long term scale,
- the cost of implementing the programs and who should pay for them
- the expectations fishermen put into their collaboration and support, which will be based on their perception about the credibility of the program,
- strengths and weaknesses
- the political support

Specific measures should be coupled in a coherent and mutual manner to support the programme with social, economic, financial, institutional, and management resources

Definition of the boundaries. The implementation of the ecosystem approach in fisheries and aquaculture involves the territorial definition of the ecosystem. The area (RENAPRODER) where the Government with the assistance of FAO is leading the plan is legally defined in its extension. This is advantageous as it clearly defines the scale of problems and increases the chances of successfully addressing them, as long as local actions can be carried out within a legal, institutional and policy framework

Resource management. Authorities ensure that the management of fisheries resources and environmental preservation that will be put in place effectively prevents any possibility of reintroduction of shrimp nets into the Estero Real, thus discouraging any possible expectation of users about it.

Medium-term sustainability of supports and incentives. The programme should ensure that the incentives to stop this illegal fishing practice and the disbursement of incentives as livelihood options have sufficient financial and technical support for its sustainability in the medium term.

Evaluation of costs and benefits. The expected costs and benefits analysis of the program should be done during the design phase to ensure that the components selected for the implementation will effectively facilitate the achievement of the development objectives and pursue sustainability

Consultation and participation in the design of the program. The programme should include regular consultation sessions with potential program participants facilitating their involvement in the design and implementation phases. This will improve the level of acceptance and compliance of the objectives and actions.

Social awareness. The programme should include the development of awareness-raising campaigns about the objectives of the project and its components from the earliest stages of its design.

Characterization and identification of the participants in the program. The program should include, when designed, an adequate economic, social and cultural characterization of the groups and communities being involved, an accurate identification of the individuals who will be included in the conversion program.

Inventory of fishing gear and equipment to be removed. The program should include a complete inventory of the shrimp nets to be removed.

Transparency in allocation mechanisms. The mechanisms for allocating incentives should be clearly and transparently defined.

Evaluation of program results. Ex-post assessments of the results obtained through their measurement with well-defined indicators.

Table 5.1 Proposed reconversion plan

Strategic Objective	Objective	Action
Withdrawal of the shrimp nets	Selection of Beneficiaries	Review log
		Defining accurately the fishermen who will join
		Define criteria for withdrawal: incentives, payments, compensation, others
Organization Development	Selection of Organization type (individual, collective, cooperative)	Review socioeconomic data
		Defining with the beneficiaries the modality of intervention of the Program
		Legalizing organized groups
Technical Assistance and Training	Comprehensive training	Shrimp farm management
		Business management
		Good aquaculture practices
		Post-harvest handling
		Organization and leadership
Development of alternatives of production and employment generation	Development of Productive Capabilities	Define the size of the investment (infrastructure, supplies, jobs, equipment and machinery) Define the Financing ways
		Making agreements between producers, government companies
	Define conversion alternatives	How many in cultivation How many in processing or in the value chain
		How many in no-aquaculture activities
Institutional Arrangements	Conforming an executing committee	Define members and institutions and their Responsibility
		Develop operation manual
		Regulations
		Developing the operational plan for the operational body
	Empowerment of the collaborative management as an instrument of management	Document disclosure

		for the areas that will be given in use	
			Agreement signature
	Allocation of areas	Distribution of areas according to the size of the organized groups
			Develop business plans for each group with their respective cadastral plans and environmental management plans
			Facilitate the rights to use the area (convention, others)

Policy framework

The National Human Development Plan (2012-2016) (PNDH) aims to achieve economic growth with the creation of job opportunities to overcome poverty and inequality, as well as eliminating hunger, and create the conditions to facilitate the full realization of Nicaraguans in a sovereign and independent country,

Such a process should be sustainable, should use natural resources and protect the environment. It should ensure well-being, the future of new generations, and life on earth (Systemic Approach).

For the period 2012-2016, the Government has proposed the sustainable development of the fisheries and aquaculture industry, based on the participation of the small farmers and artisanal fishermen, while facilitating the conditions for investments on a business scale. The government has put an emphasis on rational resource management based on the following lines of action:

▪ the transfer of technology
▪ the facilitation of associative forms of organization.

The collaborative fisheries and aquaculture management plan holding an Ecosystem approach of the Estero Real delta is part of the PNDH's guidelines of action, where four challenges are addressed: environment, social, economic-productive and governance.

In these communities the government with the support of FAO has, since 2009, led to the formulation of a strategy to ensure the sustainability of the fisheries and aquaculture sector in the Estero Real delta. A comprehensive work on socio-ecological interrelationships through an extensive process of consultations was carried out so that the proposal contributes to the sustainable development of activities, equity and the resilience of interconnected socio-ecological systems.

Part 2 - Implementing strategy of the collaborative management plan on fishery and aquaculture in the natural reserve of Estero Real.

The *Strategy Implementation Plan* is proposed with an inclusive vision, based on the Objectives, Goals and Principles identified in the various workshops. It seeks to ensure that aquaculture production, by maintaining the quality of the environment and the ecosystems that support it, improves directly or indirectly the economic benefits through the sustainable use of fishery resources in the Natural Reserve of the Estero Real.

The strategy raises responsibilities, logical processes, and resources to achieve a process of change, by making the ecosystem compatible with the quality of life of the inhabitants through good practices

Overall Goal

Improving the socio-economic and cultural conditions of life of artisanal fishermen and farmers who develop their activities in the Protected Area of the Estero Real Delta by expanding their options and capabilities to promote well-being through the friendly and sustainable use of natural resources.

Specific Goals

1. Promote the implementation of the Fishermen's Reconversion Programme that aims to carry out activities in sustainable shrimp farming; effective access to formal employment in shrimp plants and farms; non-aquaculture production activities to promote sustainable development and development of cooperatives among small farmers in shrimp.
2. Strengthen the Local Management Committee (CLM) and the inter-agency commitments for the implementation of the Collaborative Management Plan of the Estero Real.
3. Promote concrete policies and actions for environmental conservation and sustainable exploitation of fisheries and aquaculture with an ecosystem focus in the protected area of the Estero Real.
4. Training and technical assistance for strengthening the Cooperatives of Fishermen and Farmers of the Estero Real.
5. Achieve the empowerment of communities on protection and conservation of the protected area of the Estero Real.

Management Plan Implementation Strategy

The Strategy meets the overall objective of the *National Fisheries and Aquaculture Plan 2007* and the *National Development Plan* with a 2012-2016 planning horizon that is in the policy guidelines for the *sustainable use of resources Fisheries and Aquacultures*, approved by Decree No.100-2001. Published in La Gaceta No. 219 November 19, 2001.

It also responds to the *Collaborative Management Plan for Fisheries and Aquaculture with Focus on Ecosystem in the Protected Area*" of the Natural Reserve of the Estero Real Delta" by:

- Developing greater technical capacity in artisanal aquaculture producers, improving production methods under the Ecosystem Approach.
- Contributing to strengthen artisanal fishermen's cooperatives converted into aquaculture producers in order to achieve the best degree of sustainable use of natural resources.
- Strengthening the associations of artisanal fishermen and aquaculture producers in the protected area of the Estero Real, to improve their managerial capability

The implementation of this strategy is based on the four management plan programs described below:

1. Environmental management and production program

This Programme aims to contribute to the promotion and development of best fishing practices and aquaculture services and the implementation of a comprehensive environmental monitoring system, to strengthen the resilience of the estuarine ecosystem.

The implementation of this programme will contribute to the recovery of the Delta of Estero Real, with direct beneficiaries being the current and future users of environmental services provided by this ecosystem.

2. Artisanal fishers and strengthening fishers' cooperatives

This programme focuses on the conversion of fishermen and farmers of the Estero Real Delta - especially those using shrimp nets – towards more productive activities carried out preferably in cooperatives that prove to be economically, socially and environmentally sustainable.

Encourage the strengthening of cooperatives of small-producers of shrimp to improve their internal governance, to effectively manage their resources, and be competitive and sustainable in the shrimp value chain.

Promote the development non-aquaculture productive activities that are economical, socially and environmentally sustainable.

3. Governance and institutional coordination strengthening program

This programme focus on the specific challenge of overcoming weak coordination and vision between public and private actors for the sustainable management of fisheries and aquaculture in the Protected Area of the Estero Real Delta.

It aims, therefore, to contribute to strengthen effective coordination and development and to maintain a collective vision that sustains the governance of fisheries and aquaculture in a participatory way.

4. Communication program, extension and environmental education

Promote behaviours and attitudes among public actors (national and local), academics, trade unions, community and society. Development of a communication system and extension at local level that leads to the achievement of the objectives of the Collaborative Management Plan.

The direct benefits of the Programme are to strengthen governance and proactive participation of stakeholders involved in fisheries management and aquaculture.

Inter-institutional coordination for the implementation of the strategy

The Collaborative Management Plan is implemented by:

- National Collaborative Management Sub-Committee of the Fisheries and Aquaculture with Ecosystem Focus in the Estero Real Delta as a general management body
- Sub group of actors
  - MARENA as the institution that looks after conservation and management
  - INPESCA as the institution in charge of the administration, development, promotion and control of the fishery and aquaculture resources
  - MAGFOR as rector of the agricultural and forestry sector;
  - private sector (farmers);
  - cooperatives, fishermen and small farmers sector;
  - local governments, municipal councils
  - other relevant actors (universities, NGOs, etc.).

Mechanism, tracking processes and evaluation strategy implementation

The indicators of the Collaborative Management Plan, at the level of the Specific Goals, will be:

- Percentage of all shrimp farms (small, medium and large) in the Estero Real Delta Nature Reserve Protected Area that apply good Aquaculture Practices.
- Share (percent) of the tax payment of concessions in semi-intensive shrimp farming systems.
- Percentage increase in labour participation in semi-intensive shrimp farming systems.
- Percentage of artisanal fishermen who use shrimp nets that have abandoned use and engage in alternative economic activities.

- Number of public, private and community actors regularly involved in meetings of the Collaborative Fisheries and Aquaculture Management Committee with Focus on Ecosystem of the Protected Area of the Natural Reserve.

Strategy financing mechanism

- Government funding (Government of Reconstruction and National Unity - GRUN)
- Relevant human, logistical and financial resources of MARENA, INPESCA and MAGFOR
- Common fund with the largest private producers in the as part of the collaborative model.
- Potential sources of funding through international agencies
- FAO
- UNDP (Small Grants Programme)
- MARENA
- EUROPEAN UNION
- NGOs (FUNDAR, LIDER, AECI)
- Institutions such as CARUNA, FDL, ISSDHU, PROCREDIT that finance aquaculture projects between small and medium-sized aquaculture farmers.

Activity: Review EAAM continuum for an individual fishery and plot for local or country fishery.

Activity: Identify challenges and opportunities for your country in moving towards EAAM.

Module 6 – EAAM plans - the link between policy and action

Module objectives
- Recognize the need for effective planning
- plans to translate policies into actions

Overview
This module explains how effective plans are the link between policy and implementation. It outlines the adaptive EAAM cycle of planning, doing, checking and improving, and clarifies what good planning entails for EAAM.

Introduction
Despite the presence of EAAM principles in countries' policies that follow international guidelines on ecosystem management it is not easy to see such principles fully implemented in operational plans. In some cases this depends on a sectorial-type approach, but often it is due to the limited planning capacity of the aquaculture agencies. Planning is very important in EAAM in view of the more challenging legal frameworks that gather many sectors (agriculture, forestry, land, etc.), and the different and sometime contrasting stakeholders' goals, which requires strategic vision and good capacity of mediation. The approach in planning should be therefore inclusive and participative, and must assess the potential risks and the possible management of conflicts among the parties involved in the proposed changes.

1. Why plan?
In any sector planning is the first step to achieve objectives. There are different goals with different levels of importance and priorities, but above all defining a plan that can achieve those goals is the most important step.

Investing time and effort to make a plan has many reasons, especially when it comes to define the direction to follow to achieve aquaculture policies specifically targeting comprehensive ecosystem approaches and social participation. A direction also involves the need to set priorities that eventually define the strategy to be followed to implement the plan.

The plan helps to take decisions based on the priorities without risks of losing the direction.

The plan also helps people to understand what they will work on and the sequence of steps required to achieve the goals. This would help them to focus, to raise motivation and to efficiently coordinate their actions without distractions.

The plan eventually is fundamental to communicate what any organization or its managers want to achieve and how, this would bring in commitment in people who will understand their role and act accordingly.

Planning should always be participatory, as it provides an opportunity to consider the future and the outcomes that are desirable by the people who can affect or will be affected by the plan. The plan is also a means to chart progress towards goals. In many cases, the process of participating is as important as the final product, especially for those impacted socially and economically by the process.

Planning can facilitate resource mobilization that allows judicious allocation of scarce resources within an organization in order to have the greatest likelihood of achieving the goals. A good plan can attract funding either through budgetary processes or from outside donors. It can also promote resource use efficiency as planning provides more certainty for the roles and responsibilities of the different

players. This is especially important in an ecosystem approach involving players that come from different sectors, disciplines and backgrounds.

Figure 6.1 Why do planning?

The initiation part that occurs before the preparation of the plan is an important phase since it determines the initial roles and tasks to organize the successive planning work. (Module 8 Startup A).

2. The management cycle

The management of any activity involves three important stages.

The **planning stage** implies the definition of the plan with the participation of stakeholders and the agreement on different priorities. The planning stage should set up how the goals are going to be achieved. Besides the objectives, all the necessary actions and ways to measure the impact of the activities are considered.
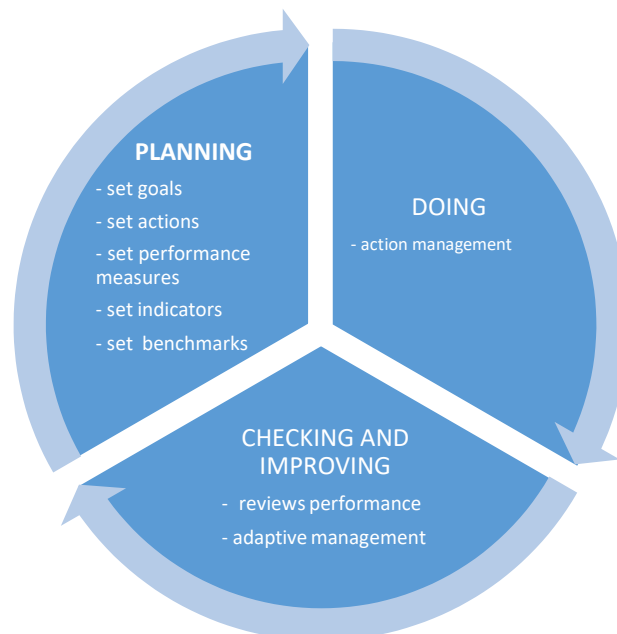
Figure 6.2 The EAAM cycle is based on the three phases of adaptive management

The **doing stage** consists in the implementation of the plan according to the actions plan.

The **checking and improving** mainly consist in the analysis of the performance data in order to evaluate the impact against the indicators. Some adjustments in due course are also made to improve the efficiency of the project.

3. From principles to implementation

The importance of planning in EAAM stands in the effective application of the high level guiding principles on sustainable development, such as those in the FAO Code of Conduct for Responsible Fisheries (or other relevant international guidelines) into objectives and actions that can be implemented in a given watershed.

Figure 6.3 Steps in adapting principles into practice

a. From principles to policy goals

The high level guiding principles contained in valuable guidelines such as the Code of Conduct for Responsible Fisheries need to be contextualized into practical policy goals. Being principles means that their goals are much high-level (conserving biodiversity, maintain coastal habitats) and cannot be achieved in practical sense, but rather inspire national policies and plans. This would be the case of the National Aquaculture Development Plan (NADP) where such high-level principles are elaborated between government agencies and stakeholders to develop more contextualized criteria that keep into account the socio-economic development of specific areas.

b. From policy goals to issues and management objectives

The national policy goals need to be contextualized to achieve management objectives to be applied in specific watersheds or aquaculture sectors. The identification of issues and management objectives need to take into account not only ecological and socio-economic factors, but also the existing framework and interactions with other sectors (agriculture, forestry, land conservation). In the case of aquaculture this means to mediate among wider groups of stakeholders. At this level the need to reduce conflicts and find consensus over priorities is important. Given the high levels of interactions with other sectors a risk assessment process is an important step to minimize the risk of failure.

c. From objectives to management actions

Each management objective can be achieved by the implementation of a management action (e.g. setting the number of farms or output in accordance to carrying capacity limits, planting mangroves in aquaculture areas, facilitating GAqPs, etc.). One management action can often address several objectives.

4. Good planning

1. *Make general principles and higher level goals operational*: any EAAM plan needs to make the general objectives of a national policy translated into simple objectives. For example: "Promote sustainable development of the aquaculture" from a national policy can be translated into "apply the Good Aquaculture Practices operating procedures" through a management measure.

2. *Provide direction*: planning provides a clear sense of direction for the activities of management. It strengthens the confidence of the stakeholders and encourages them to move along a chosen path, while also clarifying the actions they should take to achieve the goals.
3. *Consider alternative courses of action*: planning permits managers to examine and analyse alternative courses of action with a better understanding of their likely consequences.
4. *Reduce uncertainties*: planning forces managers and stakeholders to look beyond immediate concerns. It encourages them to have a vision of the whole system, analyse the complexities and uncertainties of the environment and attempt to gain control.
5. *Minimize impulsive and arbitrary decisions*: planning tends to minimize the incidence of impulsive and arbitrary decisions and ad hoc actions that can divert the course of the project thus resulting in the potential failure in achieving the objectives. It injects a measure of discipline into thinking and action.
6. *Provide a basis for better management*: it provides the basis for the other managerial functions. Thus, planning is the central function around which other functions (e.g. monitoring and control) are designed.
7. *Include adaptive responses*: planning tends to improve the ability of management to adapt effectively and adjust its activities and directions in response to changes taking place in the external environment.
8. *Enable proactive action*: planning stimulates management to decide in advance on what action to take when things do not go according to plan (control rules).
9. *Promotes transparency*: it makes decision making transparent and available to all stakeholders.

Figure 6.4 Characteristics of good planning

5. Outputs from planning

Planning can be developed at different levels: local, watershed, national, regional. The increase of boundaries would necessarily imply with a higher degree of complexity and participation that need to be contextualized into practical and simple objectives.

EAAM planning entitles the production of a plan and its implementation:

- EAAM plan: the outcome of the planning process that contains objectives, management actions and performance measures (indicators and benchmarks);
- Work plans: these are an outline of all tasks that need to be completed (including timelines and responsibilities) in order to implement the EAAM plan.

Module 7 - EAAM planning and implementation process

Module objectives

- Describe the key steps of the EAAM process and how to plan, implement and monitor EAAM;
- Identify the planning steps in the EAAM process

Overview

This module outlines the EAAM process. It describes the initial tasks and the five EAAM steps and sub-steps, highlighting those that specifically involve planning.

As explained earlier, the EAAM cycle consists of three main stages: planning, doing, checking and improving. These three stages translate into five major steps for EAAM, each of them with a specific series of tasks.
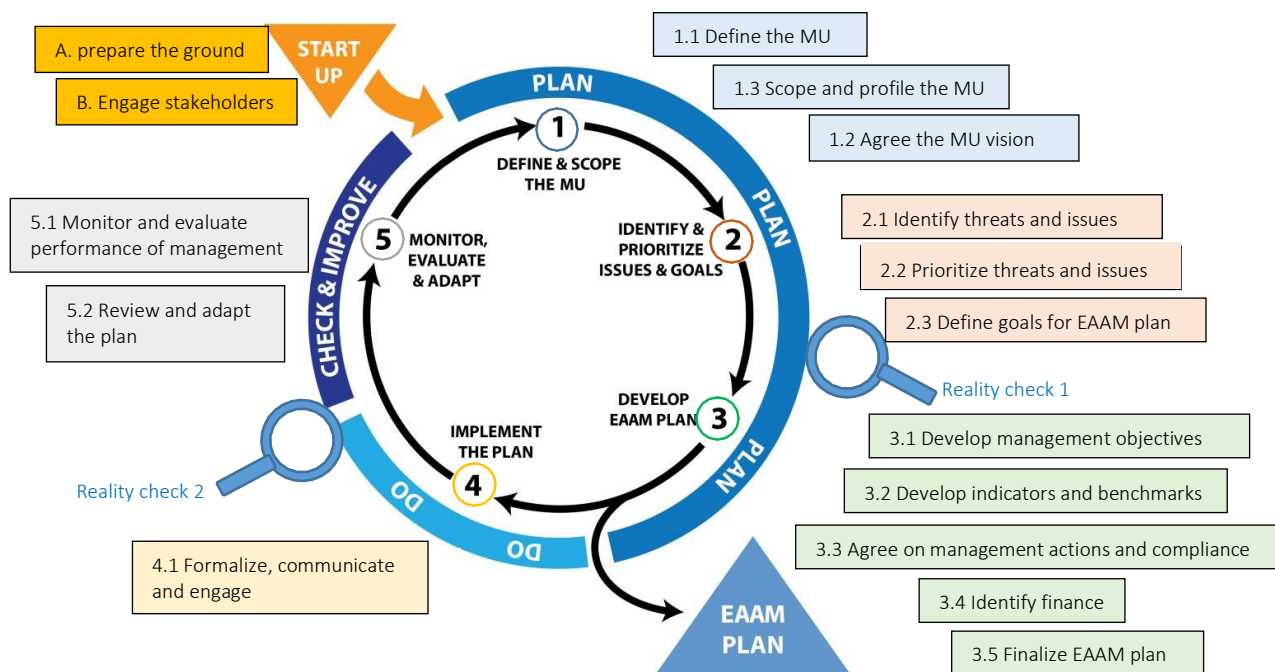
Fig. 7.1 Summary of the five EAAM steps and tasks

Startup A and B

Startup A - Before starting the various steps of the planning process a sequence of startup tasks are needed. These consist of one-off tasks aiming to set up the core team in charge of preparing the ground for the planning activity, by establishing an operative framework with stakeholders and set-up an initial agenda.

    i.   Identify the EAAM team and facilitators
    ii.   Identify the broad MU area
    iii.   Develop startup work plan
    iv.   EAAM introduction
    v.   Coordinate with other agencies and government levels
    vi.   Identify stakeholders and organizations
    vii.   Establish key stakeholder group

Startup B - Engaging stakeholders is a critical stage that involves identifying the various potential stakeholders, raising awareness about the EAAM process and starting the on-going process of involving them in the various EAAM process stages (initially planning, and then implementation and monitoring). Preliminary stakeholder engagement is important for identifying the expectations, roles and responsibilities of stakeholders.

Step 1 – Define and scope the Fishery Management Unit

1.1 Define the Management Unit (MU) – The identification of the MU is important to define the boundaries of the future EAA plan. It can be a geographical area ruled by specific regulations (natural reserve, marine area), or belong to a productive cluster of same-specie farmers. The boundary can be also national or regional (i.e. Mekong river).

1.2 Agree the MU vision – Define a shared vision among stakeholders helps to share an ideal view of the future, which leads to the definition of the main goal in the EAA plan.

1.3 Scope the MU - This sums the background information on land, culture, synergies/conflicts with other sectors that characterizes the MU. It is important to have key economic, social, environmental and governance information. Information can be collected from existing data from the home organization, government departments, partner organizations or stakeholders.

