

## **PART 3**

### **Towards policy guidelines**



## Part 3 – Towards policy guidelines

**Hambrey, J.B.**

*Hambrey Consulting, Ross-shire, Scotland, United Kingdom of Great Britain and Northern Ireland..*

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### **ABSTRACT**

This section presents elements of introductory guidance for consideration of key issues associated with EIA and monitoring in relation to aquaculture development worldwide. It draws on the substantial analysis of environmental impact assessment and monitoring presented in the regional reviews, special salmon review, synthesis report and the deliberations of the workshop. It is necessarily relatively simple and generic; more prescriptive guidance cannot be developed without reference to the particular circumstances in different countries.

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# Introduction

“Environmental Impact Assessment and Monitoring in Aquaculture” is one component of the FAO project “Towards sustainable aquaculture: selected issues and guidelines”, (GCP/INT/936/JPN), which was implemented by FIMA, FAO’s Aquaculture Management Service, with the generous support of the Government of Japan.

The Project Component on “Environmental Impact Assessment and Monitoring in Aquaculture” aims to address key issues of environmental assessment and monitoring in aquaculture with view to generate strategic advice and technical guidance information for use in policy-making, capacity-building and training in the sector. Special attention was given to different aquaculture farming systems, different environments and different socio-economic contexts of development, with particular consideration of special circumstances and requirements of developing countries.

This section is based on the activities and results generated by this Project Component, which include the findings of four regional reviews, a special salmon aquaculture study, and a global review and synthesis of EIA and monitoring in aquaculture, as well as on the deliberations, views and recommendations of the FAO Technical Workshop on EIA and monitoring in aquaculture, held from 15 to 17 September 2008 at FAO headquarters in Rome.

Most of the material for this section was derived from both the above regional and global reviews as well as from contributions to, and recommendations from the technical workshop. The relevant references and sources are presented in the bibliography of the section on the Global Review and Synthesis of EIA and monitoring of aquaculture, which can be found in Part 1 of this publication.

The purpose of the present section is to provide interested readers with elements of preliminary guidance on key issues associated with EIA, environmental monitoring and management systems in aquaculture. The section is necessarily simple, generic and short.

It is emphasized that this section is not prescriptive. Specific guidance usually can only be developed with reference to particular circumstances in different countries. Readers are encouraged to review this section, and the available reference materials, with a view to developing their own views and identifying their priorities and options for change and improved management, and to consider preparing relevant and effective policy and technical guidelines, as necessary, in order to further promote the sustainable development of aquaculture.

## DEFINITIONS AND MEANING

The IAIA (1999) define **Environmental Impact Assessment** as;

*“The process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made”*

A more process driven definition, which encompasses management as well as assessment is offered by Sadler and McCabe (2002):

*“The systematic, reproducible and interdisciplinary identification, prediction and evaluation, mitigation and management of impacts from a proposed development and its reasonable alternatives”.*

In practice different countries have different and more specific definitions and associated guidelines, although the basic process is remarkably similar between countries.

*It is important that each country should have its own clear definition of EIA as applied to aquaculture, along with clear objectives and appropriate guidance materials.*

We also refer to “**strategic environmental assessment**” throughout this report. For the purposes of these documents, and in order to encompass the range of different definitions used throughout the world, we propose the following “general” definition:

*Strategic environmental assessment is the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects associated with existing or new economic activities under a particular plan or programme, within a particular sector, or within an identified physical area or region.*

SEA therefore encompasses procedures such as programmatic EA, regional EA, and sector EA. The core idea is that the collection of information relating to many actual or possible developments is used to inform a higher level strategic response, in terms of management and mitigation measures for the sector, for a particular area, or in relation to a government programme. The level at which SEA is undertaken is a key issue for more effective management of aquaculture development.

**Monitoring** is a broad term which may refer to:

- the collection of information on the state of the environment before and after development, designed to assess the actual impacts of the development;
- the routine collection of information on the state of the environment unrelated to a specific development, but which may be relevant to the management of the sector or indeed of the wider environment;
- the collection of information on the practical implementation of mitigation measures arising from EIA or other conditional permitting procedures.