Step 2 – Identify and prioritize issues and goals

2.1 Identify threats and issues – This stage refer to the analysis of the threats and issues associated with aquaculture in the area considered for the plan (MU). The evaluation should be developed under the three components criteria: ecological well-being; human/socio-economic well-being; and governance.

2.2 Prioritize the issues - The large number of issues brought by the stakeholders need to be prioritized in order to select the most important and impacting ones. The risk assessment can be a useful tool to help identify them. The key issues that will selected should be within a manageable number to be make a realistic plan.

2.3 Define goals for the EAAM plan - While considering the issues it is useful to group them into separate themes (e.g. those to do with aquaculture/ecosystem, those to do with communities, those to do with cross-sector governance etc). Then develop a goal for each theme. These are also long-term goals that relate to the overall vision.

Reality check 1

Consider constraints to and opportunities for achieving the selected goals. This is a reality check to decide whether these goals are really achievable

Step 3 – Develop the EAAM plan

3.1 Develop management objectives - Clear and appropriate management objectives are required for all high priority issues requiring management. The objectives should state what will be achieved through management actions.

3.2 Indictors and benchmarks - Develop indicators and benchmarks for the above objectives. These will enable stakeholders to assess whether the objectives are being achieved.

3.3 Agree on management actions and compliance - Discuss the management actions needed to meet each specific objective. Often the same action can meet several objectives. Management actions should be accompanied with a description of how the actions will be complied with, by including actions to enforce and generate compliance. Collectively, the objectives, indicators, benchmarks and

management actions provide a means to communicate with decision-makers on how well the management is performing and will influence future changes in management.

If possible, specific management actions should also be accompanied by decision rules on how they are to be applied and what to do if they are not working. The key is to try and agree about what might happen and how to counteract this before it happens (proactive action).

3.4 Identify sustainable financing to support implementation of the plan. These can be from different sources: government budget, international organization budgets, small grants, stakeholders' contributions, etc.

3.5 Finalise the EAAM plan - This is achieved by systematically collating the key data from the above steps. The plan will guide the steering during the EAAM process. A template is at the end of the current module.

Step 4 – Implement the plan

4.1 Formalize, communicate and engage - A simple work plan is developed that outlines who does what tasks during implementation, and when. The EAAM plan needs to be formalized so that it has authority and backing: in this the endorsement or the mandate by the government authorities is essential. A communication strategy needs to be developed to communicate different types of information to different stakeholders. The dissemination of the plan, apart from seeking the commitment of the stakeholders has also the goal to bring in synergies and long-term funding.

Reality check 2 The appropriate governance arrangements will need to be clearly defined. The implementation of EAAM can utilize co-management arrangements. A supporting policy environment will need to be established for co-management arrangements to work. This will take time and probably require strengthening institutions and developing human capacity.

Step 5 – Monitor, evaluate and adapt

5.1 Monitor and evaluate performance of management actions - A set of indicators and benchmarks were identified in the EAAM plan. Monitoring these and any other generic indicators allows management to see if the plan is on track and pursuing the goals. On the contrary there is the need to take remedial actions to respond to the mutated conditions (i.e. adaptive management). The monitoring and evaluation is performed periodically to assess not only the achievement of the results, but also if the steering is respecting the timing of the work plan.

5.2 Review and adapt the plan - Monitoring data can be collated yearly for a quick check on progress and the plan can be adapted if there is sufficient evidence suggesting that a change is necessary. Every three to five years a longer-term review should take place to assess how the EAAM plan is performing. The actual time of the review should reflect the nested nature of the EAAM plan, such that the outputs and reports can feed into the broader strategic plans. In the light of longer-term data and reviews, the plan may need to be adapted considerably to allow for unforeseen elements and to incorporate lessons learned.

Activity: Human circle to embed the EAAM steps.

Activity: Form meaningful (MU) groups.

EAAM template

This is the suggested template for the EAAM plan. The outputs from Steps 1-3 are essential components of the plan, and elements from Steps 4-5 also need to be included. The template consists of 10 headings and sub-headings.

EAAM plan for MU XXXX

1. VISION
  - The broad goal of management.

2. BACKGROUND
  - Description of the area and resources to be managed, including maps at different scales.

The aquaculture management area
  - Area of operation of the aquaculture, jurisdictions and ecosystem "boundaries" (including national/province/district jurisdictions). Map of MU.

History of aquaculture and management
  - Brief description of the aquaculture background, integration, water use, people involved, etc.

Current status of the aquaculture
  - Description of the aquaculture farms, hatcheries production, mills, processing factories, etc;
  - Resource status;
  - Map of resource use patterns.

Current management (co-management) arrangements
  - Existing management arrangements between the department of aquaculture and other sectors or communities, farmers' groups

Socio-economic benefits, including postharvest
  - Description of stakeholders and their interests (including socio-economic status);
  - Description of other uses/users of the ecosystem, especially activities that could have major impacts and arrangements for coordination and consultation processes;
  - Social and economic benefits, both now and in the future.

Special environmental considerations
  - Details of critical environments, particularly sensitive areas, risk factors, water.

Institutional aspects
  - Legislative background;
  - Existing co-management arrangements – roles and responsibilities;
  - MCS arrangements;
  - Consultation process leading to the plan and ongoing activities;
  - Details of decision-making process, including recognized participants;
  - Nature of rights granted in the aquaculture, and details of those holding the rights;
  - Nature of rights granted for land or areas of water, land use certifications;
  - Maps of management interventions/user rights/jurisdiction boundaries.

3. MAJOR THREATS AND ISSUES

Ecological issues
  - Aquaculture and general environmental issues, including both the impact of aquaculture on the environment and vice versa.

Social and economic issues
  - Issues relating to the people involved in farming, the general public and at the national level, including gender issues.

Governance issues
  - Issues affecting the ability to achieve the management objectives.

4. GOALS OF MANAGEMENT
  - Higher level goals, i.e. the ultimate goal of management.

5. OBJECTIVES, INDICATORS AND BENCHMARKS
  - Priority issues, objectives, benchmarks for the aquaculture sector:
  - Aquaculture resources;
  - Environment (including carrying capacity, pollutants, genetic pollution, diseases, habitats, biodiversity, integration, etc.);
  - social;
  - economic;

- governance (ability to achieve the plan).

6. MANAGEMENT ACTIONS
  - Agreed actions for the plan to meet all objectives within an agreed time frame, including pollution and disease control, habitat protection, socio-economic benefits, good governance, etc.

7. COMPLIANCE
  - For actions that require rules/regulations – arrangements for ensuring that the management actions are effective.

8. DATA AND INFORMATION NEEDS
  - Data and information needs to monitor implementation of the plan. Clarify where the data are to be found and who collects, analyses and uses the information.

9. FINANCING
  - Major sources of funding.

10. REVIEW OF THE PLAN
  - Date and nature of next review(s) and audit of performance of management

Module 8 - Startup A - Preparing the EAAM

Module objectives

- Address the initial step of building an operative EAAM team to move the initial steps the work
- Stakeholder identification

Overview

This module details the Start-up phase with its eight tasks that need to be carried out to initiate the EAAM process

Introduction

The start-up phase is a preliminary step necessary to organize the successive work of the EAAM. There are eight Start-up tasks to get the EAAM process moving. These preliminary tasks (Figure 8.1) are necessary to organize the successive planning work.
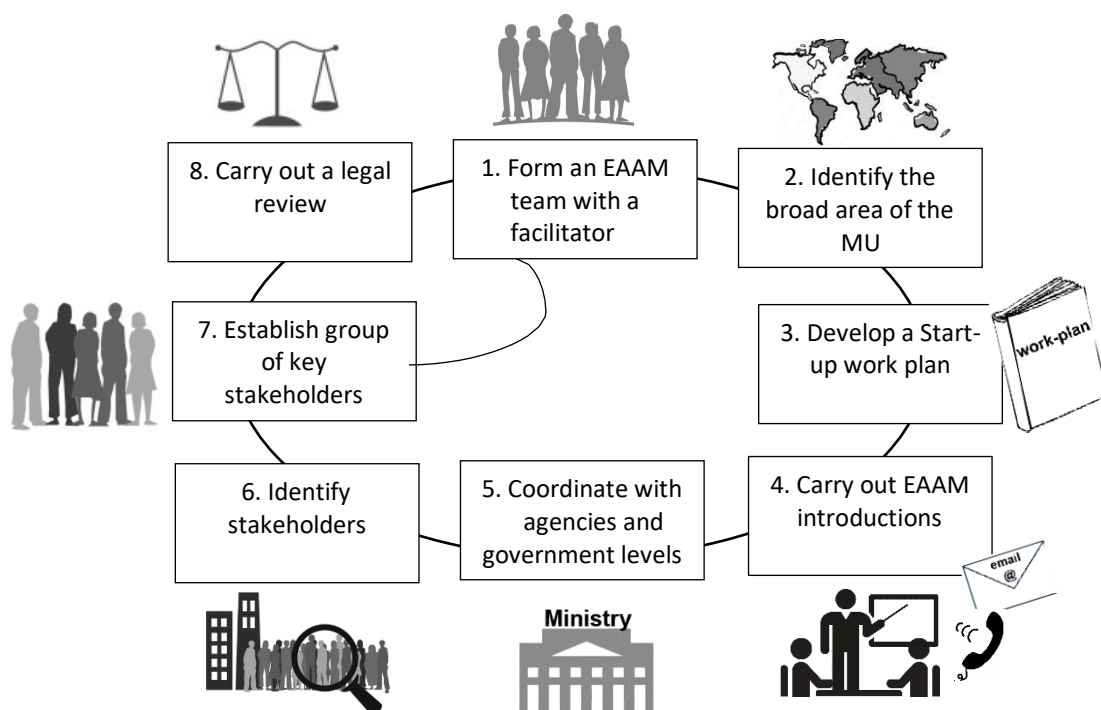
Fig. 8.1 Preliminary tasks to be done during the start-up phase to initiate the EAAM plan

The key objective of these initial tasks is to provide an adequate organizational framework where to move, to set up an initial work-plan and to liaise with stakeholders who will be supporting the participative planning process.

The EAAM planning should not proceed until there is sufficient support from stakeholders and the scope of the work is understood. On the contrary possible lack of data and information is not a pre-condition to abort or delay the EAAM process, since a precautionary approach can be used instead.

A: Start-up tasks

Task i. Identify the EAAM team and facilitators

The promoting agency for EAAM is likely to be the aquaculture agency. It should establish a team to guide the EAAM planning process. Good facilitation, community mobilization and conflict management are the key skills required by the team to connect and consult with stakeholders during the successive EAAM steps. The team needs to guarantee a fair representation of all stakeholder groups, maintain a clear two-way communication, and create a transparent and fair decision-making environment to reduce any risks of conflict.

Task ii. Identify the broad area to be managed

At this stage all the members of the team should agree on the area to be managed by the EAA plan. In doing so they need to take into account existing jurisdictional boundaries. The choice of the area eventually defines the relevant stakeholders who will be contacted for the initial talks and the successive engagement for the planning phase.

Task iii. Develop the start-up work plan

The EAAM team initially needs to identify:
- the broad goals of the planning work
- the strategies and next steps
- the EAAM partners and stakeholders
- the initial roles and responsibilities in the planning process.

The start-up work plan mainly focuses on the organization of the planning steps, while the planning activities that will end up with the project work-plan will occur at the EAAM Step 3.

In many cases, task iii involves working with traditional community leaders or institutions, but there is big openness to include any community groups to participate, also depending on the cultural and social contexts and the dimension of the project area selected.

The Start-up work plan outlines the activities to be done during this preparatory phase (e.g. stakeholder meetings), the timeline, as well as the individual responsibilities for each activity and the budget to be used.

The Start-up work plan will also to consider the size of the budget available, and identify short-term sources of funding to initiate the planning process. Being a start-up phase some credit lines may not be active yet despite existing budgets. Therefore all options for extra funding are welcome. In some cases, starting EAAM will be part of a donor-supported project and every opportunity should be taken to direct sufficient funds to the planned activities. Many aid projects will have budgets for these types of activities.

Task iv. EAAM introduction

The EAAM team should start by making courtesy calls, holding meetings and raising public awareness to establish the initial working relationship between the community, the prospective agency partners, and the facilitator or agency. This entails a number of activities, including:

- formally introducing EAAM to prospective partners;
- answering questions about EAAM;

- establishing rapport with prospective partners;
- identifying roles of partners;
- organizing and attending meetings, training and awareness-raising sessions;
- collection of baseline data and information on the management unit;
- meeting with local leaders, government officials, etc. and obtaining approvals; and
- initiating the EAAM process with the community, government agency partners, and other stakeholders.

Task v. Coordinate with other agencies and levels of government

EAAM requires coordination, consultation, cooperation and joint decision-making between different aquaculture agencies operating in the same ecosystem or geographical area. In addition it should also link with other sectors that have an impact on aquaculture or are affected by aquaculture.

It is important to ensure that aquaculture institutions at each level of government (from local, municipal, district, provincial, regional to national) are informed and engaged early in the EAAM planning process. This helps to harmonize policies and objectives across different levels of governance as well as provide institutional support and interface with other concerned departments for the development of synergies among ministries or departments.

This task may require effort to bring together agencies that have rarely have worked together despite complementary goals or overlapping issues.

One of the advantages of collaborating with other agencies is the better use of resources that can be shared for same/similar goals. This is particular important in case of countries with limited budget, resources or expertise. In addition the collaboration among agencies would help to develop synergic and coordinated actions without raising confusion in communities.
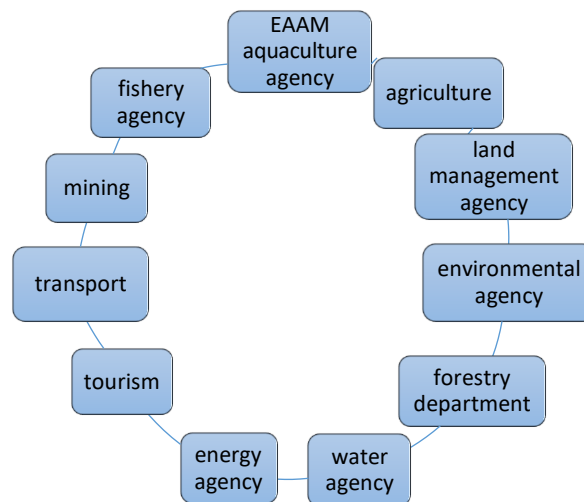
Figure 8.2 Potential linkages for inter-agency cooperation and consultation in EAAM

Task vi. Identify and prioritize stakeholders and organisations

The network of stakeholders that needs to be involved in EAAM is complex, both in terms of vertical linkages (national to local), horizontal linkages (between different users of the natural resources). The extent of the stakeholders depends on the extension of the area being managed.

Who are the stakeholders?

> A stakeholder is any individual, group or organization which has an interest in or which can affect or be affected, positively or negatively, by the EAAM process
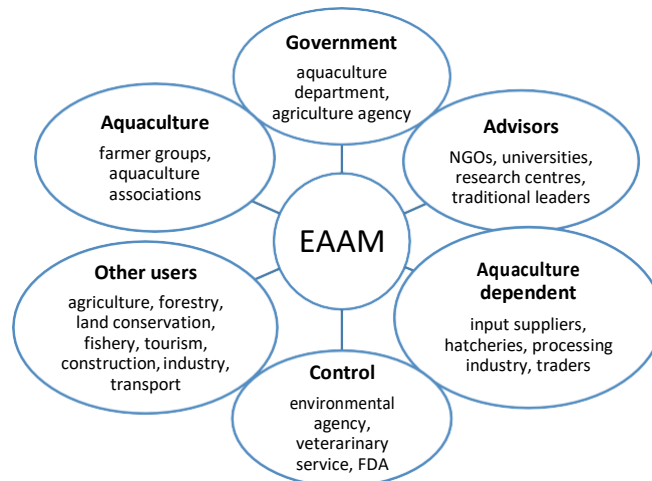
Fig. 8.3 Examples of stakeholder groups

Stakeholders are individuals, groups or organizations of men and women, old and young, who are interested, involved or affected (positively or negatively) by the future EAAM plan. They may be willing to take action based on their interest or values.

Stakeholders include representatives of sectors that may be affected or affecting the EAAM, who are dependent on the resources to be managed, with claims over the area or resources; with activities that impact on the area or resources (i.e. agriculture farmers competing for water or affecting the water with their chemical residues, tourism operators impacted by marine fish cages, energy agency restricting the access to water bodies, forestry department limiting access to planting areas, etc.).

All relevant stakeholders need to be invited to the initial EAAM stakeholder meetings or workshops. However there is the need to balance between large numbers of stakeholders representing all the sectors involved and the risk to have too many people that make it difficult to manage. When starting this task it is important to include the people who are most likely affected by the planning process: small-scale and large-scale aquaculture farmers, farmers' association, government officers at different levels, NGOs, research groups, inspection agencies.

It is important to remember that support or lack of support by stakeholders can lead to the success or failure of an EAAM

A Stakeholder Analysis (see People Toolkit) can be performed to identify:
- potential partners for an EAAM,
- possible approaches to a particular person or group who can be supportive or hostile
- perception of the dynamics and relationships with persons or groups interested in a particular resource or project.

One form of stakeholder analysis is the 2x2 matrix (Figure 8.4) where stakeholders are plotted according to:

   (i) **how important** the stakeholder is to the EAAM process on one axis (Y axis)
   (ii) **how much influence** (power) they have over the EAAM process on the other axis (X axis) 0

According to where stakeholders fall on the matrix a different strategy is adopted:

1. **High importance + high influence** (red box) - are key stakeholders for EAAM success and strong allies to the EAAM plan. They need to be kept motivated and on board.
2. **High influence + low importance** (yellow box) - need to be considered for the EAAM plan. They are potential supporters use their influence to converge people to same positions. Influential

people/groups should be actively monitored as they can also block the EAAM process for personal or political gains

3. **High importance + low influence** (white box) - are the most affected but do not have the power or a voice. They need to be represented and supported in having more of a say and influence over the EAAM process.

4. **Low importance + low influence** (green box) - need to be kept informed and involved, with minimal effort and monitoring.
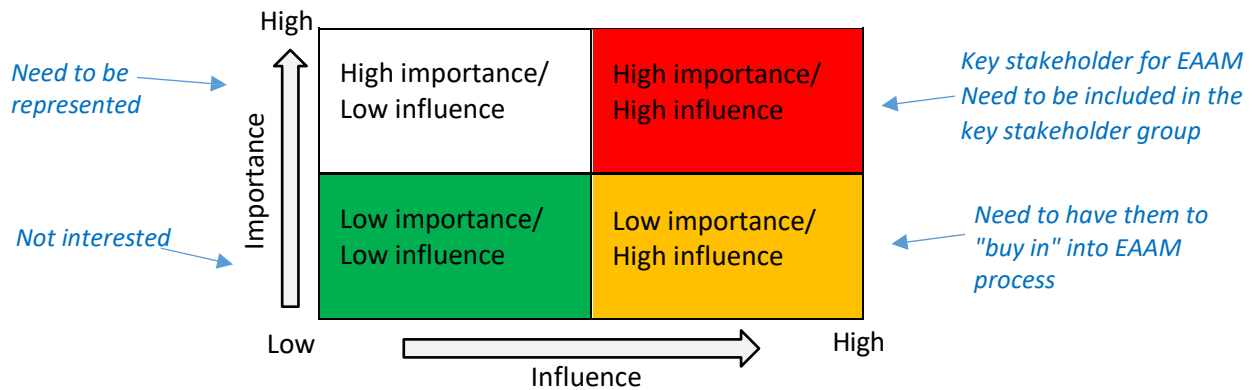

Figure 8.4 Stakeholder analysis using a 2x2 importance and influence matrix and inclusion strategies for EAAM process (in blue)

Another way of visualising stakeholders is to plot them on a Venn diagram (Figure 8.5) that describes their relationships as part of institutional analysis.
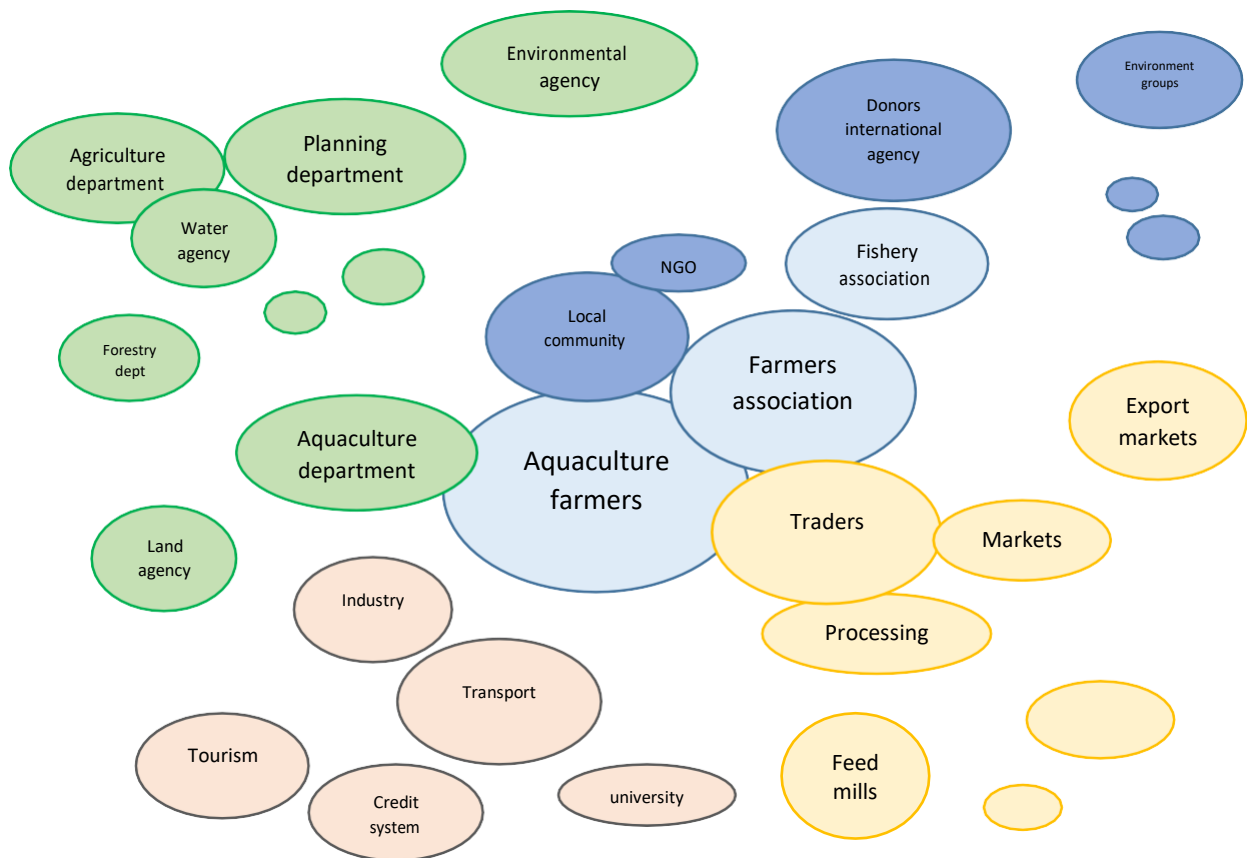
Figure 8.5 An example of Venn diagram showing the relationships among stakeholders

In the Venn diagram the size of circle indicates importance and the proximity of circle indicates the frequency of contact:

- Separate circles = no contact;
- touching circles = information passes between institutions,
- small overlap = some cooperation in decision-making
- large overlap = considerable cooperation in decision-making

Activity: (i) List stakeholders, and (ii) conduct a stakeholder analysis,

Activity: Plot the stakeholders on a Venn diagram

Task vii. Establish a group of key stakeholders

The key stakeholder group is a small number of people (four or five depending on the prioritization process) representing different sectors of the community or management agencies who will work with the facilitators to guide the EAAM process after Startup. This group may include some of the start-up team established in Task i, or be made of new people.

The key stakeholder group is fundamental to give responsibility and power to community members, or other individuals/groups not typically engaged in aquaculture management. Some of the group roles are:

- develop dialogue and stimulate EAAM discussion;
- facilitate community organization;
- help stakeholders understand EAAM;
- identify problems, issues, and opportunities in engaging stakeholders;
- assist in decision-making within an EAAM process;
- identify other stakeholders and stakeholder groups; and
- gather and spread information among community members

Task viii. Determine the legal basis for EAAM

It is desirable to have a legislative or policy mandate to develop an EAAM. This is particularly true when using co-management, because it is better to provide local communities with legal authority to manage. Although establishing a legal basis for an EAAM is desirable, the lack of appropriate existing legislation should not be used as a reason to delay starting the process.

Nevertheless, reviewing the legal basis for EAAM is essential to understand existing supporting or non-supportive policy.

Module 9 - Startup B - Stakeholder engagement

Module objectives

- Apply participatory approaches for stakeholder engagement
- Organize and hold stakeholder meetings;
- Describe the basics of co-management

Overview

This module explains participation and facilitation; how to hold and facilitate participatory workshops/meetings which underpin the EAAM process. It also introduces co-management as a key approach for EAAM.

Introduction

Stakeholder engagement is an ongoing activity that initiates in Startup B and continues throughout the whole EAAM process. The stakeholder engagement builds institutional knowledge of the EAAM team, key stakeholders and participating partners, agencies and institutions. Also refer to community mobilization methods outlined in Module 16 Reality check II and in many tools in the People Toolkit.

1.Participation

A successful EAAM process needs that all the participant people, users, local organizations and communities, underrepresented groups (most vulnerable and less able to ensure their needs and expertise), as well as local government officials and other stakeholders are enabled to take control and make decisions. To do this they need to increase their awareness and understanding of the ecosystem approach in aquaculture.

Participation brings many benefits to the process, such as:

- The inclusion of many different perspectives brought by stakeholders;
- Promotion of actions for the project;
- Build-up empowerment in participants through
  - independence and self confidence
  - enabling change;
  - increased awareness, knowledge, skills, institutional capacity;
  - ownership of decisions and outcomes;
  - building responsibility
- Achievement of quick and cost effective results;
- Improvement of ownership of decision and outcomes;
- Literacy is not prescribed;
- Welcoming any personal opinion or contribution;
- Building relationships and partnerships.

It is also very important to identify leading people able to gather followers for a shared process, and who can motivate others.

The three pillars of participatory approaches are:
- **Attitude and behaviour**: the facilitator's attitude and behaviour is critical to the success of participatory workshops. He or she has to remain neutral, manage discussions fairly and involve all those present.
- **Tools**: there are various tools that can be used to stimulate participation by all members of the population. However, the tools are only effective if they are used with the correct attitude and behaviour (i.e. non dominant).
- **Sharing**: sharing information, knowledge, opinions and feelings is a key element of participatory processes. Through this sharing, people are empowered and issues can be discussed and resolved, or at least brought into the open, where they can be managed through conflict resolution (<mark>see Module 12 Reality check I</mark>).

2. Good facilitation

A facilitator is usually a neutral, independent person whose role is to support individuals, groups and organizations during participatory processes. Facilitators need to be aware of power relations and dynamics in order to facilitate participation of everyone. For this reason, they need to pay particular attention to gender dynamics (e.g. women not speaking up at meetings where men are present); social hierarchies (e.g. senior people limiting or inhibiting juniors from speaking) and socio/cultural differences (e.g. ethnic minorities, least educated people, poor people not having a voice).

Good facilitation involves:
- trust in other people and their capabilities;
- patience and good listening skills;
- self-awareness and openness to learning new skills;
- confidence without arrogance;
- good life experience and good common sense;
- respect for the opinion of others, not imposing ideas;
- ability to create an atmosphere of confidence among participants;
- flexibility in changing methods and sequences; and
- knowledge of group development including the ability to sense a group mood.

A key element in any communication is building rapport, such as the feeling between two people that they can relate to each other. In many situations, establishing a rapport of trust is crucial for ensuring that any message is received and understood as intended. A good facilitator knows how to build rapports.

Facilitators enable groups to work out issues effectively by:

a) Encouraging full participation, overcoming self-censorship - Often people do not say what they really think or do not speak at all. Facilitators have the skills to allow everyone to be heard. They know how encourage quiet members to speak, how to control premature criticism by others and how to keep everyone thinking instead of shutting down.

b) Promoting mutual understanding and overcoming fixed positions - A facilitator helps the group to realise that productive groups are built on mutual understanding. The facilitator also recognises that misunderstandings are inevitable and provides support to distressed people by building a respectful environment. A facilitator never takes sides, honours all points of view and keeps listening, so that each and every person feels confident that someone understands them.

c) Fostering inclusive solutions and changing the win-lose mentality – in many people conflicts are only solvable with a win-lose approach and not with win-win agreements. An experienced facilitator

can help a group to search for innovative ideas that include everyone's point of view. Although it is a challenging task, the understanding of methods that foster inclusive solutions brings new ways of thinking and builds hope in the achievement of effective solutions within the group.

d) Teaching new thinking skills and improving the management of meetings - A facilitator has both the opportunity and a responsibility to teach group members how to design and manage effective sharing, problem-solving and/or decision-making processes.

e) Designing explicit and clear procedures for running meetings/workshops - Having an explicit and agreed objective and a clear agenda to achieve can make a huge difference in running a meeting and manage the behaviour of members. A facilitator can train procedures for running successful meetings/workshops.

f) Structuring thinking activities – A structured thinking activity, like brainstorming, can be very helpful to focus on specific topics or issues. An experienced facilitator can use such tools to facilitate outputs.

g) Using clear language to describe group dynamics - Enabling a group to reflect on its own group dynamics helps the group to get a shared point of reference and a shared language. This enables the group to step back from the content of their discussion and talk about the process, which can help them to improve the participative dynamics of the meeting.

> **Activity:** Draw a good and a bad facilitator.

3. Facilitating participatory EAAM stakeholder workshops

Workshops can combine training, development, team-building, communication, motivation and planning and usually have a clear purpose or output that is to be generated through the workshop process, rather than just being an awareness raising exercise.

Participation and involvement in workshops increases the sense of ownership and empowerment and facilitates the development of the organisations and individuals involved. Workshops are effective in helping to manage or facilitate change, achieving improvement, creating initiatives, plans, processes and actions. They are also good for breaking down barriers, improving communications inside and outside agencies, groups and communities.

The aim of the initial EAAM workshops or meetings is to agree on:
- identifying the main stakeholders that need to be involved during the Startup A phase (Module 8 task vi);
- the selected area MU (Module 10 Step 1.1);
- the scope of the MU by defining the broad management goal (vision) and eliciting more background information (Module 10 Steps 1.2 and 1.3).

An EAAM stakeholder workshop involves the gathering of many stakeholders to:
- improve aquaculture-related situations that affect them;
- form a useful social interaction that enables to enter into dialogue, negotiate, learn and make decisions for collective action;
- persuade government staff, policy makers, community representatives, scientists, business people and NGO representatives to think and work better together to improve the EAAM.

4. Assessing stakeholder interest and commitment

Once stakeholders are identified, it is necessary to understand their attitudes and positions in relation to the EAAM. Use the stakeholder engagement matrix (Tool n.18) to work out where stakeholders are positioned and, depending on this, identify what type of action is needed. A community needs to be

organised to engage and enact in the EAAM process. This requires awareness, self-reliance, empowerment, ability to promote new values, build relationships and foster leadership (see next section 6.1, Module 16 Reality check I and People Toolkit).

Alternatively, it may be necessary to work on lobbying/advocacy with local government officials, ministers, donors or funding agencies. This involves a personal skill set, including the ability to write policy briefs, and knowledge of the political environment (see Tool n.37).

Networking with other stakeholder groups is also important (e.g. with NGOs, research bodies, etc.) to gather information, seek strategic alliances and gain momentum.

Another approach is to work through local and national or international media. Traditional and social media can be used not only to raise awareness, but also to actually lobby and gather public support for the EAAM.

Measures must be put in place to ensure the participation of all key stakeholders. This could involve some challenges in finding adequate representability in areas where aquaculture does not account many farmers or where there are distortions in the representativeness of the sector by political leaders.

Broadening stakeholder involvement in the management process is a central principle of EAAM. Through consultations and negotiations, the partners develop a formal agreement on their respective roles, responsibilities and rights in management. Those involved in EAAM have both rights and responsibilities, with the rights consisting in management rights – the right to be involved in design and implementation of management actions.

5.Co-management

Co-management has shown to be particularly effective in handling common resources, as in the case of fisheries, in which central government shows difficulties in effective steering due to low management capacity and enforcement.

There is a strong interdependence between the ecosystem approach and co-management as they are largely complementary. The rights, and degree of empowerment of stakeholders, have an important impact on their ability to engage in the decision-making and implementation processes.

More recently new opportunities have shown up in combining resource conservation, efficient management, economic capability and social justice in the aquaculture sector. Since co-management can harmonize these goals, this approach has started to be greatly considered in fish farming as well.

Nevertheless the type of aquaculture co-management, which differs from the fishery, needs to be defined case by case with proper institutional design.

Co-management can be defined as:

> Collaborative and participatory process of sharing rights and responsibilities between representatives of user groups, government agencies, research institutions and other stakeholders

There are different degrees of power sharing:

- **Community control**: power delegated to the community to make decisions and inform government of these decisions;
- **Partnership**: cooperation of equals with joint decision-making;

- **Advisory**: users advise government of decisions to be taken and government endorses these decisions;
- **Communicative**: two-way information exchange, local concerns are represented in management plans;
- **Cooperative**: community has input into management;
- **Consultative**: Government consult with users but makes all decisions;
- **Informative**: community is informed about decisions that government has already made.

The EAAM plan can build up such different management approaches on individual cases. Mediation among the parties should ascertain the willingness of stakeholders to take responsibility, their leadership capacity, the resources needed and the risks to be taken.

Nevertheless co-management helps to reduce conflicts between stakeholders and government, between government agencies, as well as between stakeholders themselves, by: i) clearly defining rights and responsibilities; ii) providing an institutional forum for discussion among decision-makers, and iii) encouraging support for the management process. Consultations and negotiations are therefore required among the stakeholders to develop formal agreements on their respective roles, responsibilities and rights in management.

The advantages of co-management include:

- more open, transparent, accountable and autonomous management process;
- a more coordinated mechanism that can build synergies between different government and stakeholder sectors;
- a more democratic and participatory society;
- more economical than centralized systems, requiring less to be spent on administration and enforcement in the long run;
- communities and resource users develop a flexible and creative management strategy, which meets particular needs and conditions (seen as legitimate);
- local solutions to local problems;
- improved stewardship and public awareness of aquatic and coastal resources management.

For more details on tools and techniques that can be used for co-management see People Toolkit, as well as Module 16 Reality check II.

Activity: Practice active listening

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6. Awareness raising

Awareness raising is a critical ingredient in the transformation of stakeholders into active partners in co-management. It should be particularly targeted at those stakeholders who are most important in resource use and management.

Awareness raising empowers people and improves their environmental awareness through knowledge. As part of the EAAM stakeholder engagement process, an awareness raising campaign should include activities that are relevant to stakeholders and their goals for sustainability, which emphasize the link between local resource-use activities and the quality of the environment. Practical tips on how to carry out an awareness raising campaign are in the People Toolkit - Tool n.9.

7. Community mobilization

The active participation of people in a community is the core of the co-management process. The success of co-management is directly related to building well-organized communities aware of their goals, politically motivated, and empowered to take action to manage and conserve their aquatic ecosystems.

Community mobilization is therefore much more than just establishing organizations; it is a process of empowerment, building awareness, promoting new values and behaviours, establishing self-reliance, building relationships, developing organizations and leadership, and enabling communities to take action.

It is important to note that communities are not necessarily homogeneous, but gather different interests based on gender, class, ethnicity, wealth. It this then necessary to build dialogue and participation in order reach common visions and goals.

Stakeholders need to organize themselves and reach a consensus on the interests and concerns that they want brought forward (Modules 10 and 11 Steps 1-2). Meetings and discussions are held among the individual stakeholders or groups to identify and clarify their interests and concerns. The key stakeholder group established in Module 8 Startup A Task vii, plays a liaison role between wider stakeholders and the EAAM team.

Effective community participation in co-management requires a strong community organization(s) to represent its members. In some cases, community organizations capable of representing their members in co-management already exist. In other cases, organizations will either need to be strengthened or newly established. An appropriate person(s) from the organization must be selected to represent them in the larger co-management organization.

Farmers associations exist in many communities. However, these organizations may not be automatically suitable as representative organizations in co-management due to their different initial mandate (e.g. promote marketing, distribute subsidies, promote training, lobbying). Changes are therefore necessary to upgrade these organization towards resource management. Such changes may be lengthy and challenging if the organization needs to reform its statute and objectives. The EAAM team and facilitators need to be aware of all these possibilities.

These organizations can be strengthened through:

- environmental education;
- social communication;
- building alliances and networks;
- organizational sustainability to keep members and funding; and
- human capacity development.

The first four points above are explored in more detail in community mobilization in Tool n.10.

Module objectives
- Define the aquaculture area
- Develop and agree on shared visions
- Scope the EAA area/zone

Overview

This module outlines how to define the aquaculture boundaries, how to agree a vision and analyse the various elements to consider for scoping the MU.

Introduction

A successful EAAM is developed on an appropriate area to be managed - the MU. During the start-up phase the area was broadly identified (Module 8 Startup A Task ii), but there is now the need to better define the boundaries to organize team work, stakeholder engagement and general information gathering.

1.1 Define the area

The spatial planning required for aquaculture zoning, site identification and Aquaculture Management Areas (AMA) has to take into account the socio-economic, environmental and governance factors.

The Code of Conduct for Responsible Fisheries guideline (CCRF) promotes the sustainable planning and management in aquaculture by developing strategies and plans to comply with ecological approaches. The EAA further develops these concepts in a strategy that integrates aquaculture into the wider ecosystem that includes the human well-being, ecological well-being and governance.

The process of spatial planning follows the *national-level scoping* initiative, which is not part of the EAAM planning. The National-level scoping helps governments to strategically design their sustainable aquaculture strategies and management by determining the priorities, the main drivers for its expansion (food security, livelihood, etc.), and its importance to meet national priorities. The tasks must take into account relevant data on the status of aquaculture, economic overviews (e.g. market analysis, global trends), policies (also environmental and cross-sectorial ones) and the active participation of relevant stakeholders, GOs, policy makers, researchers, aquaculture farmers, fishermen, and other sector directly or indirectly involved in the use of the same resource.

The process of spatial planning is usually developed in three levels: (i) aquaculture zoning, (ii) site selection and (iii) aquaculture management areas or AMAs.

(i) Aquaculture zoning

An aquaculture zone is a hydrological area suitable for farming that includes a section or a whole catchment area (from source to estuary), a water body (lake, reservoir), coastal area or off-coast area. The zones ease the integration of aquaculture in a specific locality that is also allocated for other uses. The zones ease the coordination between regulating agencies and allow combined actions and collective management by neighbouring farmers.

Zones need careful monitoring to avoid environmental impacts due to the cumulative effect that may not be noted at farm level, even with a farm environmental impact assessment.

Policy makers, government officials, scientists, farmer groups, industry representatives, local authorities and regulatory bodies, and community members should be directly involved in this process, to ensure well-represented stakeholder engagement. When done properly, zoning can minimize negative environmental impacts, biosecurity risks, and stakeholders' conflicts.

(ii) Individual site selection

Site selection for farming should take into account the physical and environmental characteristics of the area, the farmed species, the technology and culture system used, the interaction with other farms and the surrounding environments. The choice is usually made on a private basis. Government provide assistance with rules using well established procedures that normally involve Environmental Impact Assessments (EIA). However the lack of analysis of cumulative effects from other farms forming clusters is one potential weakness that needs to be considered in the zoning process.

(iii) Aquaculture management areas

Aquaculture management areas (AMAs) are clusters of farms that join common management practices and share a common waterbody or water sources. While each single farm is responsible for its own management, AMAs target common management goals and objectives on issues that mainly require collective action (resource conflicts, management of risk, wastewater discharge, health management etc.). AMAs can also benefit communities of farmers who can take advantage from scale economies for input procurement, extension, markets access and postharvest services.

The selection of AMAs is dependent on spatial risk assessment based on physical parameters (water flow, depth, carrying capacity). Supply of services, market accessibility and, above all, conflict management with other stakeholders claiming the use of common resources (e.g. water access, land, fisheries vs aquaculture access to water bodies) are decisive factors for the definition of AMAs.

Figure 10.1 exemplificative map of an aquaculture zone (the whole map), representing individual land-based farms (squared ponds in the map) owned by different farmers. In this zone there are three aquaculture management areas (AMAs)   Source: Google Earth

The EAA as main framework supporting the planning and management process

The zoning, site selection and AMAs selection follow common evaluation criteria:
i.   Scoping to understand the broader issues in the multi-stakeholder context in which aquaculture might develop.

ii.   Identification of opportunities and assessment of main risks with special consideration to fish disease and environmental issues

(i)   Carrying capacity estimation to determine maximum production allowed in a given area.

iii.   Allocation of user/area access and/or management rights.

iv.   Develop of management plans for the zone/site/AMA.

v.   Monitoring of the plan and adjustment over time

Activity: Map the aquaculture zone, individual sites and AMAs

1.2 Agree on the MU vision

It is important to agree on the vision for the MU. A vision is the top-level aspiration of what the future will look like if management is successful. This should reflect any known national or provincial policies and legislation. There is a set hierarchy of vision–goals–objectives–actions (Figure 10.2).

Vision
Broad goal for the plan

Goals
Goals for different set of issues

Objectives, indicators & benchmarks
Objective for each issue

Management action 1

Management action 2

Management action 3
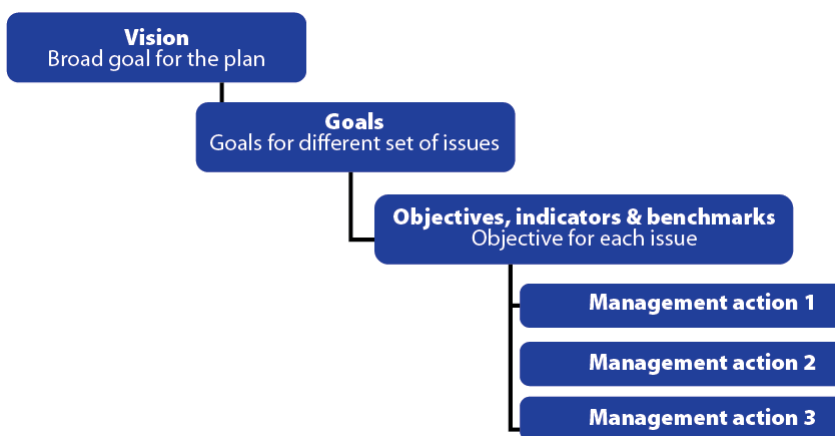
Figure 10.2 The EAAM plan hierarchy

The process of visioning

Visions are about imaging the future and bringing new possibilities alive. Imagery is the mental process of creating views and sensations, of improving communication between the conscious and unconscious levels of our minds.

Developing a vision allows the group develop a metaphor, a common image of an ideal future where everything appears perfectly working, with no conflicts. Achieving this ideal and shared picture would be easy and captivating since in our minds we often translate worlds into images or stories, by bringing ourselves from a state of thinking to a state of feeling.

The development of a shared vision is fundamental, as innovations are seldom the output of one mind. Breakthroughs are always the result of a mutual sharing of ideas and approaches.

Creating this ideal, shared picture of the future allows the group to take part of the destination. It is then necessary to step back into reality to question on how to get there, on what conditions would be necessary to get as closer as possible to that ideal world.

Creating this vivid image is the first step towards change. It will help to strengthen the motivations and empower the people towards a shared goal, common objectives and actions.

Activity: Agree on the vision for the FMU

1.3 Scope the Area

Once the location and boundaries of the MU have been defined and the vision has been agreed, the MU now needs to be scoped and profiled so to bring together all the relevant background information. The profiling will serve as:

- a basis for all EAAM planning and management activities;
- a baseline for future monitoring and evaluation of performance.

The process of scoping and profiling the MU is outlined in more detail below, but in some cases it may not be necessary to carry out all the steps in such depth; the actual MU scoping document may be relatively brief because it is made of background information. It is also important to remember that much of the information may have been already collected and is hold by different agencies, organizations and stakeholders; the work would simply consist in compilation and collation of data.

The MU profiling addresses a broad range of information across different disciplines and technical fields, including social sciences, natural sciences and political sciences.

The EAAM team works with stakeholders and the key stakeholder group to profile the aquaculture farming. The broad range of interests and dimensions to aquaculture should be captured in the profile. However, in practice the most important consideration for the team is a balance of expertise, so as to collect data which are relevant and useful. This data will then act as a baseline for assessing change over time and can be a starting point for monitoring performances.

The MU profile should help to answer these key questions:

- what is the current condition of resources, patterns and problems of resource use?;
- what are the patterns of power in resource access and use, i.e. between and within gender, ethnic groups and social hierarchies?
- What is the legal framework that support/constrains the aquaculture development in the area?

Information needs

Scoping is underpinned by data, information and knowledge derived through both the formal scientific sources and through traditional knowledge, noting that the framework for EAAM is such that lack of data should not be an obstacle to getting started.

The research of data is used very broadly to obtain and verify data and information, either from existing sources or from new activities. Depending upon the MU vision, the research may only involve those stakeholders associated with particular activities. When it is not possible to research all stakeholders, it may be necessary to set priorities as to which stakeholders to focus on. This can be done by noting three main factors:

- proximity to resources;
- the impact that stakeholder activities have on resources;
- relative levels of dependence of stakeholders on resource-related activities.

The MU information to be gathered needs to be a balance between scientific information and indigenous knowledge. "Indigenous or local knowledge" of resource users and other community members (from different genders, ethnic groups, social groups, etc.) is a very sensitive information for both planning and management. Information collected will differ depending on research methods, as well as the profiles of those who are collecting the data. The key stakeholder group determines the scope/scale of the research based on the information needs required for developing a decision-making process, given the available resources or time. The collection of information may take several weeks to several months, depending on the scope and scale of information needs.

The three assessments needed for the MU scoping and profiling process reflect the three EAAM components:

1. **Resource and ecological assessment** – physical carrying capacity, ecological carrying capacity, water resources, water quality for target species, aquaculture impact on water and benthic habitat, impact on surrounding sensitive ecological areas and populations depending on the areas (e.g., fisheries, agriculture, tourism), etc.
2. **Socio-economic assessment** – social carrying capacity, production carrying capacity, potential production, livelihood generation, level of knowledge, level of technology, value chain analysis, gender analysis, potential user conflicts, access to production infrastructures (e.g., roads, energy) and markets for both inputs and outputs, etc.
3. **Legal and institutional assessment** – Aquaculture policies, laws and regulations at different levels, local environmental plans, policies and regulations on agriculture, water use, etc.