#### **THE NEED FOR BETTER ENVIRONMENTAL MANAGEMENT OF AQUACULTURE**

Aquaculture is growing rapidly throughout the world and generates exceptional quality food products and raw materials. Production is likely to overtake that of fisheries in the next few years (Brugere and Ridler, 2004; FAO, 2006; 2007). It has a substantial influence on land, water, natural resources and the communities that depend on them. Some forms of aquaculture have the potential for significant environmental effect (Box 1).

*It is essential that the social and environmental issues are understood, and taken into account in aquaculture development planning and management.*

*Equally it should be understood that most aquaculture is relatively benign and generates tremendous social and economic benefits, and should not be overly constrained by complex and bureaucratic procedures.*

#### **DIVERSITY**

Aquaculture is hugely varied throughout the world. It ranges from back garden ponds and subsistence production to global companies producing thousands of tonnes of shrimp or salmon. It takes place in cold mountain streams, tropical floodplains and

## BOX 1

**Possible environmental effects of aquaculture**

- Effects on water and sediment quality.
- Habitat and land-use change.
- Effects of chemicals/medicines on ecology and humans.
- Release of disease organisms and carriers.
- Escape of genetically changed and alien species, and direct/indirect impacts on biodiversity and fisheries.
- Resource use conflict (navigation; fisheries; farming).
- Cultural effects (landscape; demography).
- Indirect impacts associated with inputs (food, fertilizer etc) on the wider environment.

ocean pens. It may use wild seed stock or highly cultivated strains. The fish, shellfish and seaweeds produced may depend on natural nutrients or food, or be fed fresh fish or highly formulated pelleted diets.

*When considering the needs for EIA and monitoring, diversity – between and within countries, between different types of environments, and between different forms of aquaculture – must be taken into account.*

**RELEVANCE AND APPLICATION**

It is clear from the definitions of EIA offered above, that it is intended to apply to “major” development decisions, and this is reflected in the fact that in those countries where EIA is required for aquaculture, there is usually a size threshold to ensure that it does not overly constrain small-scale producers or overburden regulators. This means that it is only routinely applied to proposals for large scale finfish and shrimp farm development. Since at a global level most fish farming is conducted on a relatively small-scale, EIA does not apply to most aquaculture activity. We need alternative forms of environmental management for small farms.

*Governments need to develop more effective mechanisms to manage groups or clusters of small farms, and the aquaculture sector as a whole.*

In a few countries with significant fish farming industry (such as Japan, Thailand, and parts of Egypt and the United States of America) EIA as such is not applied to aquaculture at any scale, and the government authorities rely on alternative environmental assessment and management mechanisms to promote sustainability of the industry.

# An effective management framework

## BUILDING A MANAGEMENT SYSTEM

The global review and synthesis (see Part 1) reveals that in the absence of an effective environmental management framework for aquaculture, EIA and monitoring can become largely pointless bureaucratic procedures which do little to protect the environment, while at the same time constraining enterprise, and in some cases serving as a barrier to entry.

There are several key requirements for such a framework, which the global review and synthesis reveals are often lacking:

*Clear environmental objectives and associated standards, against which environmental impact can be assessed and monitoring systems designed.*