Risks

It would be also important to carry out a risk analysis, also in view of climate change adaptation:

inland aquaculture – water pollution, chemical contamination/runoff, diseases, genetic contamination, floods, droughts, severe winters/summers, earthquakes and tsunami, volcanic eruptions, tidal surges, storms, etc.

Coastal aquaculture - oil/chemical spills/runoff, pollution, ice, storms, waves, tsunamis, tidal surges, harmful algal blooms, disease, genetic contamination, hypoxia, etc.

More detail on these assessments can be found in Tools n.20, 21 and 22.

There is likely insufficient information to answer all questions regarding the impacts of policy choices, but there is usually enough to identify the interactions between farming and other sectors and the direction of particular human impacts on biota and their social and economic impacts.

Data can be either quantitative or qualitative:

- **Quantitative data** - are a numerical measures, i.e. "who, what, when, where, how much, how many, how often," and are obtained through standardised interviews, biophysical surveys and surveys using closed questions.
- **Qualitative data** - often refer to "how and why" and can be obtained informally, e.g. through free and guided interviews (including focus group discussions); surveys using open-ended questions; participatory methods; observations; and interpretation of documents.

When data is poor, scoping can be carried out with a qualitative conceptual model via stakeholder engagement. In this case, the data comes from synthesizing informal or disparate sources of information or from using the participants' basic understanding of the ecosystem.

Statistical analysis can quantify the most critical connections in the system in data rich situations, but it can be time consuming and requires skills. A good alternative can be conceptual modelling. Nevertheless for both socio-economic and governance issues it is good to always include qualitative data as this can be used to summarize info from quantitative analysis.

An EAAM is an information driven and guided process, it is therefore important to note that data and information are cross-cutting and are not only required for scoping. Data for the scoping phase will also provide indicators and benchmarks for monitoring system (Module 12 Step 3.1 and 3.2; Module 17 Step 5).

EAAM uses an adaptive management process where a lack of information should not preclude action, but rather implements the project by using a precautionary approach (less information = more caution). Existing information and traditional knowledge can be utilized, as long as they are verified and validated.

A move to more sophisticated data can be available over time. In this sense a direct advantage is given by the cooperative and participatory nature of EAAM with its established dialogue and collaboration with research departments and academic staff that can adjust their research agenda towards the information requirements for EAAM.

Once key information, parameters and illustrations have been gathered and analysed, they can be presented to stakeholders to be validated. Validation can take place in various forms:

- small discussion groups with key stakeholders;
- presentations to specific groups of stakeholders or interest groups;
- presentations to groups of selected representatives of different stakeholder groups;
- community meetings involving a wider range of stakeholders.

Activity: Discuss what type of data and information is needed for scoping, what methods are used to obtain it and what sources will be used?

Sharing Information

There is apparently little information sharing about ecosystem management in aquaculture. Information sharing across boundaries only occurs when there is a joint management status or the need to fulfil specific obligations to regional fishery management organizations with the scope to inform about the progress of projects or decisions to be taken.

Aquaculture information (often in the form of statistics) is also reported to regional bodies (e.g. NACA, FAO) as part of an obligation or to support regional knowledge. Nevertheless countries and organizations often appear reluctant to share raw data, which results in dissemination of summary information.

Regional or bilateral research programs encourage transboundary sharing, particularly on topics of interest (e.g. role of mangroves as habitats; climate change effects, fish diseases). The resulting outcomes can be of advisory utility for the improvement of norms or sustainable practices.

NGOs typically work in an advocacy mode and the information that they gather are likely used to influence policy or decision-making, or to support particular stakeholder groups in order to empower them in negotiations or for leverage support (political/financial). International NGOs often provide transboundary information especially if they have projects in several countries. (e. g. food security, nutrition, labour migration/human rights abuse).

Participatory EAAM should foster better sharing of information, a lot of which will now be recorded in the EAAM plan

Finishing Step 1 allows the Vision and Background to be completed into the EAAM plan under the following headings:

EAAM plan for MU XXXX

1. VISION
  - The broad goal of management.
2. BACKGROUND
  - Description of the area and resources to be managed, including maps at different scales.
The aquaculture management area
  - Area of operation of the aquaculture, jurisdictions and ecosystem "boundaries" (including national/province/district jurisdictions). Map of MU.
History of aquaculture and management
  - Brief description of the aquaculture background, integration, water use, people involved, etc.
Current status of the aquaculture
  - Description of the aquaculture farms, hatcheries production, mills, processing factories, etc;
  - Resource status;
  - Map of resource use patterns.
Current management (co-management) arrangements
  - Existing management arrangements between the department of aquaculture and other sectors or communities, farmers' groups
Socio-economic benefits, including postharvest
  - Description of stakeholders and their interests (including socio-economic status);
  - Description of other uses/users of the ecosystem, especially activities that could have major impacts and arrangements for coordination and consultation processes;
  - Social and economic benefits, both now and in the future.
Special environmental considerations
.   - Details of critical environments, particularly sensitive areas, risk factors, water.
Institutional aspects
  - Legislative background;
  - Existing co-management arrangements – roles and responsibilities;
  - MCS arrangements;
  - Consultation process leading to the plan and ongoing activities;
  - Details of decision-making process, including recognized participants;
  - Nature of rights granted in the aquaculture, and details of those holding the rights;
  - Nature of rights granted for land or areas of water, land use certifications;
  - Maps of management interventions/user rights/jurisdiction boundaries.
  - For actions that require rules/regulations – arrangements for ensuring that the management actions are effective.
  (…)

3.   MAJOR THREATS AND ISSUES
4.   GOALS OF MANAGEMENT
5.   OBJECTIVES, INDICATORS AND BENCHMARKS
6.   MANAGEMENT ACTIONS
7.   COMPLIANCE
8.   DATA AND INFORMATION NEEDS
9.   FINANCING
10.   REVIEW OF THE PLAN

Module objectives

- Identify issues
- Define goals
- Prioritize issues

Overview

This module outlines how aquaculture issues can be identified and broken down into the three EAAM components, before being assessed for risk. The module also explains how to define goals for the EAAM plan.

Introduction

During the initial participatory workshops with stakeholders an important activity is to identify all issues relevant to the aquaculture, to help stakeholders decide where to focus the management plan in order to generate the best outcomes for stakeholders.

To assist in this process, the issues can be separated into the three EAAM component groups:

1. **Ecosystem well-being** – all ecological "assets" (e.g. resources, externalities, ecosystems) relevant to aquaculture and the issues/impacts being generated by the farming may affect the ecosystem, the impact on aquaculture by other anthropic activities.
2. **Human well-being** – the socio-economic benefits and disadvantages from aquaculture practices: food security, livelihood, social equity, gender empowerment, education, health, conflicts, indebtedness, vulnerability.
3. **Good governance** – the management and institutional systems ruling the aquaculture sector, the issues in delivering the proposed outcomes: access and tenure systems, compliance, democratic processes, conflict resolution and institutional arrangements, the possible areas of conflict with other sectors such as agriculture, forestry, water management for the access of resources.

The identification process must cover all the direct and indirect impacts of aquaculture activities on the broader ecosystem, and the wanted and unwanted social and economic outcomes on both the aquaculture and the community. The process should also identify all the elements needed to enable the effective governance and administration of aquaculture, including legislation, plans, consultation, compliance, etc. Finally, it also records any external issues that could affect the performance of the fish farming, including natural (e.g. climatic) and human induced ecological (e.g. pollution), social (e.g. international attitudes) or economic (e.g. exchange rates) impacts.

Because of the large number of issues being identified, the key task of the whole EAAM process is to ensure that only the most important issues are addressed by direct management interventions. This requires the prioritization of the identified issues (ecological, socio-economic and governance) under a risk assessment analysis. A successful planning process relies, for the most part, on prioritization of the identified issues.

The evaluation of the aquaculture issues should be performed under the light of the existing high-level policy goals set at the national or regional level and the broad management vision of the MU. In addition the resulting goals identified should be consistent with the existing or proposed new legislation. The aquaculture policies and management plans often stop at broad goals, this is due to the very large number of needs and objectives that policies need to address at the same time, which results in the impossibility to procure broad answers to everything.

The identification and categorization of the issues can be facilitated by a good number of tools available (Table 11.1).

Table 11.1: Tools for identifying and categorizing issues (see Toolkit for more details)

Name	Description	Implementation
Card storming (variation on brainstorming)	Discuss issues and write their key ideas on cards; the facilitator then organises these ideas into clusters. Fosters interdependence and collaboration.	Easy
Component trees	Have three EAAM components (human, governance and ecological) as headings, and categorise the various issues under each of these three headings and the possible sub-headings. Breaks each issue down until it becomes manageable.	Moderate
Problem tree	A diagram that traces the causes and effects of problems	Moderate
Asset/objective-impact/threat matrix	A matrix that helps to separate identified issues into their two different categories – an "issue" describes a threat to, or impact on, what is desired to achieve.	Moderate
Causal analysis	Issues are sorted into a hierarchy of cause and effect starting with the overarching driver, then the root cause and proximate cause that results in the issue	Moderate

Cause and effect

When threats and issues are identified through a participatory process they appear to be highly variable, spacing from broad ones (e.g. pollution) and very specific ones (e.g. quality feed).

A tool called a "problem tree" is a very helpful means to classify the wide number of issues identified (Tool n.28). The problem tree can categorize four levels of issues:

1. Drivers: these are large-scale events that have a trickle-down effect on many issues (e.g. growth in population and wealth, climate change).
2. Effect: The effect that the core problem creates;
3. Core problem: the actual problem;
4. Causes: the cause of the problem. These can be broken down further into main and underlying causes.
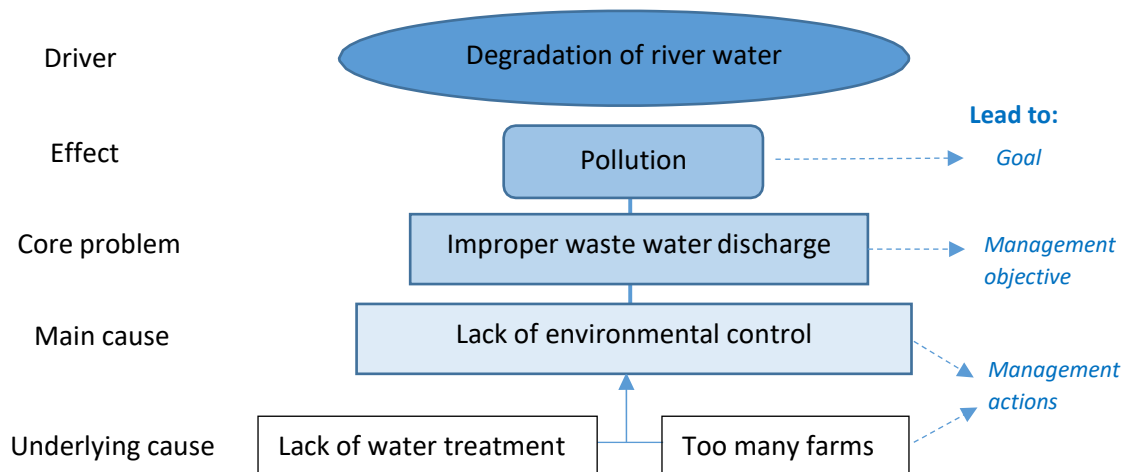
Figure 11.1: Example of a problem tree for "degradation of river water"

Using the problem tree

The problem tree helps to identify threats and issues at a level that can be addressed by the management. The effect is often linked to the goal (see later in this module), and the core problem often identifies the management objective (Module 13 Step 3.1). The main causes or underlying causes can be addressed by management actions (Module 14 Step 3.3). In the example in figure 11.1 management actions could address the main cause by improving the monitoring and control, by changing the policy to enforce the need to treat wastewater before release, or by limiting the licensing to allow production to stay within the effective carrying capacity of the watershed.

Issue check list

Regardless of the method used, it is important that all the issues in the MU have been considered. Here is an indicative checklist that outlines the categories that should be considered. Some of these will not be applicable to every MU, but deciding which issues are included is an important step that stakeholders involved with the EAAM process have to take.

Ecological well being	
Aquaculture resources	
Water	• Water access • Water quality • Conflicts with other water users
Land	• Land access • Constrains on land use • Conflicts with other users
Feed	• Use of agriculture inputs • Unsustainable use of fish meal/oil
Fish	• sustainability of main commercial species
Aquaculture effects	
Habitat	• food chain impacts • impacts on farmland • loss of mangroves; damage to sea bed • impact on biodiversity • impacts on natural recruitment of farmed species
Land	• Reduced crop productions • land/coastal erosion
Water	• Reduction of water for irrigation

71

	• Wastewater discharge
	• Eutrophication
	• Saltwater intrusion
	• Salinization of aquifers
Pollution	• Chemicals/antibiotics discharge
	• oil discharge
Fish species	• Introduction of exotic species
	• Spread of diseases
	• Escapees
	• Cross-transmission of diseases to wild stocks
	• Impact on wild fish/fishery
Ecosystem effects	
Pollution from other users	• Pollution from human discharges
	• Pollution from industrial activities
	• Pollution from agriculture
Climate change	• Extreme events
	• Raising temperatures
	• Salinification
	• Increased diseases
	• Loss of biodiversity
	• Change of habitats
	• Droughts/flooding

Human well being	
Livelihoods	• food security
	• access to essential food
	• impact on employment
	• even/uneven income distribution
	• access to/use of resources
	• emigration
Human development	• education
	• health
	• social equity
Safety and health	• product quality
	• Post-harvest
Interactions with other sectors	• Conflicts with other productive sectors (agriculture, forestry)
	• Conflicts with other economic activities (tourism, industry)
	• Feed for aquaculture
	• Competition for employment
	• Value chain equity
	• market supply
Gender	• Access to employment
	• Social change
	• empowerment

Good governance	
Institution	• lack of cooperation among relevant agencies • lack of coordination within the department • lack of management structures/mechanisms • lack of planning • conflicts among different policies • conflict with other sectors' regulations • conflicts for access of resources (land, water)
Farm communities/fish industries	• lack of awareness of existing rules and regulations • lack of leadership and managerial capacity
Consultation/dialogue	• lack of participation • conflicts among groups • conflicts among sectors
Information and knowledge	• Lack of knowledge on ecosystem management • Lack of technical knowledge of aquaculture management and GAqPs
Global economy	• changing market demand • change of market prices • change of input prices
Compliance and enforcement	• Lack of control • Lack of enforcement • Lack of capacity

Activity: Agree on the set of threats and issues that are applicable to the selected aquaculture area Use a problem tree analysis to sort them into (i) Drivers, (ii) Effects, (iii) Core problems, and (iv) Causes

2.2 Define goals for the EAAM

Remember the EAAM plan hierarchy:
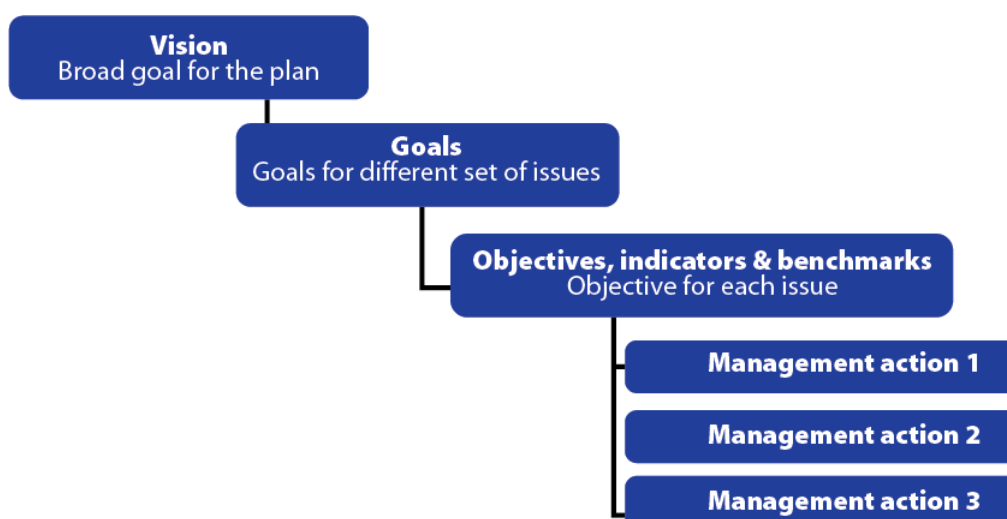
Figure 11.2 Positioning of Goals in an EAAM planning

As can be seen in the figure 11.2, goals are following the Vision. Goals should still be a broad level statement and limited to three to five for any EAAM plan. A goal is the long term outcome that management is planning to achieve. It often refers to a group of inter-related issues.

An objective is a formal statement detailing what you are trying to achieve for each issue and are considered in the next step (Module 13 Step 3.1).

Example goals are:
- Better use of marine and freshwater resources;
- Improved livelihoods of communities that are dependent on the aquaculture resources; and
- improved governance of aquatic resources in synergy with other sectors

It may be appropriate to consider at least two goals for the ecological component to cover both the farming and ecosystem issues and at least one the other in the EAAM.

> **Activity**: Using the results of the problem tree analysis, put the Drivers aside as they are out of our control. Develop a goal for each theme (e.g. the 3 components of EAAM), by looking at the effects within each theme.

2.3 Prioritize the issues through a risk assessment

The work of the stakeholder group to identify issues can result in a very long list of problems that need to be classified in order of importance. Organizing the issues helps to spot the most important ones that will be addressed by the EAAM plan. Prioritization of specific issues is usually conducted using a risk assessment. A number of tools are also available to prioritize issues (Table 11.2).

A risk analysis typically seeks answers to four questions:
1. What can go wrong? (Risk)
2. How likely is it to go wrong? (Likelihood)
3. What would be the consequences of it going wrong? (Impact)
4. What can be done to reduce either the likelihood or the consequences of it going wrong? (Action)

> **Remember → Risk = Likelihood x Impact**

High priority issues are those with a high likelihood of occurrence and high impact. These high priority issues are the ones that require direct management.

Table 11.2: Tools for prioritizing issues

Name	Description	Implementation
Non formal risk categories/ Semi quantitative risk assessment	The risk associated with each identified issue is directly assigned by the participants to one of three categories – high, medium or low risk, with the descriptions incorporating both the consequence and the likelihood	Easy
Qualitative risk analysis (impact/ likelihood matrix)	Participants place issues on the 2x2 matrix with two variables of likelihood and impact with two to six categories of likelihood and two to six levels of consequence (impact). Each identified issue is rated accordingly and plotted onto matrix	Moderate

Dot ranked informal vote ranking	Participants identify issues which they think are high priority. Final count shows which issues are of high priority to that group of stakeholders	Easy
Pair-wise ranking	Participants list up to five issues on cards on both vertical and horizontal axes of a matrix, in the same sequence. Compare each pair and agree which is the higher risk. Repeat until all possible combinations have been filled. List the results in rank order by sorting the cards in order of priority	Easy

A simple semi-quantitative risk assessment helps to rate each issue as to whether it has (i) high, medium or low likelihood of occurring and (ii) high, medium or low impact when it does occur. These are then plotted on a 2x2 matrix diagram (Figure 11.2). In this way, the high likelihood/high impact issues are identified. These are the high priority issues that need to be considered into the planning process. The medium risk issues might also be identified and mentioned in the EAAM plan in case their priority changes over time.
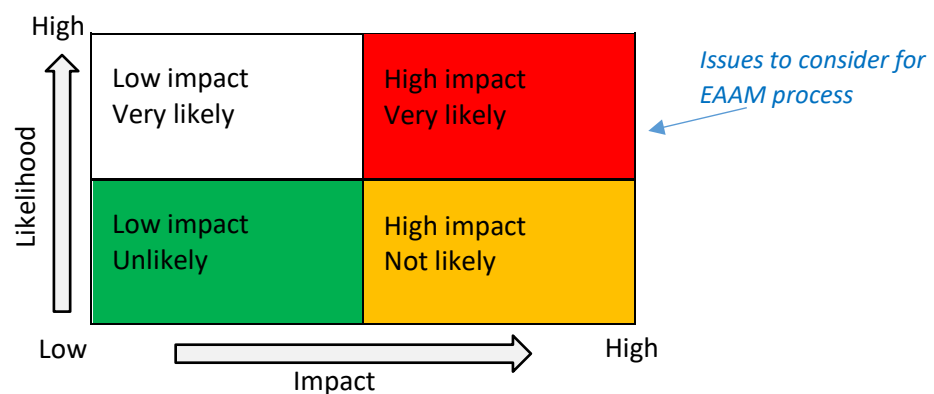
Figure 11.3: Semi-quantitative risk assessment. Likelihood is the probability of occurrence and impact is how change would occur.

Activity: Prioritize the issues using a 2x2 risk assessment and select the high priority issues and group them into the 3 EAAM components of EAAM.

Finishing Step 2 allows the issues and goals to slot into the EAAM plan under the following headings:

EAAM plan for MU XXXX

3. MAJOR THREATS AND ISSUES
Ecological issues
- Aquaculture and general environmental issues, including both the impact of aquaculture on the environment and vice versa.

Social and economic issues
- Issues relating to the people involved in farming, the general public and at the national level, including gender issues.

Governance issues
- Issues affecting the ability to achieve the management objectives.

4. GOALS OF MANAGEMENT
- Higher level goals, i.e. the ultimate goal of management.

Module 12 - Reality check I

Module objectives

- Identify the constraints and opportunities (CO) in meeting the EAA area/zone goals;
- Use facilitation skills with co-management partners in focus group discussions (FGDs);
- Use conflict management to resolve diverging priorities/expectations in EAAM

Overview

This module allows the EAAM key stakeholder group to step back and assess what may stand in the way of the EAAM plan and EAAM goals from being realized. This is the time to practice the facilitation skills discussed earlier in Module 9 - Startup B. This module discusses how to assess conflict so as to move towards consensus and explains the stages of conflict management. It then outlines strategies and techniques for dealing with conflict, including how to achieve, where possible, "win-win" (mutually beneficial) solutions.

Introduction

At this stage of planning, the high priority issues that management can address have been identified and grouped under themes. Goals have been developed for each theme. It is now time to do a reality check to see if the goals are really achievable. This is called Reality check I. A second reality check will follow afterwards - Reality check II, which will be carried out after the EAAM plan has been implemented to assess the conformity of the plan to the EAA goals and legislations.

1.Constraints on and opportunities for achieving the goals

Each goal needs to be reviewed to identify the constraints and opportunities for achieving it.

To evaluate whether the goals are achievable, the EAAM team could ask the following questions:

Relevant questions:

1. Is funding available or achievable to reach these goals?
2. Is there sufficient political support and stakeholder support?
3. Is there institutional support?
4. Is there sufficient human capacity?
5. Are the time frames realistic?
6. Can the information/data needs be met at a level where the precautionary approach allows for adaptive management?

Some of these questions may have already arisen as governance issues. If the answer is a definite "no" to any of these questions, then there are two options: either reset the goal to be more realistic or work with stakeholders to remove the constraint, or at the least manage it. If possible, constraints should be turned into opportunities.

Planning tools are also available to evaluate whether the goals are achievable (see Toolkit 25).

Activity: Consider the constraints and opportunities in meeting the goals.

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2. Facilitation and focus group discussion

Many of the constraints can be overcome by involving the stakeholders in Focus Group Discussions (FGDs). FGDs and the role of a facilitator were introduced in <mark>Module 9 Startup B</mark>.

Remember the key ways to sustain stakeholder engagement are:

- effective facilitating that can be achieved by:
  - guiding people in a discussion of their experiences, feelings and preferences about a specific topic;
  - raising issues identified in discussions;
  - use of probing techniques to animate discussion and promote in-depth reflection.
- participants can make their own questions, frames and concepts and develop their own priorities.

Mind that during this process the interactions among participants open opportunities to source data.

During any FGD, the facilitator is expected to:

- guide each session;
- not be too intrusive/structured in their approach;
- allow the discussion to flow freely;
- use a fairly small number of general questions to guide the focus group session;
- refocus the discussion as necessary;
- intervene to bring out important issues if participants do not; and
- build rapport (use active listening)

Focus Group – How it works

Focus groups help to understand about the community needs or point of views. A focus group differs from a normal groups because:

- It has people gathered for a specific discussion topic
- There is a trained facilitator to ease the dialogue
- The participants and the discussion are carefully planned to create a not-inhibiting environment where people can freely express their opinions.

1. When organizing a focus group you need to:
2. Think about your goals: Why you wish to have a focus group, what you hope to learn
3. Find a good facilitator (if not you) with experience on managing groups and gets on well with participants, who knows a bit of the topic
4. Find a recorder to take notes of important point of the discussion
5. Carefully choose the participants with a representative sample of stakeholders
6. Think at the questions to use to facilitate:
   - *What is your idea about the current situation*? *Are you satisfied with it?*
   - (If yes) "*What does make you satisfied about*? *What is going fine*?
   - *Is there anything that makes you not satisfied*? *What is it*? *Why is that*? *How do you want the situation*? *What do you want to change*?
   - *What about this particular issue* (of the topic under discussion). *What is your idea*?
   - *How about this particular aspect* (of the topic). *What do you think about that*?
   - Ask the same questions for the other angles of the topic. Also change your stile and pose indirect questions
   - *Someone says____instead of____what do you think*? *Why so/why not*?
   - *Do you have any proposal*?
   - *Any other things you would like to add*?

   Use also discussion stimulators such as:

Activity: Hold a focus group discussion

3. Conflict and conflict management

Given the extent and scope of the EAAM multi-stakeholder process, and the likely confrontations between different levels of resource users, conflicts are inevitable in EAAM. Conflict is not necessarily negative. It can facilitate the emergence of more equitable power relationships, correct bad fisheries management practice and improve EAAM policy.

Conflicts over aquaculture management have many dimensions including, but not limited to, resource use/access, pollution, power, technology, politics, gender, age and ethnicity. Conflicts can take place at a variety of levels, from local to scales. The intensity of conflict may vary from confusion and frustration to violent clashes between groups over resource ownership rights and responsibilities. Conflict may result from power differences between individuals or groups or through actions that threaten livelihoods.

Conflict management is about helping people in conflict to develop an effective process for dealing with their differences. The generally accepted approach to conflict management recognizes that the parties in a dispute have different and frequently opposing views about the proper solution to a problem, but acknowledges that each group's views, from the group's perspective, may be both rational and legitimate. Thus, the goal of people working in conflict management is not to avoid conflict, but to develop the skills that can help people express their differences and solve their problems in a collaborative way.

Activity: On the FMU maps, mark the areas where conflict is likely and who the players will be.

Moving from conflict assessment to consensus

A first step in conflict management is to assess the specific conflict in question. An analysis of a particular conflict can provide insights into the nature, scope and stage of conflict, and possible approaches to its management. There are four main factors that should be analysed when assessing conflict:

- **Characterize conflict and stakeholders**. Here the type and origin of the conflict encountered is analysed, including the number of stakeholders involved, the balance of power among the parties and the relationships between them.

- **Stage in the management cycle**. Conflicts at the "beginnings" stage are likely to be different from conflicts at the implementation stage. New stakeholders may arise as the EAAM process proceeds. This requires a flexible process that adapts to changing circumstances.
- **Stage in the conflict process**. Determine whether conflict is at a point at which interventions may be accepted.
- **Legal and institutional context**. The formal and informal institutions, the manner in which conflicts are resolved through these institutions and the formal legal doctrines may influence the appropriate approach.

Conflict can be ignored (hoping it will go away), confronted (with the risk of deepening the disagreement), or it can be managed positively. One approach to conflict management is to have multi-stakeholder analysis and consensus building meetings (Tool n.4). These meetings have the objective of fostering productive communication and collaboration prior to the outbreak of conflict by employing tools such as conflict anticipation and collaborative planning, together with the cultivation of alliances and mobilization of support. Adopting a participatory co-management approach to planning and implementing EAAM (as outlined in Module 9 Startup B and Module 16 Reality check II) will definitely support such a collaborative process.

Building consensus involves collaborative decision-making techniques, where a facilitator/ mediator assists diverse or competing interest groups to agree on contentious issues, objectives or other matters where consensus is needed, as opposed to taking a majority vote. This usually involves respectfully sharing perspectives and working together to seek mutual benefit. Ideally, it can be used before conflicts actually emerge (thus reducing the need for conflict management). In EAAM, conflict management is useful at the stage of setting overall management goals and EAAM plan objectives, where reaching agreement on big issues paves the way for agreements on smaller technical or institutional issues, as well as in resolving conflicts during the implementation of the plan.

How to use conflict management in EAAM

The goal of conflict management is to apply skills that help people express their differences and resolve their problems in a win-win outcome. Conflict management is basically a form of facilitated negotiation that works best in these conditions:
- all disputing parties are known;
- willingness to resolve issues;
- reaching a solution is important for all;
- parties trust conflict management method;
- mutually beneficial solution is possible;
- parties have authority to make deals;
- funds, time and resources are available; and
- resolution is desirable in a wider context.

It is necessary to get past the symptoms and understand the root causes of the conflict (often from multiple sources) to be able to manage it. In the EAAM process, potential sources of conflict include:
- relationships: values, beliefs, prejudices, past injustices, past miscommunications;
- information: poor quality, misinformation, different interpretations;
- interests: perceived or actual, physical or intangible;
- structures: resource flows, authority, institutions, time constraints, finances.

The stages in conflict management are:
1. Initiation: a stakeholder or outsider may invite help to manage the conflict;
2. Preparation: conflict assessment, information sharing, rules, participant selection;
3. Negotiation: articulating interests and win-win options, packaging desired options;
4. Agreement: concluding jointly on best option package, recording decision making;
5. Implementation: publicising outcomes, signed agreement (optional), monitoring.

Conflict as part of the change process

Conflict should be viewed as an opportunity for change. Responses to change often follow the following stages: (i) denial, (ii) resistance, (iii) acceptance and (iv) commitment (Figure 12.1).
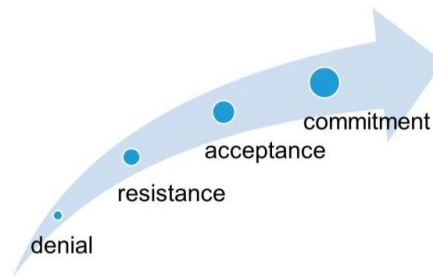

Figure 12.1: Conflict is a process of change that can have four stages

Conflict can be expected as part of the EAAM process of change. If the process is well managed, working through the conflict may lead to greater commitment towards the change. Use the strategies outlined below and conflict management tools (Tool n. 8) to assist with working through conflicts that might be encountered.

Strategies for dealing with conflict

Strategies for dealing with conflict can be categorized according to the strength of the desire to reach objectives and/or maintain good relationships (Figure 12.2). If someone has a high concern for the relationship and a low concern for the objective, that person is likely to accommodate. If someone has a low concern for the relationship and a low concern for the objective, that person will likely go for an avoidance strategy. If someone values the objective more than the relationship, they will compete. Compromise occurs when someone "gives up" some of what they wanted in order to reach an agreement that suits all parties. If someone values the relationship and objective equally, they will go for collaboration, which is the win-win solution.
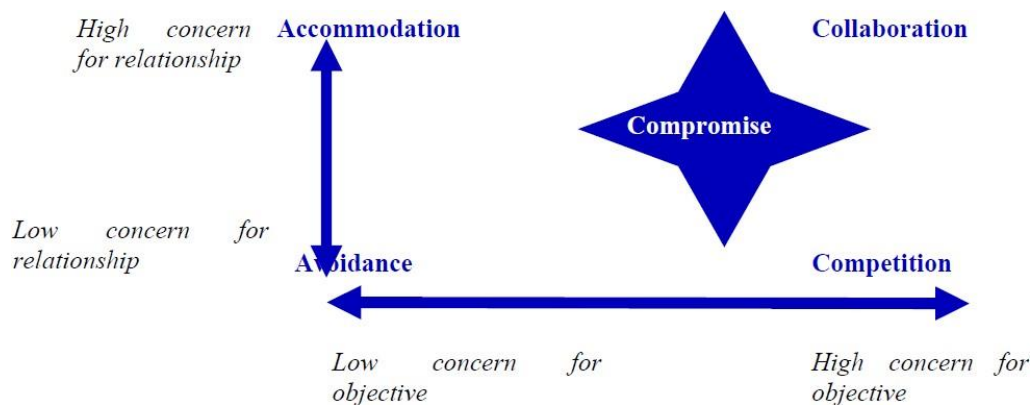

Figure 12.2: Conflict strategies

Table 12.1: The five strategies in dealing with conflict

Approach	Behaviour	Justification
Avoidance	Non-confrontational. Ignore issues. Deny they are a problem	Afraid of damaging relationships or creating even greater problems
Accommodate	Agreeable, non-assertive behaviour. Cooperative, even at expense of personal goals	Afraid of damaging relationships and creating disharmony

Compete (win/lose)	Confrontational, aggressive. Must win at any cost	Survival of fittest. Must prove superiority
Compromise	Settle for middle ground. Satisfies no one completely, but everybody gets a part of what they wanted	No one wins everything they want, but everyone wins something
Problem-solving collaboration (win-win)	Needs of both parties are important. High respect. Mutual support. Assertive/cooperative	Mutually beneficial solution can be found

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Achieving win-win solutions

When trying to achieve a solution(s) to a conflict situation that will work for all parties, it is a good strategy to think of potential opponents as problem-solving partners. Here is a process that can be used when mediating between stakeholders in conflict.

1. Set the scene: "Let's find a way to solve this that works for everyone".
2. Define problem in terms of needs/outcomes. Define the original problem and individual needs, as well as expected outcomes. Identify the shared (relationship) needs.
3. Brainstorm possible solutions.
4. Evaluate the solutions.
5. Choose solutions.
6. Plan what action will be taken.
7. Evaluate results

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Conflict management techniques

1. The use of **suggestions** rather than proposals encourages flexibility and movement, and encourages building on ideas in order to reach agreement. Not "*We need to do it this way!*" but "*What if we try to use this approach?*"
2. Be **assertive**, not aggressive or passive, to take emotions out of the situation; assertive behaviour can be especially useful for dealing with anger or aggression by slowing down perceptions so that you "respond" rather than "react". Not "*I'm the manager here!*" but "*We need to think this through from the start.*"
3. **Avoid "you" statements**. "*I*" or "*we*" (not "*you*") statements are less likely seen as personally critical; avoiding "you" statements can assist this through a more sensitive approach based on mutual interests. Not "*You're wrong!*" but "*I think we should try to use another approach.*"
4. **Anticipate reactions** proactively to plan and prepare your approach to conflict; "*I know you're very busy, but we could really use your help on this.*" Anticipation of the other person's feelings and awareness of their reactions helps to create a more positive climate in which to respond and encourage responses rather than reactions.
5. **Consider the other person's** interests to make your comments more relevant; "*I realise this is our problem not yours, but a good solution can help you too.*"
6. **Acknowledge reactions** detected through body language or expressions; "I *can see that you don't think much of this approach, so let's talk about it.*"
7. **Apply limit setting** to clarify responsibilities and create limits for decisions; limit setting is useful to clarify priorities, especially when organizational authority applies (i.e. the decision is not your own). "*Please get it to me by Monday*" or "th*e department needs the figures for the year end.*"

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The first six conflict management techniques concentrate on this critical area of converting emotional reactions into more flexible responses. Everyone has personal views, feelings and emotions that influence the way they respond to others in conflict situations. Those managing the EAAM process

need to be sensitive to personal factors in both themselves and the other stakeholders' interests. This may sound difficult now, but it will certainly increase management effectiveness.

Characteristics of assertive communication

Being assertive is very culturally dependent. What is acceptable in certain countries may be considered rude or inappropriate in parts of the region. The characteristics listed below therefore need to be adapted to the region and culture in which the EAAM process takes place:

- speaking in short, direct sentences;
- using phrases such as "*I think*," "*I believe*," and "*in my opinion*" to demonstrate taking responsibility for thoughts;
- asking others to clarify their statements when there is uncertainty around their meaning;
- describing events objectively rather than exaggerating, embellishing or distorting;
- maintaining direct and extended eye contact (in certain cultures only, e.g. western culture).

Tips for EAAM managers

- Agree objectives through consultation with the stakeholders. Ensure all concerned share the MU's vision (broad goal).
- Divide responsibilities and resource entitlements carefully to minimize conflict. People with identical objectives who share resources are likely to compete against each other. Enable and encourage stakeholders with complementary objectives to work in co-operation with each other.
- Create opportunities for relationship building and make interdependencies between different departments or agencies explicit. This will encourage tolerance and collaboration when difficulties arise.
- Recognize staff and partners who demonstrate that they value supportive working relationships.

Activity: Win-win solutions role play

Module objectives
- Develop management objectives
- Develop indicators and benchmarks

Overview

This module outlines how to develop management objectives, and from this how to develop indicators and benchmarks. It also briefly discusses data and information needed for indicators, and reiterates the importance of stakeholder participation in these key activities.

Introduction

After identifying the MU goals for each EAAM component, and the key issues that require direct intervention, the plan preparation needs to focus on how to develop a management system that will deliver successful outcomes. This requires clear objectives that indicate what is going to be achieved for each aquaculture issue. At the same time, with the definition of the objectives there is the need to identify the actions that are needed to achieve the objectives and what indicators can be used to measure such achievements.

Therefore the first thing to do is to develop objectives for the high-risk issues (high likelihood/high impact) identified in Module 11 step 2.3. The objectives, also called management objectives, are at the core of the EAAM plan. They must be clear, measurable and directly linked to one or more of the higher-level goals. Some medium-risk issues might require identification of a mechanism in the plan for ongoing review and some form of contingency plan. Low-risk issues might be mentioned in the plan, explaining why they are considered low risk.

3.1 Management objectives

Using the high priority issues it will be easy to create robust objectives. Each objective needs to state what will be achieved, e.g. "reduced discharge of aquaculture wastewater". The stakeholders should also decide how to assess the achievement of the objective. This is done by setting indicators and benchmarks. In practice, it should be possible to find the indicators from the data already collected or the data that has to be collected. Indicators and benchmarks are only identified once an objective has been agreed (Tool n.30 for examples).

Relevant questions

For each issue that is to be directly managed the following relevant questions apply:
1. What are the management objectives relevant to this issue and what will aquaculture try to achieve for this issue?
2. Is there any conflict between issues? If so what one needs to be prioritized?
3. Is there stakeholders' agreement on the objectives?
4. Are the agreed set of objectives and outcomes for the issue consistent with the high level goals, policies, treaties, legislation, etc.?

- For each issue requiring direct management, identify possible management objectives.
- If there is more than one management objective for an issue, determine their hierarchy or relative priority.
- Obtain stakeholders' inputs or advices regarding their appropriateness and practicality.
- Review management objectives to ensure that they are consistent with high level objectives, legislation or policies.
- Confirm the set of management objectives that will be used for developing the management plan.

For an EAAM plan, if the issues are specific it will be easier to set objectives and plan management actions accordingly. For example, for the broad objective: "Reduce the pollution from aquaculture wastes" There may be two related management objectives:

1. Improve/enforce water treatment in aquaculture farms;
2. Reduce the number of farms.

As it is sometimes difficult to develop management objectives without also identifying the relevant indicator and benchmark, it is better to think of these elements as a package. So, objectives and their relevant indicators and benchmarks need to be worked out together.

3.2 Indicators and benchmarks

Stakeholders also decide on how to assess whether the objectives are being achieved. This is done through setting indicators and benchmarks to measure management performance to determine whether management is meeting the objectives.

What is an indicator?

An indicator measures the current status at one point in time. An indicator can be a quantitative or qualitative measure of some attribute of aquaculture that is directly measured (e.g. quantity pollutants in the water column); estimated using a model (e.g. wasted estimated using a discharge model); measured indirectly (e.g. fish productivity); or even just inferred (e.g. number of collaborative meetings as an indicator of cooperation and coordination across agencies).

More than one indicator may be used to monitor performance of the same management objective. This can provide greater confidence where none are considered accurate by themselves, but requires determination of how they will be collectively interpreted to track performance when they show differing trends.

Participatory, community-based monitoring can be used to develop and monitor suitable indicators that are based on locally collected data. This can provide a practical and cost effective method to measure progress towards meeting the management objectives developed for EAAM.

Where the risks are low, crude indicators may be adequate. When selecting indicators, the level of complexity and the precautionary nature of the management action must also be considered. Where the inherent risks are higher, or the management approach is more aggressive, more robust and precise indicators will be needed. The alternative is for management to be more precautionary with appropriate adjustments made to the acceptable performance limits.

Relevant questions:

1. Is there already an indicator being used?
2. What levels of the indicator define acceptable performance for the objective and why?
3. How precise or robust does the indicator and associated benchmark need to be to match the risk profile of the fishery?

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4. What resources are available for indicator measurement?
5. Would the cost of moving to a more robust indicator be worth the additional expense?
6. Are the resources sufficient to maintain the indicator system as long as needed - are the proposed indicators compatible with the monitoring and evaluation capacity available?
7. To what degree should the indicator–benchmark–management systems be formalized?
8. Is it appropriate to generate control rules?

Key actions

- Identify possible indicators to measure performance for each management objective.
- Agree on the level of precision and accuracy required.
- Review what data/information are available and the relative costs for each possible indicator given their relative uncertainty.
- Determine the most cost effective options.
- Given the levels of uncertainty in the indicator, determine what will signify acceptable and unacceptable performance.
- If more than one indicator is to be used for the objective, determine how they will work together to determine the assessment outcome.
- It should be possible to estimate the indicators from data that has been or could be collected.

Most commonly used socio-economic indicators[2]	
Indicators	**Examples**
Educational indicators	- Illiteracy rates (age and gender) - Years of study (age and gender)
Employment indicators	- Unemployment rates (sector, age and gender) - Type of employment and salary distribution
Family and home facility indicators	- Household income, house ownership and housing facility situation (sanitary, water supply, energy supply etc)
Economic indicators	- Gross income per hectare - Profit - Return to labour (USD/man/year) - Employment per hectare - Return to labour per hectare - Employment per tonne of product - Capital investment per job created
Shareholder and investor indicators	- Financial returns - Creation of shareholder value - Overall sustainability of the business
Community indicators	- Sustainability of local fish stocks - Health of the harbour had its suitability for recreational activities (including fishing) and employment rates
Employee indicators	- Competitive rates of pay, working conditions and work/life balance - Employee equity and benefits such as superannuation

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[2] Adapted from: FAO 2010 Aquaculture Development. Ecosystem Approach to Aquaculture. FAO Technical Guidelines for Responsible Fisheries 5 Suppl. 4. Food and Agriculture Organization of the United Nations - Rome

The benchmark describes where you want to go (target), where you came from (baseline) and where you do not want to be (limit).

Benchmarks are often targets that specify the desired state of the indicator (e.g. 20 percent of area under integrated farming) or limits that specify a boundary within which to operate, or that should not be exceeded (e.g. 50 percent of existing pollutant concentration).

It is always desirable to set benchmarks using a precautionary approach which involves setting reasonable levels and taking firm actions when these are approached or exceeded.

Measuring management performance

The comparison of the indicator with an agreed benchmark (a target, and a baseline or limit) provides a measure of how well management is performing (Module 17 Step 5; (Figure 13.1).
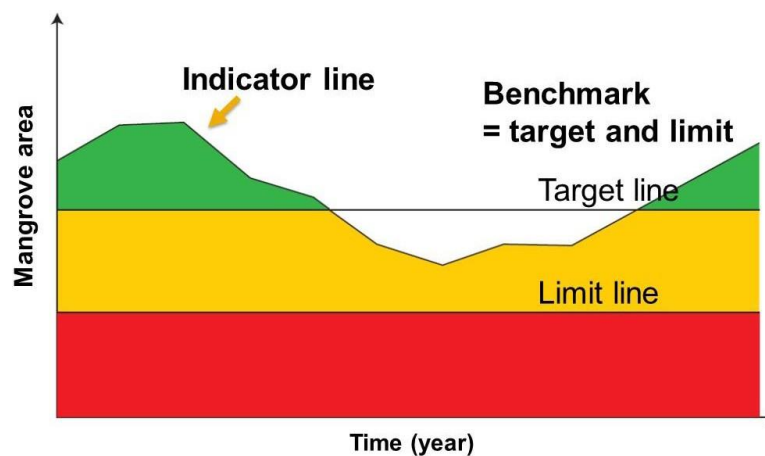

Figure 13.1: Measuring management performance: trend of an indicator shown against two benchmarks (target and limit).
Green is the desirable outcome (above the target), orange is less desirable (below the target but above the limit, and red is undesirable.

Data and information needs for indicators

Indicators and benchmarks need to be SMART:

- **S**pecific (in terms of quantity, quality and time);
- **M**easurable (objectively verifiable at acceptable cost);
- **A**vailable (from existing sources or with reasonable extra effort);
- **R**elevant (to objectives and sensitive to change);
- **T**imely (to ensure usefulness to managers).

Data and information needs were discussed in Module 10 Step 1.3 Scope the MU. The same considerations apply to data and information for indicators and monitoring. Data needs are guided directly by the indicators selected. The collection of new data will be likely needed and participatory approach to data collection should be encouraged.

Relevant questions:

1. Who is responsible for measuring the indicator(s)?
2. Where do the data come from (new or existing)?
1. 3. If new, what method will be used?

It is also good practice to carry out data validation. Specifically, a combination of different types of qualitative and quantitative data collection methods and sources should be used. This will provide a more complete analysis of the subject matter – can enhance credibility of evaluation conclusions and confidence in the recommendations.

Participatory Monitoring and Evaluation

Where possible, participatory monitoring and evaluation (M and E) should be used to collect data and monitor indicators. Participatory M and E focuses on who measures change, who benefits and how concerns are negotiated, specifying what to measure as indicators and setting the benchmark targets and limits. The composition and skills of the assessment/M and E team are very important. Note that the assessment/M and E team may be the same or different from the EAAM team.

> **Activity:** Develop management objectives, indicators and benchmarks for a selected number of high priority issues

As part of the overall EAAM plan, the objectives, indicators and benchmarks slot into Section 5 of the EAAM plan under the following headings:

EAAM plan for MU XXXX
1. VISION
2. BACKGROUND
3. MAJOR THREATS AND ISSUES
4. GOALS OF MANAGEMENT

5. OBJECTIVES, INDICATORS AND BENCHMARKS
  - Priority issues, objectives, benchmarks for the aquaculture sector:
  - Aquaculture resources;
  - Environment (including carrying capacity, pollutants, genetic pollution, diseases, habitats, biodiversity, integration, etc.);
  - social;
  - economic;
  - governance (ability to achieve the plan).