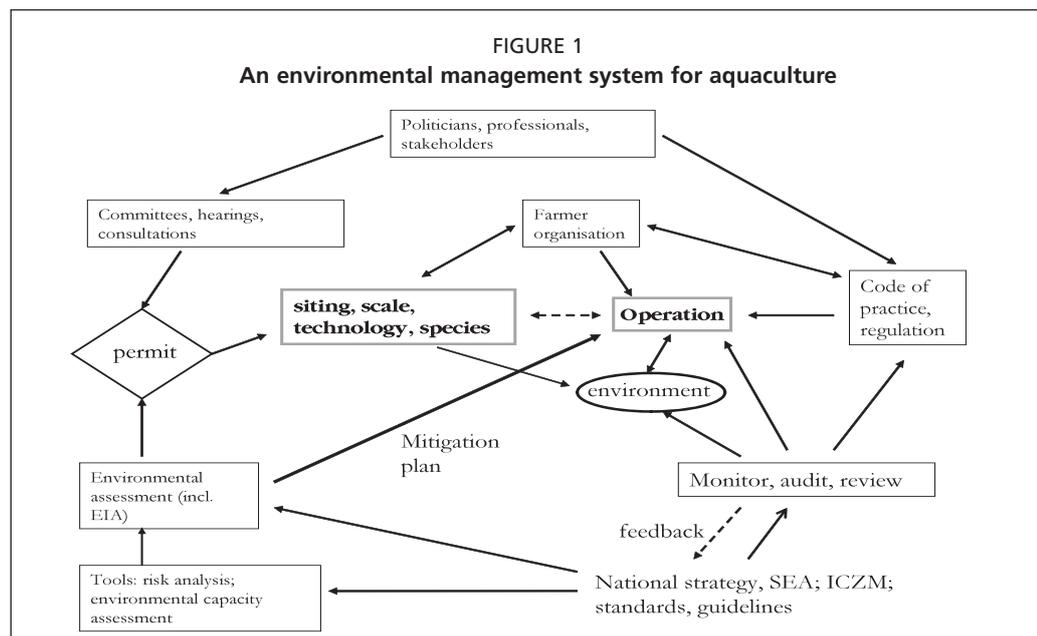
*Procedures which focus environmental assessment, mitigation, regulation and monitoring on the greatest social or environmental threats.*

*Cost effective monitoring of both the environment, and the implementation and effectiveness of any mitigation measures.*

*Analysis of monitoring data providing feedback into both sector level and farm level management.*

If the feedback mechanism is effective, this becomes a *management system*, rather than a management framework. Through a process of learning and adaptation, a management system should become steadily more effective as experience is accumulated.

The key elements in an effective management system for aquaculture, and the place and role of EIA and monitoring within it are shown in Figure 1.



*At the heart of the management system is aquaculture, whose social and environmental impacts are defined by siting, and by operational decisions and practices. The various elements in an effective management system seek to influence both siting (through permit procedures) and operation (through regulation and codes of practice) for the benefit of both the industry itself and wider society. The relative importance of these different elements, and the way in which they are used, will depend on the type of aquaculture and the special circumstances in each country and region. Without monitoring and feedback however, there is little prospect of improved management.*

### **DEVELOPING STRATEGY AND STANDARDS**

EIA or simpler forms of environmental assessment cannot be undertaken in isolation: they must refer to the values and standards of society in the form of environmental objectives and associated indicators and reference points. In some cases these may already exist as part of wider frameworks for the management of natural resources, and in particular water quality. In other cases they may need to be established either for the wider environment, or specifically in relation to aquaculture.

*Standards should be developed and agreed as part of a **national or regional strategy** for aquaculture, which identifies key issues and offers guidance or sets standards.*

Desirable elements in such strategies might include the following:

- identification of most important social, economic and environmental issues;
- higher level objectives and possibly targets in relation to these issues;
- standards and protocols for addressing these issues at national level;
- standards and protocols for addressing these issues at more local level;
- procedures for making, or agreeing trade-offs between different needs and objectives at local level;
- issues of farmer organization, representation and responsibility;
- institutions and decision-making procedures more generally.
- identification of specific opportunities for aquaculture development, in terms of location, technology, species, markets, products etc
- identification/confirmation of proper and adequate scales for reference and action.

Ideally there would be a hierarchy of such strategies: at national level, at the level of an identifiable waterbody or watershed, and at a local government level.

These strategies may be informed by strategic environmental assessment. Equally they may form a part of a broader integrated coastal or watershed management plan.

# Reducing complexity and increasing efficacy

There is much potential for complexity, duplication and grinding bureaucracy in such a management system. The key to developing more efficient procedures is to address issues at the right scale, to minimize duplication, and to ensure that all assessment and monitoring is focused on the most important issues.

## SCALE ISSUES

*Some environmental issues are best dealt with through regulation or protocols at regional or national level because their effects are pervasive and wide ranging<sup>1</sup>.*

These might include, for example, the introduction of alien or genetically modified species. The issues surrounding such introductions are complex and require risk analysis and research at national or higher level, and assessment of likely costs and benefits to the sector and the country as a whole, and the development of appropriate regulations or protocols. These issues cannot easily be dealt with through EIA at an individual farm site, unless this is used as a “test case”.