6. MANAGEMENT ACTIONS
7. COMPLIANCE
8. DATA AND INFORMATION NEEDS
9. FINANCING
10. REVIEW OF THE PLAN

Module 14 – Steps 3.3, 3.4 and 3.5
Management actions, compliance, finance and finalize EAAM plan

Module objectives
- Agree management actions and how stakeholders will comply with these;
- Include financing mechanisms in the plan;
- Bring it all together – finalize the implementation plan.

Overview
This module completes Step 3. It explains how to agree to management actions and focuses in particular on how to ensure compliance with these agreed actions. The module also discusses financing issues and concludes with how to finalize the EAAM plan.

Introduction
Having determined the set of management objectives, indicators and performance measures for the aquaculture, the next step is to produce an agreed and coherent set of management actions that address the issues and meet the objectives.

3.3 a Management actions
The manager's toolbox
In existing aquaculture management, the focus is often on managing people to promote sustainable use of the aquatic resources. For example, technical actions may target the adoption of Good Aquaculture Practices (GAqPs). In EAAM, because the issues and objectives being considered are broader, an expanded suite of management actions is required.

Thus, the suite of management actions in EAAM will include: (i) conventional aquaculture management actions to address farming concerns; (ii) actions to maintain, restore, and conserve the structure and function of the ecosystem; (iii) actions that address human social/economic dimensions; and (iv) actions to address the governance issues.

EAAM management actions may include activities such as:

- technical measures to regulate water pollution;
  - control limits:
    - input controls (e.g. carrying capacity, fish biomass,)
    - output controls (e.g. total allowable discharge limits)
  - spatial controls (e.g. aquaculture farming locations);
- ecosystem manipulation (e.g. habitat modification, algal bloom, genetic pollution, planting mangroves, remediation/integration measures);
- community-based development:
  - income diversification (e.g. alternative livelihood skills);
- human capacity development:
  - aquaculture management skills;
- working with others:

> o Integrated agriculture, mangrove friendly aquaculture, Integrated Coastal Zone Management (ICM), Environmental Agency, etc.

See Manager's Toolbox Tool n.33 for a "work- in-progress" template of management actions as well as Tool n. 35 for management actions specifically for alternative livelihoods.

Some of the EAAM issues and objectives will fall outside the mandate of the aquaculture agency. In these cases, EAAM needs to link to additional management sectors, such as agri/forestry management, disaster risk reduction and climate change adaptation. EAAM management actions can include management plans and actions undertaken through other management strategies (e.g. ICM,) when they meet the EAAM management objectives.

Overlapping actions

In most cases, there will be several management actions that could address a particular objective and a list of these could be assembled through brainstorming sessions with members of the target community, assisted by the key stakeholder group and relevant government agencies. Community engagement tools such as the problem-objectives tree (Tool n.28) can be used to encourage community members to propose management actions that would solve particular problems. For each objective, it is useful to prepare a list of all possible management actions with particular attention given to their ease of application, likelihood of success, feasibility and cost.

As a result, unlike many aquaculture management processes that simply introduce interventions without first setting objectives, it will be clear to all stakeholders why a particular management action is being introduced. All management actions must include reference to those responsible and the time frame required for their implementation. Different management actions will be the responsibility of the community, the promoting agency, or other agencies.

Decision or control rules

Where possible, the use of specific management actions should be accompanied by decision rules on how they are to be applied. In practice, this is often developed later in the process. The decision rules state what action should be taken under different conditions, as determined by its performance. In a small-scale aquaculture context these actions need to be pragmatic (e.g. strict enforcement of pollutant limits). The key is to try and agree on what might happen and how to react to the change in the indicator value. This provides some certainty for all stakeholders and the rules should be widely known and understood. In certain cases, decision rules can be quantitative (e.g. changing the farming operations, stocking or culture system) or, more commonly, qualitative where, for example, a certain value of an indicator triggers a decision to conduct a review of management.

Management actions and the Rules and regulations

Good practice is develop a set of rules and regulations as a companion document to the EAAM plan. Because the EAAM plan is intended as long-term reference (albeit with regular adaptations and changes) management actions in the EAAM plan should be generic. The exact specifications of this action are best set out in the rules and regulations (e.g. use of breed species). This is because it is often easier to change rules and regulations rather than the EAAM plan itself (although this depends on how the EAAM plan is formalized Module 15 Step 4). Rules and regulations can be formal or informal, indeed those made by communities based on their EAAM plan may prove to be more effective than top-down laws and rules, if there is good community buy-in.

3.3 b Compliance and enforcement

There is no point in developing management actions unless there is some way to ensure compliance with these actions.

Compliance and enforcement are different but complementary concepts. Compliance is achieved when farmers' actions conform to the relevant regulations and legislation, whereas enforcement is the act of enforcing or ensuring observance of and/or obedience of rules and regulations. Compliance is the outcome of voluntarily acceptance of, and action in accord with, the management rules and regulations.

When the rules and regulations are broken, enforcement is the action taken against those responsible for non-compliance. The task of balancing compliance with enforcement requires that resource managers must make compliance a preferred outcome compared to enforcement actions. Any compliance and enforcement system should be accountable, legitimate, equitable and flexible. Compliance is best achieved when farmers perceive management as being legitimate and fair, the science as being reliable and trustworthy, where there is effective monitoring, control, and surveillance activities, and effective penalties to decrease economic incentives for violating.

Enforcement systems attempt to increase compliance with rules governing resource use by monitoring user behaviour and punishing those engaged in prohibited activities. By increasing the severity and likelihood of sanctions and, thus, raising the opportunity cost of non-compliance, enforcement systems act directly upon resource users to foster adherence with established rules. Enforcement systems also shape compliance indirectly. By shaping perceptions of overall compliance rates, enforcement systems affect rates of "contingent compliance," where individuals base their decision to obey rules upon the (perceived) rate of compliance by others. Through both the design of sanction mechanisms and the perceived "fairness" of enforcers, enforcement systems also shape perceptions of legitimacy.

Monitoring and control

Monitoring and Control (M and C) is the mechanism for implementing agreed management actions. The components of M and C comprise:

1. Monitoring (M) – the collection and analysis of information relevant to compliance;
2. Control (C) – the rules by which the fishery is governed;

Note that this use of the word "Monitoring" has a different scope to that used in the term "Monitoring and Evaluation (M and E)". Monitoring for compliance can be thought of as a specialized subset of the larger monitoring for M and E. Monitoring for compliance includes collecting information on what is happening in the aquaculture farming. Control is the rule under which aquaculture can be managed, as stipulated in national aquaculture legislation, EAAM plans and other arrangements (i.e. traditional law). This provides the basis on which aquaculture management (via M and C) is implemented. Monitoring and Control needs:

- Cooperation and coordination across several agencies;
- Stakeholder "buy-in";
- Training and resourcing;
- Education and awareness raising; and
- Policing, prosecuting and sentencing.

Top-down and bottom-up compliance and enforcement

Enforcement can be "top-down" (i.e. aquaculture officers' enforcement) and/or "bottom-up" (i.e. co-management, agreed and voluntary compliance to specific production practices). While the national and local governments have responsibility for law enforcement, enforcement of regulations by farmers is increasingly common when governments are short of enforcement resources. In some cases, farmers would undertake enforcement, while in other cases they can report anomalies. Resource users may also decide to self-enforce regulations when they believe that they benefit from compliance with regulations (e.g. GAqP). Ideally, self-enforcement should be formally empowered by

agreement with responsible government agencies so that it is legitimate, otherwise there is the danger self-enforcement takes on a form of vigilantism.

Enforcement is more than the presence of armed police having the authority to arrest people; it involves the application of a broad range of approaches by different institutions and stakeholders to change or modify behaviour. Enforcement interventions can be 'soft' preventive measures or 'hard' sanctions. Soft enforcement approaches promote voluntary compliance with the requirements of the law without going to the courts. Soft enforcement focuses on the social and cultural dynamics of compliance that can be used to: (a) sustain widespread compliance, (b) encourage voluntary compliance, and (c) achieve general deterrence.

Soft or positive approaches include:

- Social marketing;
- Social mobilization;
- Best aquaculture practices;
- Legislation and regulation;
- Information management and dissemination;
- Education and outreach;
- Monitoring and evaluation.

A mechanism of incentives could also be put in practice to promote virtuous practices that would be rewarded.

Negative or 'hard' enforcement uses legal sanctions imposed by a court or regulatory authority for deterrence. Hard enforcement approaches have one objective, which is to identify, locate and suppress the violator using all possible instruments of law. Negative or hard approaches include:

- Continuous presence of law enforcers;
- Consistent activities to detect, apprehend and prosecute violators and impose appropriate sanctions;
- Sophisticated strategies developed to apprehend repeat violators;
- Negation of all economic benefits from illegal activities.
- Negation of the legal entitlement to do aquaculture farming

Enforcement requires consultation and coordination among the various agencies and organizations with responsibility for enforcement of regulations, monitoring, surveillance, apprehension and sanctions. This may include the departments belonging to ministries (agriculture, irrigation, environment and natural resources), Police, any community-based enforcement units.

Actions to foster compliance with management rules and regulations will change over time. In the initial phase of management, there will need to be an emphasis on general public education and outreach and visible enforcement processes to help stakeholders become familiar with boundaries and regulations. As benefits of management become understood, stakeholders should develop a sense of "ownership" of—and a commitment to—the success of the management. At this point self-enforcement should emerge (wilful compliance) from social sanctions and peer pressure.

See Tool n. 34 for ways to improve monitoring and control.

3.4 Financing

As for any other plan, developing the EAAM process will require consideration of the required budget and other sources of funding to support the process. Module 8 Startup A explained that secured funding to embark on the EAAM process was needed. Funds must be available to support the various activities related to planning, implementation, coordination, M and C and M and E of the plan. It is good practice to plan yearly budget lines for each of these activities as part the EAAM plan and

implementation work plan (see <mark>Module 15 Step 4.1</mark>). Funding, especially sufficient, timely and sustained funding, is critical to the sustainability of the EAAM process. In the early stages of implementation, funding may have been obtained from an external donor organization or a large development project. This source of funding may or may not continue in the long run. Programmes often fail when this outside source of funding stops; it is therefore essential to put in place alternate sustainable financing mechanisms. Funds also need to be made available on a timely basis to maintain cash flow for such things as staff salaries and activities. The EAAM process must be supported and accepted by the community so that stakeholders will be confident enough to invest their own time and funds

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Relevant questions:

1. Is funding available from existing budget or are new sources required?
2. What is the existing budget and budget cycle?
3. Who will/can pay?
1. 4. What are the equity issues and the impacts on stakeholders?

The choice of which financing mechanism(s) to utilize in a particular case should be based on analysing several feasibility factors:

- financial (funding needed, revenue generation, revenue flow, year-on-year needs);
- legal (legal support for financing mechanism, new legislation needed);
- administrative (level of difficulty to collect and enforce, complications and costs; potential for corruption, staff requirements);
- social (who will pay, willingness to pay, equity, impacts);
- political (government support, monitored by external sources);
- environmental (impact).

Depending upon the situation, and the support from government, several sources may be available:

Government revenue allocations	• Direct allocations from government budget; • Government bonds and taxes earmarked for conservation; • Debt relief
Grants and donations	• Bilateral and multilateral donors' grants; • Foundations; • Non-government organizations; • Private sector; • Trust funds
Tourism revenues	• Fees (entry, diving, yachting); • Tourism-related operations of management authorities; • Hotel taxes; • Visitor fees • Voluntary contributions by tourists and tourism operators
Real estate and development rights	• Purchases or donations of land and/or underwater property; • Tradable development rights and wetland banking; • Conservation concessions.
fish industry revenues	• Eco-labelling and product certification; • Aquaculture license fees and taxes;

	• Fines for illegal farming
Energy and mining revenues	• Oil spill fines and funds; • Royalties and fees for offshore mining and oil and gas; • Right-of-way fees for oil and gas pipelines and telecommunications infrastructure; • Hydroelectric power revenues; • Voluntary contributions by energy companies
For-profit investments linked to rural livelihood or marine conservation	• Private sector investments promoting conservation; • Corporate Social Responsibility • Biodiversity prospecting
Other sources	• Loans; • Income derived from local enterprises such as handicrafts, aquatic products, and visitor gifts

Activity: Agree management actions, and relevant compliance and enforcement actions

Activity: Agree financing mechanisms to support the above

3.5 Finalize the EAAM plan

Steps 1-3 of the EAAM process culminate in the material needed to develop the EAAM plan. This plan specifies in ONE document all the elements needed for the implementation of EAAM.

The template below shows the main elements of a typical EAAM plan. Most of the information for the plan should have been collected through the stakeholder consultations, research (scoping) and through secondary data.

The act of going through the consultative process to develop the EAAM plan is just as important as the output itself. It fosters ownership of the plan, trust of other stakeholders and starts to build a sound working relationship between stakeholders. It also allows roles and responsibilities to be clarified and can form the link between major players such as research institutes, fishery agencies and fishers, thereby making the work of each more aligned to the needs of the end-users.

EAAM plan for MU XXXX

1. VISION

- The broad goal of management.

2. BACKGROUND

- Description of the area and resources to be managed, including maps at different scales.

The aquaculture management area

- Area of operation of the aquaculture, jurisdictions and ecosystem "boundaries" (including national/province/district jurisdictions). Map of MU.

History of aquaculture and management

- Brief description of the aquaculture background, integration, water use, people involved, etc.

Current status of the aquaculture

- Description of the aquaculture farms, hatcheries production, mills, processing factories, etc;
- Resource status;
- Map of resource use patterns.

Current management (co-management) arrangements

- Existing management arrangements between the department of aquaculture and other sectors or communities, farmers' groups

Socio-economic benefits, including postharvest

- Description of stakeholders and their interests (including socio-economic status);
- Description of other uses/users of the ecosystem, especially activities that could have major impacts and arrangements for coordination and consultation processes;
- Social and economic benefits, both now and in the future.

Special environmental considerations

- Details of critical environments, particularly sensitive areas, risk factors, water.

Institutional aspects

- Legislative background;
- Existing co-management arrangements – roles and responsibilities;
- MCS arrangements;
- Consultation process leading to the plan and ongoing activities;
- Details of decision-making process, including recognized participants;
- Nature of rights granted in the aquaculture, and details of those holding the rights;
- Nature of rights granted for land or areas of water, land use certifications;
- Maps of management interventions/user rights/jurisdiction boundaries.

3. MAJOR THREATS AND ISSUES

Ecological issues

- Aquaculture and general environmental issues, including both the impact of aquaculture on the environment and vice versa.

Social and economic issues

- Issues relating to the people involved in farming, the general public and at the national level, including gender issues.

Governance issues

- Issues affecting the ability to achieve the management objectives.

4. GOALS OF MANAGEMENT

- Higher level goals, i.e. the ultimate goal of management.

5. OBJECTIVES, INDICATORS AND BENCHMARKS

- Priority issues, objectives, benchmarks for the aquaculture sector:
- Aquaculture resources;
- Environment (including carrying capacity, pollutants, genetic pollution, diseases, habitats, biodiversity, integration, etc.);
- social;
- economic;
- governance (ability to achieve the plan).

6. MANAGEMENT ACTIONS

- Agreed actions for the plan to meet all objectives within an agreed time frame, including pollution and disease control, habitat protection, socio-economic benefits, good governance, etc.

7. COMPLIANCE
  - For actions that require rules/regulations – arrangements for ensuring that the management actions are effective.

8. DATA AND INFORMATION NEEDS
  - Data and information needs to monitor implementation of the plan. Clarify where the data are to be found and who collects, analyses and uses the information.

9. FINANCING
  - Major sources of funding.

10. REVIEW OF THE PLAN
  - Date and nature of next review(s) and audit of performance of management

Module objectives

- Develop an implementation work plan;
- Summarize what is meant by formal adoption of the EAA plan;
- Develop a communication strategy.

Overview

This module explains how to formally adopt the EAAM plan and how to develop a work plan for the effective implementation of the EAAM plan. It also discusses the related communication strategy that should be developed

Introduction

Once the EAAM plan has been approved and agreed, implementation should start as soon as possible in order to capitalize on the good will and excitement generated by the negotiations amongst stakeholders. Time scales for implementation can be a problem because, if the planning process takes too long, it may result in loss of momentum, particularly if staff or governments change. Implementation comprises the activities through which the EAAM plan is carried out. The implementation process will involve numerous decision-making points and a different process from the one used to create the plan and the agreements. All the activities in the EAAM plan must be implemented correctly and in a timely manner if the goal and objectives are to be achieved.

Many of the problems facing aquaculture management (water pollution, climate change, land use, water use), fall outside the direct control of aquaculture managers. Therefore, implementing the EAAM plan will require aquaculture managers to reach out, coordinate and integrate themselves within broader processes of integrated land management (agriculture), water management, forest management, coastal management (ICM), integrated watershed management (IWM), and conservation management. If these processes do not exist, coordination with at least the environmental agency will be required.

In practice and because the world is structured along sectoral lines (e.g. agriculture, forestry and fisheries; mining and petroleum; environment; shipping and maritime affairs), sectoral management will likely be the entry point for more integrated management approach of EAAM. Thus, while planning, monitoring and evaluation are carried out at the ecosystem level, implementation will require working with other sectoral agencies, including the environment protection and conservation agency (see Figure 15.1 below).

Implementation will, therefore, require trusting the plan and trusting the partners and staff of the fisheries and other agencies. No plan is perfect. There will be successes and failures. This is why continual monitoring and learning-by-doing (adaptive management) has been emphasized. There will likely be failures early on in implementing EAAM as everyone learns to work together and do their job, but it is important that everyone learns from these failures and moves forward.

Given the importance of a high degree of stakeholder participation and cross-sectoral coordination, the implementation of the EAAM plan should include specific measures and mechanisms to continue engaging all parties throughout the management process. This can include such things as: participatory research; co-management; management councils and committees involving stakeholders in management decisions on a regular basis; and the use of traditional and local knowledge (as explained in Module 9 Startup B and further detailed in Module 16 Reality check II).
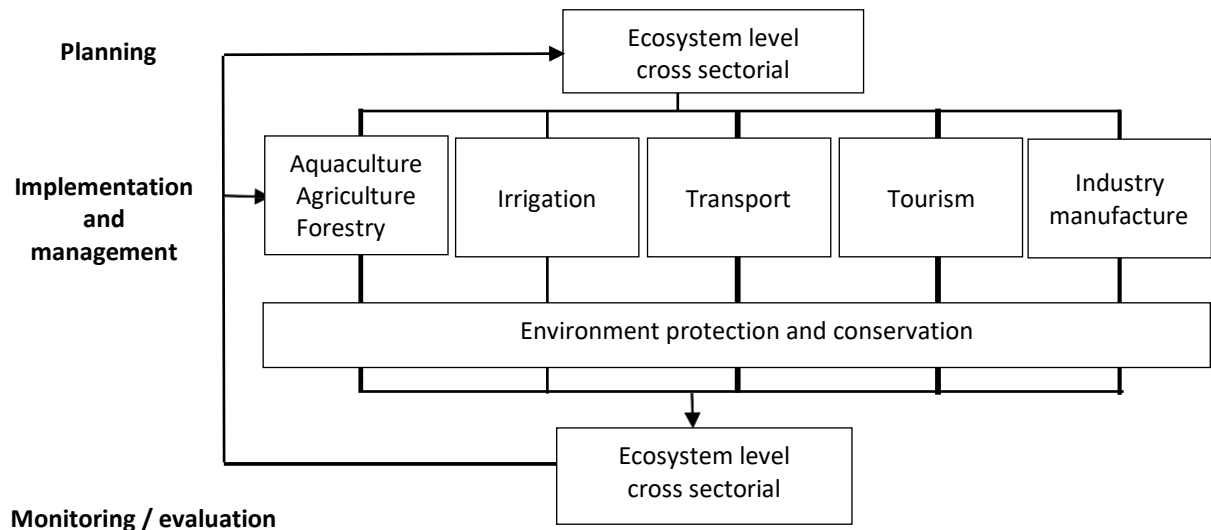
Figure 15.1: Implementing EAAM: integrating sectoral management within ecosystem planning, monitoring and evaluation

1.Formalizing the EAAM plan

To implement the agreed set of management arrangements it is often necessary to have them formalized. Depending upon the jurisdiction and fishery, this may need to be a formal, legal document and in some cases may require parliamentary approval. In other cases, legislation may be needed to recognize and implement the EAAM plans. At the other end of the spectrum it may be as simple as a list of activities agreed to, and maintained by, the local community leadership group.

It is necessary to determine what level of formalization is required for the EAAM plan to ensure that the specific arrangements are both legally and socially enforceable by the relevant authority or groups. This may involve a "central" management authority, local or regional authorities or local community leaders, or some combination of these. There is little chance of success if the plan is not endorsed by those who influence the implementation of the plan. More details on legal and policy support are provided in Module 16 Reality check II which focuses on governance. Once a new or revised EAAM plan has been formally approved it is vital that this is communicated to all the stakeholders who could be affected by any changes to their previous activities.

2.The work plan to implement the EAAM plan

Managers will benefit from using an implementation work plan that outlines what would need to be done to implement the EAAM plan, by whom, by when, and where. To generate such a work plan requires going through the full set of EAAM actions developed in Module 14 Step 3.3 and determining (i) what are the specific tasks that need to be undertaken? (ii) who are the actual persons/institutions that will be responsible for completing these tasks? and (iii) by what date will the tasks be complete?

Headings that could be used for such a work plan include (i) information/knowledge management; (ii) management actions and M and C; (iii) legal/institutional strengthening; and (iv) human capacity development.

In order to develop a realistic work plan it is important to ask: are there really enough resources (both people and financial) to complete each of the tasks?

This work plan needs to be developed by the fishery management agency because it is their staff and resources that will be most involved in starting the process. If specific actions are to be undertaken by other groups, they need to be involved in planning for these aspects. The work plan should include a schedule of activities and responsibilities with clear milestones.

Basic work plan format

- For all the management actions identified in the EAAM plan, determine what needs to be done, by whom and when. A matrix with column headings of What, Who, When and Where is a good tool for this.
- It may also be necessary to have some separation of activities based on whether they are dealing with different functional components of the aquaculture – inland, coastal, etc. Undertaking consultation may be very different for the various groups and separate activities may therefore need to be generated.
- The process should clearly identify where changes are needed, such as by the implementation or modification of legislation, regulations, licence conditions or policies. If so, these need to be scheduled.
- The process should also identify the activities that may be outside the scope or jurisdiction of the fisheries agency. In these circumstances it may be necessary to advise other government departments of the issues they should be dealing with. Such interdepartmental governance issues are often a high-risk area and such should be tackled with due caution and tack and with the support of Agency leads.
- Once all the activities have been identified, the assignment of priorities and timelines should be undertaken by the relevant fisheries/management agency.

3. Communication strategy

Communication includes sharing the results of the EAAM plan with the identified target audiences and identifying ways to adapt management practices to improve EAAM. A communication strategy provides a clear process for sharing results in a logical and strategic way.

Startup B discussed ways of initially engaging and consulting with stakeholders. Once the implementation of the EAAM process is underway, keeping stakeholders informed at a community level is very important to maintain the momentum and legitimacy of the management system and its functionality (e.g. its capacity to adapt to change). This is especially important in the case of a community-based fishery. Keeping the government committed to controversial actions will generally require direct discussions with key political leaders and not merely submission of reports.

Relevant questions:

- Who needs to know about the aquaculture and why? Are they interested in all aspects or just some aspects of the aquaculture?
- What communication format is appropriate for different target audience types: formal report, newsletter, website, etc.?
- What should the frequency of the communication products be for each audience?
- What should the report contain: information on successes and failures; progress and blockages; problems and solutions; present as well as future perspectives?
- What action is expected from the audience in return?
- What impact are the reports expected to have: the raising of awareness; institutional response?
- How to get feed-back from the reports?

A communication strategy will include:

- an analysis of the range of possible internal and external audiences, their characteristics and a set of priority target audiences;
- a plan for how and where results will be delivered by identifying which media and formats will be used with each audience group, and the approach and style of delivery to be taken;
- a set of key messages which illustrate examples and stories that explain the results and help focus the attention of particular target audiences; and
- the timeline of when messages and presentation formats are to be released and delivered to target audiences.

Possible headings for a communication strategy:

1. Communication objectives
2. Stakeholder audience
3. Messages
4. Media and format
5. Personnel/human resources
6. Relationship strategy

Media and format could include: meetings, workshops, news articles, web pages, emails, newsletters, status reports, social media and PR materials. Give due consideration not only to levels of literacy, but also to what is socially or culturally acceptable. Remember how some audiences are more accessible than others; ensure ALL audiences are catered for (including the less powerful, less literate, the ones with a lesser voice). Refer to Tool n.36 for more methods.

Once these pieces of the strategy are pulled together, it will be possible to estimate the time, and human and financial resources needed to complete the communication strategy (Table 15.1).

Table 15.1: Basic communication strategy template

Target audience	Communication method (how and where)	Key messages	Timing

Module 16 – Reality check II

Module objectives
- Check on the status of the EAAM plan implementation;
- Consider whether implementation is in line with the principles of EAAM;
- Consider whether implementation is in line with enabling legislation and supporting environment
- Revisit the constraints and opportunities in meeting your EAAM zone goals

Overview
This module outlines the second reality check. This check takes into account the main principles of EAAM introduced earlier, as well as some important practicalities in terms of a supporting environment. It stresses the need for an effective legal framework; effective compliance and enforcement; nested institutions and coordination mechanisms; appropriate scale; capable aquaculture management institutions and human capacity; as well as adequate human and financial resources. If these are not in place, either the EAAM plan will need to be modified or the weaknesses rectified

Introduction
While implementation is based on the plan and agreed activities, the quality and effectiveness of implementation are shaped by a number of governance issues or the "ability to achieve". As part of the EAAM process, seven principles were considered and the elements of good governance were described. In Startup A, coordination with other agencies and levels of government were highlighted, and the legal basis for the MU was discussed in Reality check I. Startup B focused on participation and co-management. Governance issues were also identified when prioritizing the EAAM issues during Module 11 Step 2.2. In this module, a reality check is undertaken to firstly, determine whether all the important building blocks that will enable EAAM implementation are in place, and secondly, whether the necessary supporting environment is in place.

A. Reality check against the seven principles of EAAM
A number of questions can be asked to check how well the implementation of the EAAM Plan aligns with the seven principles of EAAM (Table 16.1) and then a subset of questions relating to each principle needs to be examined (see below).

Table 16.1: EAAM principles in practice

1. Good governance	NO	PARTLY	YES
Is there an adequate legal framework?			
Are rules and regulations in place and agreed to by stakeholders?			
Are effective compliance and enforcement arrangements in place?			
Are effective governance arrangements in place?			
2. Appropriate scale			
Is management at the appropriate ecological, human and governance scales?			

3. Increased participation			
Is co-management with relevant stakeholders working?			
4. Multiple objectives			
Have the different objectives for management been considered and trade-offs made?			
5. Coordination and cooperation			
Are nested institutions and resource user groups working? Is cooperation, coordination and communication taking place?			
6. Adaptive management			
Can the management system learn by doing and adapt accordingly?			
Are the results of Monitoring and Evaluation (M and E) being communicated and acted on by adapting the plan and subsequent management?			
7. Precautionary approach			
Has management commenced despite a lack of data and information?			
Are management actions more conservative when there is greater uncertainty?			

1. Good governance

An adequate legal framework

Internationally, the instruments for an EAAM are mainly contained in voluntary agreements including:

- Rio Declaration on Environment and Development, Rio de Janeiro, 1992
- Agenda 21 of the UN Conference on Environment and Development, Rio de Janeiro, 1992
- Convention on Biological Diversity, Rio de Janeiro, 1992
- FAO Code of Conduct for Responsible Fisheries, Rome, 1995

Few aquaculture organizations or national policies and legislation actually make explicit reference to EAAM, although this is now changing. Many countries of the region have a legislative framework that does not constrain EAAM. On the contrary, in many countries decentralization policies and legislation to support these policies foster EAAM development and co-management.

In the longer term, EAAM may require that existing legal instruments, and practices are reconsidered and that adjustments are made where necessary. In the future, it may be necessary to regulate the inter-sectoral interactions through primary legislation, e.g. laws controlling coastline development or zones.

Reviewing and confirming the legal basis for all plans, agreements, and proposed activities is an important activity for the implementation team to conduct, with a focus within and across the local/municipal, provincial, national and international levels. The team should identify the relevant legislation and associated decrees/bylaws, ordinances and subsidiary acts for their particular country/region (noting that in many cases, the aquaculture and environment departments may not have a consolidated set).

The process of making laws and aquaculture management plans is also reliant on the underlying legislation that provides the basis for rights and legitimizes the decision-making process. The initiation of planning by communities can lead to effective local management plans. However, it is important that these are legitimized or placed within broader planning frameworks. If not, there is a risk that these local planning actions will be undermined by outside forces that lie beyond the power of communities and local management systems to address.

Because the implementation of the EAAM plan is often applied across a number of sectors, each with its own responsible agency (for example, the aquaculture agency and the tourism agency), a number of laws may be relevant to the MU, not just the aquaculture law (Figure 16.1). The environment agency is often the only agency with cross-sectoral responsibilities.
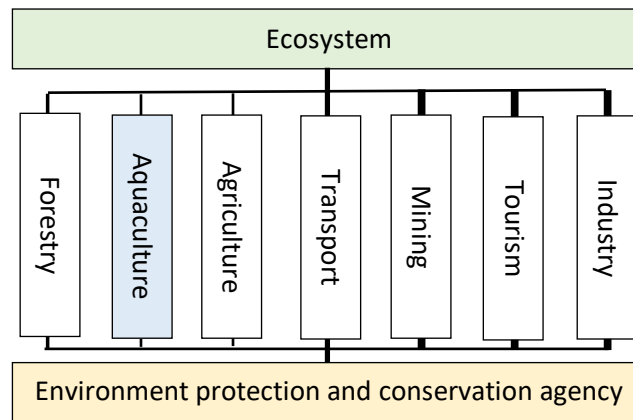

Figure 16.1: Sectors that might have legislation relevant to EAAM. Note that the environmental agency and environmental laws cut across all sectors.

In cases where new or modified regulations are required, or where changes to the legal framework are needed, the drafting process could be assisted by viewing good examples from elsewhere, and having access to legal experts. When drafted, these revisions usually involve formal approval by Parliament or government, which may require specific consultation with politicians and their advisors. Having stakeholder support for the proposed changes will clearly assist in securing government approval.

Inadequacies in current legislation should not act as a deterrent to getting started with the EAAM process. As issues and management actions are identified, the need for changes in policy and legislation will become apparent and the EAAM process should guide those processes and make the management systems more responsive and effective.

As a reality check following questions could be asked:

The chief question is: can EAAM be implemented within the current legal framework? In other words, are the current laws a constraint?

Other questions may be:

1. Are international commitments included?
2. Are there coherent multiple legal instruments – e.g. environment and aquaculture, national and provincial?
3. Are specific laws required to implement EAAM?

Rules and regulations in place and agreed to by stakeholders

One of the keys to implementation of an EAAM plan is have rules and regulations in place that are agreed to (or at least acknowledged) by stakeholders. This leads to greater buy in and a higher probability of compliance. Through the EAAM planning steps, by linking management actions with objectives and core problems, the need for, and rationale for having the appropriate rules and regulations should have become apparent.

Effective compliance and enforcement (refer also to Module 14 Step 3.3)

EAAM is underpinned by effective compliance. Effective compliance involves:

- participatory compliance and enforcement by stakeholders;
- enforceable legislation and control mechanisms (licences, land leases, water areas leases);
- extension work (i.e. working with farmers to improve awareness and compliance);
- data collection systems (production);
- environmental monitoring (i.e. water quality, pollution);
- veterinary, food safety inspections;
- international cooperation (e.g. regional fishery commissions).

As with all other components of the EAAM process, participation is the key. By being part of the planning process, stakeholders are more likely to take ownership of the proposed management actions and should be more compliant. In some cases, these stakeholders can also be part of the enforcement team, although care is needed in terms of their roles and responsibilities.

It is important to establish a collaborative inter-agency mechanism to manage and facilitate compliance. Partnerships provide the authority for compliance and also the inter-agency mechanism to develop and coordinate compliance plans. Partnerships provide the necessary conditions for good communications and transparency and can address issues of corruption. Partner agencies can readily share knowledge and information on the farmers. It will be important to initiate the partnership process with a meeting of the heads of all the key institutions involved in fisheries to assess their commitment. Partnerships composed of 10 people or less are manageable in size.

The lead agency will likely be the aquaculture agency. The long-term goal of compliance should be to encourage voluntary compliance by the farmers' communities/industry with the rules and regulations that govern the aquaculture (both formal and traditional). To achieve this, it is recommended that the partnership established for the MU provides the strategic overview for compliance issues and helps to identify and use more effectively the compliance assets that exist at other levels (i.e. inspectors, monitoring data, etc.). The nested system of partnerships is established at the district level, around the AMAs. The key institutions to be engaged in compliance partnerships might include:

- national/provincial/district aquaculture, agriculture and environmental agencies;
- community leaders;
- NGOs;
- private sector (farmers, farmers associations, traders and processors);
- police;
- marine transport

Each of the partners brings with them important compliance assets (farms, staff, farming experience, Information Technology) that can be combined to provide a strong compliance network. The sharing of assets should be stipulated in the partnership agreement. The partnership would require support from secondary partners - other government institutions (national/ provincial/district), or donors.

Effective governance arrangements

Cooperation and coordination, both vertically across different jurisdictional levels (e.g. Communities to National) and horizontally across relevant agencies involved in EAAM (e.g. across aquaculture, agriculture, environment and tourism) will need structural arrangements in place that formalize the coordination and facilitate participation. A hypothetical governance arrangement is shown in Figure 16.2. At the Community level, villages have "Village Committees" (VCs) (often two committees – one for men and one for women). Selected individuals of these VCs would be then be represented on "Management Advisory Committees" (MACs) at the District level. In turn, selected individuals would be represented at the Provincial level. This could also be the area designated as a MU, and in that case it could be a MU MAC. At the national level there could be a National EAAM committee with representatives of aquaculture, environment, agriculture, forestry, tourism etc. At the highest political level, an overarching Council made up of politicians from relevant Ministries could be providing policy guidance and direction.
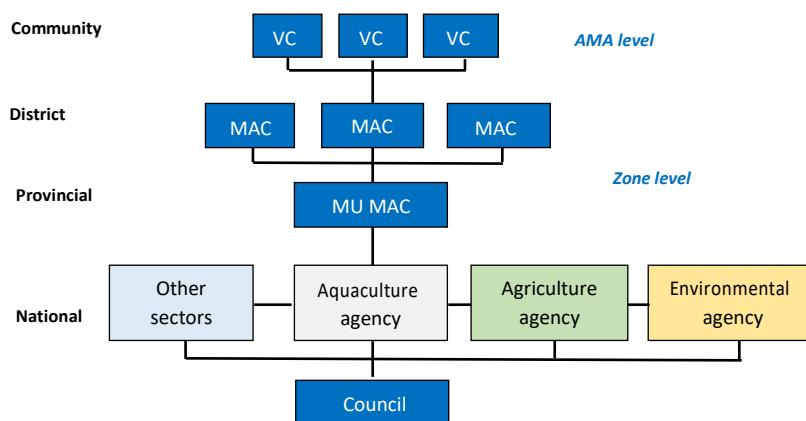

Figure 16.2: An example of a governance arrangement that coordinates across jurisdictions and agencies involved in EAAM.

2. Appropriate scale

Appropriate ecological, human and governance scale

In Step 1 of EAAM, the spatial scale and boundaries of the MU was agreed. However, EAAM must be implemented within the context of the multiple spatial and temporal scales that reflect the natural hierarchical organization of ecosystems. Early on in this course scaling issues were introduced in Module 4 Principles and benefits of an EAAM). Scaling up and scaling down are very real issues that need to be taken into account.

Since ecosystems are nested, part of one or other ecosystem may lie outside the MU and EAAM often involves ''scaling up'', or at least considering these externalities. If the MU does not include impacts of other components of the aquaculture e.g. commercial large-scale farming, then management of the small-scale aquaculture activities could easily be undermined. Often it is practical to start EAAM on a relatively small pilot scale (e.g. a small coastal community) and a next logical step would be to scale up to include alliances or clusters, for example a number of communities covering an entire zone.

One of the challenges of EAAM is to fashion ways to ensure that the actions of aquaculture institutions at each level of government are harmonized with one another and are consistent with agreed EAAM goals and policies. There is often a gap between national planning and policy goals on one hand, and the practical goals and implementation through local government on the other. This calls for a consistent approach across national and local levels and reinforces the importance of having an inclusive framework that allows for this harmonization of policy and management objectives. Management decisions that are matched to the spatial scale of the ecosystem, to the programs for monitoring all desired ecosystem attributes and to the relevant management authorities are likely to be more successful in achieving ecosystem objectives.

Cross-scale alignment for ecosystem management will take time and may not be achieved during the first iteration of the EAAM cycle. In some cases, the impact of unaligned scales on the MU may only become apparent during the implementation and monitoring and evaluation phase (Steps 3 and 4). This can be improved when the plan is adapted from the next iteration (Step 5).

As a reality check following questions could be asked:

With the goals and objectives that have been set for the MU in mind;

1. How do the boundaries of the MU relate to the wider ecosystem boundaries?
2. If the MU only covers part of the ecosystem, are arrangements in place to align management across boundaries?

3.Increased participation

Co-management

Remember: co-management is a "Partnership arrangement in which a community of local resource users, government agencies, other stakeholders and external agents share responsibility and authority for the management of the aquaculture, with various degrees of power sharing".

As a reality check following questions could be asked:

1. Is co-management at the appropriate scale relative to the MU?
2. Are communities empowered?
3. Is there an effective co-management structure?
4. Is there equitable participation?
5. Are effective conflict management mechanisms in place?

Of special importance when working with farm communities and stakeholders is whether or not they are empowered. This involves increasing awareness, knowledge, skills and institutional capacity so that stakeholders have the power to act and make decisions. Stakeholders need to be in a position where they can take ownership of decisions and outcomes and act responsibly. Empowerment also involves promoting and sustaining motivation.

Community development is an internal process of growth and development that can be fostered by: (i) information dissemination, (ii) training, (iii) facilitation and mentoring by external agent, and (iv)

networking. During the initial steps of EAAM, some or all of these five methods to promote participation and community development should have taken place.

Community mobilization

EAAM requires the sustained, motivated participation of communities. Have communities associated/relevant to the MU been mobilized? The following types of activities can initiate community mobilization and/or strengthen existing groups for their participation in the EAAM process:

- environmental education;
- social communication;
- building alliances and networks;
- organizational sustainability;
- human capacity development.

Refer to Tools n.9, 10 and 19 for more detail.

4. Multiple objectives

Different objectives and trade-offs

Because EAAM covers the ecological, human and governance dimensions of sustainable development, conflicting objectives of management often arise. For example:

- ecological objective: reduce the production to comply with the carrying capacity of the zone;
- economic objective: make the farmers and supporting industries more economically viable;
- human objective: increase employment;
- governance objective: increase subsidies

The first objective may not be compatible with the second, since reduce output would limit the marketable volume of fish and thus incomes. This also will not have an effect on employment unless diversification strategies are taken. The compliance with the carrying capacity has the goal to stabilize production and make it sustainable without the risks of having massive fish mortalities or algal blooms in the future. This is particularly valid in a climate change perspective with increasing environmental problems due to temperatures. In this case shifting towards primary sector (fishing production) to secondary production (processing industry), especially if developed locally, can help to boost local employment and income opportunities and to create scale economies with better utilization of resources. In such a case the development of subsidies to favour the shift towards processing would be a favouring condition. In the reduction of farming output there will be "winners" and "losers", but this depends on the overall perspective and the ability to manage conflicts by proposing win-win solutions. Where the "losers" lose their right to produce indiscriminately, some sort of compensation or promotion of alternative businesses (processing) and training becomes more important.

As stressed throughout this EAAM course, nothing acts in isolation and it is important to develop packages of management actions that will achieve a trade-off of all the desirable objectives. With aquaculture developed in a limited natural resources, it is not always possible to have: (i) massive aquaculture productions, (ii) a healthy environment, (iii) vibrant economies and (iv) full employment, all at the same time, despite over-arching policies that often try to suggest otherwise.

As a reality check following questions could be asked:

1. Does the EAAM plan cover objectives that address all the high priority issues identified for the MU?
2. Have the trade-offs between competing objectives been considered and agreed?

5. Coordination and cooperation

Nested institutions and resources

Throughout this course it has been emphasized that in EAAM there is a need for aquaculture, agriculture and environmental institutions to ensure coordination, consultation and cooperation, including joint decision-making with other interacting sectors. Such an understanding will assist in highlighting negative interrelationships, as well as the interrelations that contribute positively to governance. Institutions operate at multiple levels of jurisdiction and they work at different levels of society. They are often linked to each other and thus form networks of relationships that improve governance through increasing coordination, cooperation and communication. An understanding of these institutional interrelationships is important when considering institutional adaptation to EAAM, because any successful change requires understanding of how the institutional system really works and which factors need to be considered.

Globally, there are many examples of how aquaculture management fits within a government system. In many countries and regions, aquaculture management is a national responsibility and is located within a ministry of livestock and fisheries, or as a component of a ministry of agriculture. In other countries, aquaculture management may be a provincial or state level responsibility. Whether or not aquaculture management has been partially delocalized, government will be involved in a coordinating or policy-level role. In particular, within EAAM, there is an important role for interdepartmental and/or intergovernmental linkages – from agriculture and forestry to shipping and tourism.

A high degree of interconnectedness between institutions can produce dynamic change patterns – changes in one part of the system may have effects on other parts of the system and a new balance may be established. Likewise, a small change in one part of the system may lead to cumulative effects on the system as a whole. For example, by allowing an increased range of stakeholders to participate in the decision-making procedures, changes to the system of management institutions may be required in order for the increased stakeholder participation to be viewed as legitimate.

Ideally, a nested structure for aquaculture management should be set up to include large zoning or coastal ecosystems, for which integrated management plans would be developed by a regional advisory council and serve as the basis for centralized decision-making. These large regions could be subdivided into smaller areas where local districts could serve as the basis for devolved management..

Cooperation, coordination and communication

Increased coordination, cooperation and communication within and between relevant institutions and resource user groups are required, both in the planning process (Steps 1-3) and in implementation (Step 4). This requires a clarification of roles and responsibilities, improved coordination and integration across government and other users, and more accountability across stakeholder groups. There are implied benefits from such policy and operational coordination, although it is important to assess the costs involved in this as well.

> Further questions when checking whether institutions are coordinated:
>
> 1. Has any conflict over management responsibility been resolved and are institutions working together in an integrated fashion?

6. Adaptive management

Learning and adapting

As stressed earlier, it is critical to adopt an adaptive management approach. One of the keys to this is to have a good M and E system in place. Developing effective indicators and benchmarks that link to the objectives of management was considered in Module 13 Steps 3.1 and 3.2. When these are included

in the M and E system (as discussed in the next module <mark>Module 17 Step 5.1</mark>), the performance of management can be tracked and adapted based on lessons learnt in its application. No management system is going to get it right all the time. Human behaviour dictates that whatever rules and regulations are put in place, fishers and other stakeholders will find ways to circumvent them. There may also be unexpected consequences that were not envisaged in the planning phase. As long as these are recognised and acted on, no harm will be done in the long-term.

7.Precautionary approach

Management initiated despite lack of data and information

The precautionary approach stipulates that lack of information is not an excuse for delaying management actions. Very often, when considering the initiation of an activity, the exact target of the management action will not be known. For example, the management action might be to reduce the number farms where the optimal number is not known. However, what is known is that there are too many farms impacting on the environment. Reducing farm numbers takes years, so that while the reduction is taking place a lot more data and information can be collected and, as numbers decrease, the optimal number will become clearer.

Risk averse management actions

The precautionary approach also stipulates that management should be more conservative (i.e. more risk averse) where there is more uncertainty. For example, if the impact of a particular aquaculture system on a critical habitat is not really known, a conservative approach would be to limit the impact of that type of farming to the extent possible in the event that the farming in question does indeed damage the habitat. It would then be necessary to prove that the farming system does not damage the habitat before the management action is revoked.

B. Supporting environment

In the implementation phase of an EAAM plan, there must be a supporting environment that will foster success. Important questions are:

1. Is there adequate political will and support?
2. Are there adequate resources (personnel, equipment and training) for EAAM?
3. Is there effective financing mechanisms?
4. Is there an appropriate institutional structure?

In this reality check phase, these need to be tested to see if the plan can really be implemented.

1.Adequate political will and support

The adoption of an EAAM management approach assumes that there is political will to address the three areas of human well-being, ecological well-being and good governance. However, the reality of a rapid turnover of high-level policy staff in government and short political terms does limit the long-term strategic implementation of the ecosystem approach to management. EAAM emphasizes the need for longer-term commitment, which spans short-term appointments and three-year planning and budget horizons.

Successful implementation of an EAAM plan will often depend on have political backing. This can be difficult to secure if the politician and senior policy makers perceives that the plan will cause some unrest and criticism from stakeholders. This in turn will affect his/her popularity and future votes. However, given good participation and communication, strengthened political will can often be gained. In the first instance, it is important to engage the politician in the planning stage of EAAM and they should be included as stakeholders. The communication strategy should also include politicians

and senior policy makers (<mark>Module 15 Step 4.1</mark>). As a special target audience, they need clear messages as to the importance of the aquaculture sector, especially in terms of food security, poverty alleviation, nutrition and health, not just the GDP, which is often small. They also need clear messages as to why implementing EAAM is good for their constituencies, especially in terms of improved livelihoods and political stability.

In many cases the EAAM team may not have direct access to the politician/senior policy makers. However, they probably have access to someone who is in contact. These people are often key to changing mind sets and perceptions, and need to be advocates for EAAM and change. As with all stakeholders, the more they are involved in the process, the more likely they are to advocate the benefits, especially when they see positive outcomes. The formation of a Council made up of politicians from relevant Ministries will also facilitate dialog and buy in (see 4. Effective governance arrangements below).

Key questions when checking on political will could include:

1. Have the politician/senior policy makers been engaged in the EAAM planning process?
2. Have clear messages for politician/senior policy makers been communicated and understood?