Similarly the use of certain chemicals and antibiotics should be subject to national policy, regulation and protocol, though in some cases there may be need for local interpretation and adaptation.

## REDUCING DUPLICATION

Tackling management issues at the right scale should itself reduce duplication. However, there are opportunities to reduce duplication at all levels. Thus most EIA generates a set of mitigation measures, which may be formalized as an environmental management plan. This may overlap with codes of practice for the sector as a whole or for particular sub-sectors which will include a range of generic mitigation measures.

*Those issues that are effectively dealt with through the application of generic codes of practice should not be revisited in EIA and associated mitigation/environmental management plans, unless there are exceptional local circumstances that require this.*

Similarly there may be standard national regulation relating to the release of certain wastes.

*A site level EIA should only consider how the farm will comply with standard regulations, and unless there are exceptional local circumstances, should not consider in detail the wider effects of the release of these wastes.*

<sup>1</sup> Table 3 in the global reviews and synthesis section (see Part 1) offers a brief analysis of the strengths and weaknesses of EIA, and levels and types of management appropriate to some of the more important issues associated with aquaculture development.

**REFINING FOCUS AND TARGETING EFFORT**

Much environmental assessment – at all levels – is characterized by long check lists and analysis of a wide range of issues. Often this results in comprehensive documents which still lack adequate analysis of the most significant issues. Most EIA guidelines emphasize the need for *screening* to identify developments most likely to cause serious impact, and *scoping* of the issues associated with a particular development, in order to focus on the most important.

*The detail and extent of the analysis should always be proportionate to level of threat.*

Despite the guidance, the global review and synthesis reveals that screening and scoping are often inadequate, and much EIA gets bogged down in unnecessary detail.

*A more explicit emphasis on risk analysis at all levels of assessment, and particularly in screening and scoping, should improve focus and administrative efficiency.*

# Small-scale production and cumulative impacts

Most aquaculture is small-scale and not included under standard EIA procedures. Notwithstanding its small-scale the cumulative impacts from many small developments can be substantial – often more substantial than those from a few large farms.

*It is essential that small-scale developments are brought within the management system.*

## **FARMER ORGANIZATION AND MANAGEMENT “CLUSTERS”**

Effective management of large numbers of small-scale farms cannot be done without *effective farmer organization* - so that farms can develop a sense of shared responsibility; so that management measures can be applied more efficiently; and so that extension messages and learning good practice can spread more rapidly.

*Farmer organizations should be promoted at a scale appropriate to important environmental management issues, and encouraged to take responsibility for group or “cluster” management initiatives.*

## **ENVIRONMENTAL CAPACITY**

Cumulative aquaculture development has often “overshot” the capacity of the environment to assimilate waste, with resulting poor water and sediment quality, declining productivity, and eventually chronic disease. This has happened particularly in Asia where large numbers of small-scale development have sometimes mushroomed out of control, with a resultant collapse of the industry, or decline into chronic poor performance.

In order to avoid this it is important to make estimates of the carrying capacity of the environment. These should be based on:

- estimates of waste production from fish farming and other sources;
- estimates of the assimilative capacity of the environment; and
- agreement on acceptable levels of change in terms of environmental quality.

There is a range of tools available to tackle these issues, from relatively simple mass balance calculations to more complex models of dispersion and assimilation.

*Countries should seek to make assessments of environmental capacity for all waterbodies or identifiable aquatic systems where fish farming is likely to develop as a significant activity.*

Assessment of environmental capacity at a strategic waterbody/watershed level may also allow for the identification of sector level mitigation, such as:

- exploiting the potential synergies between input based aquaculture (such as intensive finfish or shrimp culture) and extractive aquaculture (such as mollusk production);
- identification of zones of greatest environmental capacity where aquaculture is likely to have minimal impact.

*Once capacity has been estimated, mechanisms should be agreed which will ensure that development does not exceed capacity. This will require some form of allocation of limited capacity to producers.*

## EIA Procedures

As noted above, site level EIA may only be practicable and useful in relation to reasonably large aquaculture developments. Most countries have size or production thresholds, or criteria relating to the sensitivity of the habitat or the risks associated with the technology.