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2. Adequate human and other resources

Human resources are a critical factor in the successful implementation of EAAM. Human resource problems include lack of capacity, as well as the difficulty of retaining good staff in the government sector. Capacity development provides skills and institutional capacity for all relevant stakeholders – farmers, resource user organizations, government officials and staff, and others that take an active role in co-management. Capacity building often implies that activities are carefully planned and executed, following a clear plan. In reality, capacity building often involves more experimentation and learning. For this reason, the term capacity development, which implies an organic process of growth and development, is more appropriate than capacity building.

Human capacity development can be defined as:

"The process by which individuals, groups, organizations, institutions and societies increase their abilities to: (1) perform core functions, solve problems, define and achieve desired objectives over time; and (2) understand and deal with their development needs in a broad context and in a sustainable manner."

This definition highlights two important points: (i) that capacity development is largely an internal process of growth and development; and (ii) that capacity development efforts should be results-oriented. Within EAAM, these efforts should focus on results linked to the EAAM plan.

The objective of capacity development is not to supply a product or service, but to foster the development of specific individuals and organizations. Capacity development is often needed to raise an organization's performance level, which is reflected in its efficiency (minimizes costs), effectiveness (achievement of its goals) and sustainability (relevance and acquiring resources for operations).

Obviously the content of capacity development will be different for the different target groups but during the planning phase "science skills" (both formal and traditional knowledge) will be required for resource assessments, fishing operations, ecology, etc., and "people skills" will be required to facilitate stakeholder involvement, including conflict resolution, negotiation skills and participatory engagement. Developing the EAAM plan will also involve drafting and understanding legislation and how to develop the plan with stakeholders. During the implementation phase, presentation skills, communication skills (especially with fishers and fishing communities, policy decision-makers and the media) will be required. Scientists will need to improve the way they communicate their results so

that they become useful to policy makers and other stakeholders. In the M and E phase, competencies in data collection and analysis, for assessing the plan's performance, will be required.

The core capacities of an organization or community, therefore, consist of:

- defining and analysing the environment or overall system;
- identifying needs and/or key issues;
- formulating strategies to respond to or meet needs;
- devising or implementing actions;
- assembling and using resources effectively and sustainably;
- monitoring performance, ensuring feedback and adjusting courses of action to meet objectives; and
- acquiring new knowledge and skills to meet evolving challenges.

In the context of participatory planning and management, local capacity is required in order to:

- ensure local resource users, groups and organizations, farmers communities and the local government unit charged with aquaculture management are more capable;
- ensure local farmers, their organization's leaders, local resources users, local government officials and staff and other stakeholders are able to undertake their roles and responsibilities in co-management;
- improve the quality of aquaculture management taking place at the community level.

Capacity development includes understanding what EAAM is and how to organize and participate in it; communicating with other stakeholders; dealing with administrative and business matters; and participating in negotiations. Capacity development is an ongoing process and is the power of an individual or organization to engage with management.

It needs to be stressed that not every individual needs to have the same knowledge and capacity. This is why the participatory approach is so powerful, the necessary capacity exists across the range of stakeholders. Determining which stakeholder is involved in the different steps of the process is an important part of making the best use of combined capacity. It is not necessary for all stakeholders to be involved in all activities. Forming small, specialized working groups is one way of controlling this.

A key concept in capacity development is what is referred to as "social capital". It is important to recognize that the whole social community is more than the sum of its individual parts. People form relationships that fulfil a number of social needs, such as communities of common interests, mutual obligation, care, concern, interest and access to information. These can be considered as networks of norms and trust that facilitate cooperation for mutual benefit. Social capital facilitates a process of learning through interaction. This social capital is critical to achieve collective action and to prosper and sustain a social, economic and institutional environment that is ready to adapt and change. The social networks can be horizontal (across the community) to give communities a sense of identity and common purpose, and/or vertical (government to community to individuals) to broaden capacity and support (see community mobilization (alliances and networking) in Module 9 Startup B and Tool n.9 and n.10).

Capacity development cannot be "done" by outsiders. An external agent can promote or stimulate capacity development and provide information, training and other types of support, but an external agent should not attempt to lead an organization's capacity development effort or take responsibility for it. The organization's managers and members must set their own goals and make decisions. Leadership must emerge from within the organization and its members must do most of the required work.

Capacity development involves the acquisition of new knowledge and its application in the pursuit of individual and organizational goals. This is the reason learning by doing, or experimental learning, lies at the heart of capacity development.

The main tools for capacity development include one or more of the following approaches:

- information dissemination (Module 9 Startup B, section 6 and awareness raising);
- training to develop knowledge, skills and attitudes (see Tool n.9);
- facilitation and mentoring by an external agent (Module 9 Startup B, section 2).

Networking, with the exchange of information and experiences from other people working on similar tasks, as well as through workshops, meetings and communities of practice. This should promote:

- feedback, in order to promote learning from experience within an organization (see participatory M and E Tool n.38).

The type and amount of capacity development will depend upon the organizations' goals and the budget available for these activities. The provision of information or one-time training, while able to reach more individuals and organizations, seldom produces lasting changes in the participants' behaviour. Facilitation by an external agent is generally more effective, although it is more costly.

Enabling factors for capacity development include:

- an external environment that is conducive to change;
- top managers who are committed to provide leadership for change;
- a clear set of objectives and priorities;
- a critical mass of members involved in, and committed to, the change process;
- awareness and understanding of the initiative;
- open and transparent processes and decision-making;
- adequate resources for developing capacities and implementing change;
- adequate management of the capacity development process.

Key questions when checking on the human capacity could include:

1. Do the staff responsible for implementing EAAM have appropriate experience and training in assessment and management of aquaculture, whether under data-poor or data rich conditions?
2. Is the implementing EAAM team trained and equipped with the skills and knowledge required to identify and reconcile management objectives in an ecosystem, both ecological and social?
3. Is the implementing team equipped with "people skills" to facilitate a process that maximizes the benefits of a having a truly participatory process?

Obviously a range of other resources such as facilities and equipment are also required. These resources link closely to having sufficient funding (see below).

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3. Effective financing mechanism

In discussing financing earlier, it was pointed out that having an EAAM plan can unlock financial resources. Early in the implementation phase, it is important that the EAAM plan be streamlined into the main activities of the aquaculture and other agencies and be included in the annual budgets. This requires knowledge of the timing of the budget cycle and links to planners who formulate the annual budget.

In many more developed countries, the cost of management (either fully or in part) is paid for by the beneficiaries of the management and others in the value chain. The logic of this policy is that if the income and well-being of the stakeholders is being increased by management, it is those who benefit that should be paying, not the public at large. This payment can be in the form of a levy or through some sort of license fee that includes part or all of the management costs. A similar "user pays"

principle is also often applied to research. In this case, those who pay have a greater say in what research is carried out. One successful model is to have 50 percent of research funded by farmers/farmers association and the remaining 50 percent by government. Allocation of the research fund is made through a board that consists of farmers, government and researchers. Not only does this pay for more research, it also assists in the prioritization of the research effort so that it becomes more relevant and useful to fishers.

Introducing a "user pays" policy, however, will not be popular with the beneficiaries and can be opposed through advocacy with politicians and other senior officials who want keep favour with the voters. As with implementing other EAAM components, moving to a "user pays" system takes time but is possible if a good co-management system is being adopted.

Key questions when checking on financing could include:

1. Has the implementation of the EAAM plan been mainstreamed into the activities and tasks of the relevant agencies, and has an annual budget been allocated?
2. Have other sources and models for funding (e.g. "user pays") been adequately investigated?

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4. Effective management institutions and arrangements

The capacity and structure of the aquaculture management agency, and the aquaculture science infrastructure, must be taken into account when considering EAAM implementation. A quick institutional analysis (see Tool n.22) can be used to look at the structure and function of the existing arrangements. In many cases, it may be necessary to develop the human capacity and infrastructure needed to manage.

The FAO approach to EAAM implementation is to build on existing management structures and processes as these are already based in the local context and can be adapted but not simply replaced. The nature of these existing structures and processes will affect the benefits and costs, and the time frame of EAAM implementation.

One of the main institutional changes required for EAAM is a clearer definition of the roles and responsibilities of the different players in the integrated process that is being introduced. This will require a commitment to change and a passion to lead others through this change. Although in many political contexts this will mean taking risks, the risks will likely be outweighed by the benefits.

Aquaculture agencies are often nested within a larger ministry that may include agriculture, forestry and as well as aquaculture/fisheries (see Figure 16.3 for an example).

In this example, the aquaculture directorate stays within the fishery secretariat, which is one of the components of the Ministry together with crop and livestock. In general the aquaculture/fishery agency/secretariat has a number of "Sections". These sections usually cover different functions such as research, administration (especially registration/licensing), policy formulation and planning, foreign affairs and post-harvest (including food quality and processing).

Key questions on effective management institutions and arrangements could include:

1. Who or what is responsible for aquaculture management? This could be an individual mandated to manage as part of his/her job, or a team that works cooperatively to manage the fishery.
2. Does the lead aquaculture agency have a structure in place (e.g. management unit) whose staff are responsible for fisheries management?
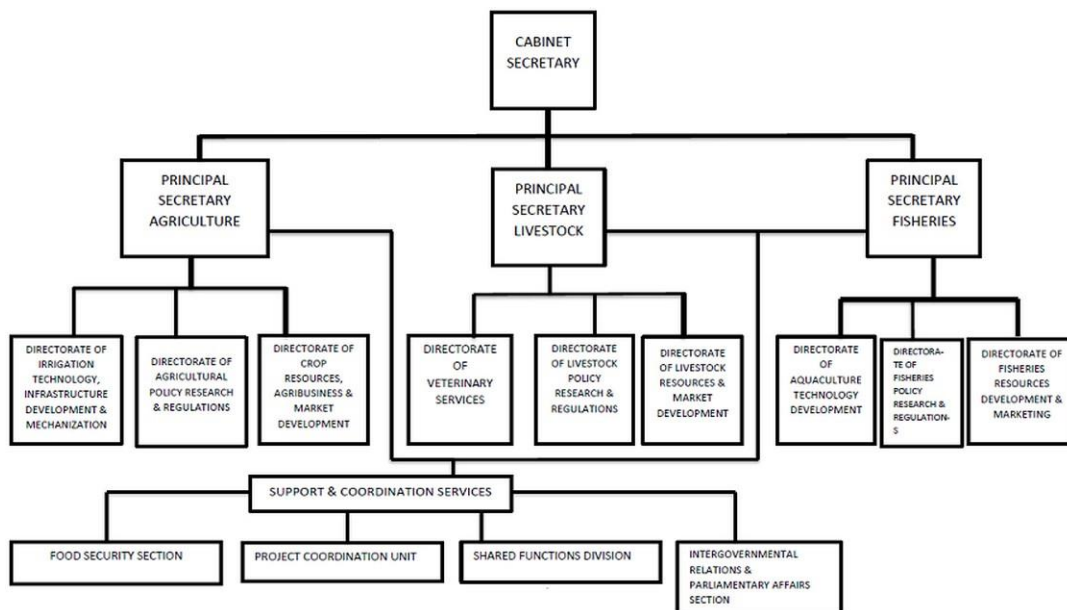

Figure 16. 3: An example of ministry of agriculture and agency structure[3]

Note FAO has a legal database that covers some, but not all, aspects:

http://faolex.fao.org/ FAOLEX is a comprehensive and up-to-date computerized legislative database, one of the world's largest electronic collection of national laws and regulations on food, agriculture and renewable natural resources. Users of FAOLEX have direct access to the abstracts and indexing information about each text, as well as to the full text of most legislation contained in the database.

A series of comparative national overviews of aquaculture laws and regulations from the top 40 aquaculture producing countries is available at http://www.fao.org/fishery/collection/nalo/en

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[3] Republic of Kenya. Ministry of Agriculture, Livestock, Fisheries and Irrigation. http://www.kilimo.go.ke/?page_id=291

Module 17 – Steps 5.1 and 5.2
Monitor, evaluate and adapt the plan

Module objectives
- Monitor how well management actions are meeting goals and objectives;
- Plan what has to be monitored, why, when, how and by whom;
- Evaluate monitoring information and report on performance;
- Review and adapt the plan

Overview
This module explains the importance of monitoring and evaluation (M and E) for effective EAAM. Section 5.1 outlines how to monitor and evaluate performance, essentially by collecting and analysing data related to indicators, as well as by collating these data and evaluating progress. Section 5.2 outlines the need for periodical review of the plan based on the M and E results and making changes to it if necessary.

Introduction
The final step in the EAAM process is to monitor how the EAAM plan management actions are meeting the objectives and to feed this information back into the EAAM process so that the learning can be adapted and used. Thus, M and E and reporting of performance is a critical step in the adaptive management process. It is essential not only to ensure that adequate performance is being generated against current objectives, but if the results are favourable, it can also be an incentive for further involvement.

To facilitate learning-by-doing, a constructive attitude to both success and failure is required. If failures are regarded as an opportunity for learning, and if people are rewarded for identifying problems and promoting innovative solutions, learning-by-doing will be strongly encouraged. The challenge can be to recognize that adaptation and refinement of plans is a normal activity that occurs through experience and acquisition of new information (see adaptive management in Module 4 Principles of EAAM).

As explained in Module 10 Step 1.3 Scope the FMU and Module 13 Developing indicators, in data-rich situations managers can use a well-directed research program, with the support of appropriate technical expertise where needed. However, in the case of data-poor situations, they will need to make increasing use of adaptive management and the precautionary approach, as well as farmers' traditional knowledge, to overcome the constraint of insufficient knowledge. In both cases, using participatory approaches for data collection and analysis will enhance understanding and ownership.

5.1 Monitor and evaluate performance
Monitoring should be done during the whole plan's implementation. The frequency of monitoring activities will be indicator-dependent i.e. some indicators will need to be monitored monthly, some seasonally and some annually.

Monitoring allows for an assessment of the EAAM plan's activities in order to determine whether goals are being achieved and what needs to be done to make improvements (adaptive management). The indicators and benchmarks developed (Module 13 Step 3.2) and the MU background information generated in the scoping phase (Module 10 Step 1.3) acts as the baseline, against which to measure progress. This is gradually built on over time.

At the simplest level, because specific objectives and indicators (Module 13 Steps 3.1 and 3.2) have been chosen to cover the important ecological, social, economic and governance issues, assessing the status of each indicator against its benchmark should provide a snapshot of how well management is performing at the ecosystem level. A common mistake is to collect too much data, data that is irrelevant to the EAAM plan or which never gets used (i.e. a waste of time and resources.) Only collect that is relevant and useful.

When planning for monitoring the main questions are: WHAT data is collected for WHAT purposes, HOW OFTEN and BY WHOM? These responsibilities are outlined in the implementation work plan developed in Module 15 Step 4.1 (see Tool n. 38 for more participatory M and E approaches). The EAAM team (who initiated and "holds" the EAAM process) might need to set up an assessment team (M and E team) composed of representatives from key stakeholder groups or they can use the key stakeholders group itself, established in Startup A. This M and E team coordinates data collection and analysis of management performance. Different stakeholders should be involved in this process and it is essential to have feedback loops in place to foster learning and to enable adaptive management. The assessment team regularly feeds back the results of monitoring to the EAAM team (or other agreed overarching committee). The collated results are also communicated to the wider stakeholder group (often as periodic evaluations).

Communicating and reporting

Different evaluation results will be required by different stakeholders and there should be upward and downward information flows between the different levels, ranging from the national level to the community level, as well as across sectors (Figure 17.1).

Figure 17.1: Monitoring information flows

The communication strategy developed earlier as part of EAAM Implementation (Module 15 Step 4.1) should outline who needs what M and E information, how (what format) and by when? Line managers and certain fisher stakeholders will need frequent, detailed data such as monthly or quarterly monitoring data to assess performance and be able to take immediate remedial action and/or redirect activities, if needed, to ensure that agreed objectives can be met.

The idea is to share data and information between as many relevant sectors and agencies as possible in order to maximize knowledge and achieve EAAM objectives. In some countries, sharing data between different departments in the same ministry can be a challenge, let alone sharing between different sectors. However, the EAAM approach of co-management, cooperation and inclusiveness

established from the outset of the process (<mark>Module 8 Startup A</mark> Task v.) should continually strive to foster this sharing of information and communication.

The communication strategy should also outline the format of reporting back by means of written documents (with or without templates, verbal workshops or other media).

A useful communication tool for summarizing the results of monitoring is the indicator "traffic lights" system. Data are entered into a computer program (basic Excel can do this) with pre-defined criteria/variables. The figures are then transformed into a visual image, whereby green = performance is satisfactory; amber (orange) = things are not progressing very well and caution is needed; red = performance is not satisfactory (Figure 17.2).
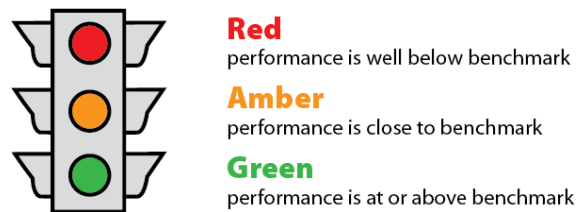

Figure 17.2: "Traffic light" reporting

In this way, the table or visual of activities immediately shows which actions are on track and which require management review or decisions. Such a visual can tell managers at a glance which activities are not performing according to plan and therefore require more information, checking, analysis or more remedial action. Remember that visuals cannot tell the whole story; before taking any action managers would also have to read the relevant feedback report. Figure 17.3 shows the traffic light system used by India in the Bay of Bengal Large Marine Ecosystem to show whether ecosystems are healthy (green); impacted (amber) or degraded (red) in terms of pollution level.
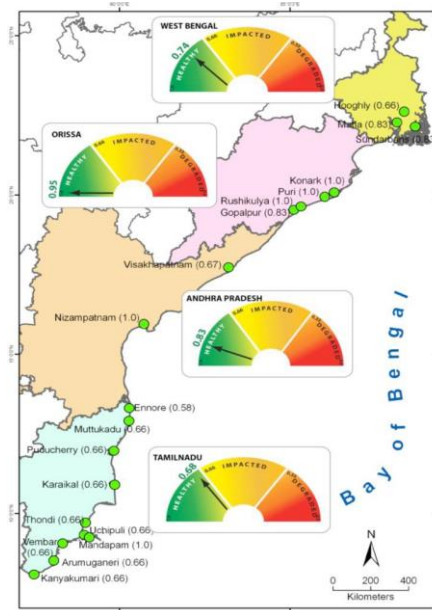

Figure 17.3: Bay of Bengal traffic light system used for monitoring ecosystems; Source: FAO.

5.2 Review and adapt the EAAM plan

The EAAM plan finalized in <mark>Module 14 Step 3.5</mark> should be adapted periodically, based on the M and E results. This involves using the results of the monitoring and periodic evaluations to improve the plan and is usually carried out during regular reviews of the plan based on the evaluation and reports. These take place with the purpose of assessing the performance of the management actions in achieving the

objectives (<mark>EAAM plan template 11. Review of the plan</mark>). These reviews are the time to consider whether the EAAM plan should be changed or not. The assessment/M and E team will be involved in this process, though the review could be facilitated by outsiders. Such reviews should be carried out under guidance from, and while making regular reports to, the EAAM team.

Short-term reviews, for example as part of an annual cycle. The results should be summarized in an annual report that is easy to understand. In general the report will contain:

- Performance assessments;
- Aquaculture management responses.

Data can be aggregated and displayed using the traffic light diagrams explained above, or via other graphs, tables or visuals. Remember that because such visuals cannot tell the whole story, some text that interprets and explains the key findings (or case studies in boxes) is also required.

If the plan is working, determine which aspects of the plan are working; if some aspects are not, it is necessary to establish why. It may then be necessary to adapt the plan, specifically looking at:

- Management actions;
- Compliance;
- Governance arrangements.

It may be that activities are going as planned and little change is needed. However, it may also be found that things are not going as expected and substantial changes are necessary. To do this, will require going back over the plan and its components to make modifications and move forward. Regular reviews are an important element of the EAAM process; they support the flexible and iterative approach by formalizing continuous assessment.

All stakeholders need to understand what actions will be taken if management is not meeting its objectives. The EAAM team must be prepared to modify any part of the plan if it isn't working. This could be as serious as modifying the objectives, indicators and benchmarks, or less serious in the case of modifying the management actions and compliance arrangements i.e. if they are stipulated in rules and regulations which are separate to the formalized plan. As with all decisions, the basic process consists of first identifying what the problem is and why it is occurring. In many developing countries, the problem might be weak governance and inadequate compliance. This will obviously not require a change to the EAAM plan, but a change to the implementation work plan (developed in <mark>Module 15 Step 4.1</mark>), so as to strengthen compliance.

In some data-rich cases it might be possible to set up formal decision rules based on how well an indicator is doing against its benchmarks, e.g. if the level of benthic pollutants goes above a reference limit point, cage culture management will be slowed down until the levels return to normality. These are known as "decision rules" and can be built into operating models of the aquaculture. Operating models can be divided into biological operating models that describe the biological characteristics of the system that is modelled, and economic operating models that describe the behavioural responses of farmers to the imposed regulations and other conditions that affect their behaviour. They provide the background against which alternative management regimes can be compared.

Longer-term reviews should also be conducted on a regular basis (three to five years), preferably by an independent third party audit. Ideally these reviews should be planned to feed into broader strategic processes (<mark>Module 6 EAAM plans – the link between policy and action</mark>).

These reviews should include consideration of the full management arrangements including the high priority issues. Longer-term reviews may provide evidence that high priority issues set earlier are no longer appropriate.

Data collection, monitoring, evaluation and reviews all need to be budgeted for. During Module 14 Step 3.4 when financing options for EAAM are explored, it is essential to earmark part of the budget for M and E activities, especially for evaluation and reviews, otherwise these are unlikely to happen.

To summarize, evaluations should be made at least annually. The yearly evaluations may trigger a review and adaptive responses in the management (if they are not working very well) and in the compliance and enforcement (M and C) activities. Once every five years or so a major evaluation and review of the plan should take place, and if appropriate, the issues, goals and objectives should be examined (Figure 17.4).
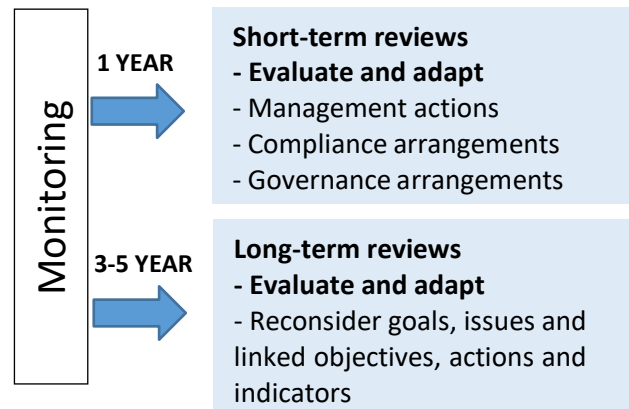

Monitoring

1 YEAR →

Short-term reviews
- Evaluate and adapt
- Management actions
- Compliance arrangements
- Governance arrangements

3-5 YEAR →

Long-term reviews
- Evaluate and adapt
- Reconsider goals, issues and linked objectives, actions and indicators

Figure 17.4: The M and E process, including short-term and longer term reviews of the plan

Activity: EAAM Quiz

Homework: Review the group outputs of the EAAM process steps and start considering how these fit into the EAAM plan template. Start planning how you are going to present the EAAM plan on day 5. NB: the format is no PowerPoints.