### STANDARD PROCEDURES

EIA procedures have become relatively standardized across the globe, and are summarized in Box 2.

The main variations between countries relate to the level of detail of assessment and the various names given to these. Some countries have a staged approach under which a “preliminary” or “initial” EIA is undertaken which may or may not lead to a more comprehensive EIA. Some countries apply different levels of EIA to different categories of development.

As suggested above, the key to more efficient EIA procedures is to ensure focus and effectiveness.

*The objectives of EIA for aquaculture should be clearly stated.*

*EIA should be undertaken when it is the most effective tool to achieve the overall objective of sustainable development, taking account of the nature and scope of aquaculture development, and the characteristics of the environment.*

*Site level EIA should take account of the findings of higher level strategic assessment and national policy more generally.*

*Assessment and evaluation should be focused on the most important issues, and on those which are not already addressed under alternative environmental management mechanisms (such as standard regulation or best practice initiatives).*

This will require an iterative approach – exploring a wide range of issues initially and narrowing the focus steadily through risk analysis coupled with a careful evaluation of the value of information for final decision-making.

#### BOX 2

##### Typical steps in EIA

1. **Screening:** what is the scale and significance of likely environmental effects? What level or detail of assessment, if any, is required?
2. **Scoping:** identify the most serious or potentially serious issues and impacts; draw up TOR for the assessment.
3. **Assessment:** more detailed identification of impacts; prediction and analysis of effects; significance of impacts; comparison of alternatives (where these are proposed);
4. **Mitigation:** identification of site, technology or management options which will minimize identified adverse impacts;
5. **Reporting**
6. **Decision:** unconditional approval; conditional approval; rejection
7. **Monitoring:** procedures for reporting performance and effectiveness of mitigation

A list of useful guidance documents relating to environmental assessment of aquaculture can be found in the bibliography at the end of the global review and synthesis (see Part 1 of this publication).

### **SOCIAL AND ECONOMIC IMPACT**

Given its name, it is unsurprising that social and economic impacts are often given limited attention in EIA. Sometimes these issues are addressed under related procedures as part of the permitting process, but this is not always the case.

There are advantages in making assessment more comprehensive to include these issues, not least because any significant environmental impact is likely to have social and economic consequences. Indeed social and economic impact is likely to be an important criterion for prioritizing environmental impact.

*Social and economic impact assessment should be included in, or closely integrated with EIA procedures.*

### **TOOLS**

EIA can become very complex. There are many tools which can enhance the quality and accessibility of the assessment:

- **risk analysis** – to refine the focus of the assessment on priority issues;
- **presentation, visualization and communications** tools – which ensure that the assessment is accessible to widest possible range of stakeholders;
- **models** which generate predictions of possible impacts and their effects, including hydrological and environmental capacity models, which can be developed at different levels of accuracy and complexity according to resources and need;
- **decision support** tools, ranging from GIS to trade off analysis and multi-criteria decision analysis.

There is a danger however that tools become an end in themselves, demanding ever more data and resources, with marginal contribution to informed decision-making.

*The wide range of tools available should be used wherever appropriate and cost effective to enhance the quality and accessibility of EIA.*

### **PARTICIPATION**

Stakeholder participation in EIA is a standard recommendation in most EIA guidance. However, fair and inclusive public consultation is costly and may generate conflict. Therefore it should be well informed and carefully managed.

Many issues are better dealt with at higher levels where generic standards and protocols can be widely agreed. Other issues are largely technical and can be addressed by competent agencies or government departments. The focus of EIA consultation should be on local subjective and/or socio-economic issues which national guidance is inadequate to address.

*Ensure that consultation is focused on those issues which require public/stakeholder input.*

*Ensure that skilled and impartial management and facilitation is provided.*

### **COMPETENT AUTHORITY**

The competent authority – the institution which coordinates EIA and makes the final associated permitting decision – varies from country to country. In some cases it is the sectoral agency or department (fisheries, aquaculture). In many cases it is the environment agency or department. In some countries it is local government. In a few countries a special independent commission may be responsible for final permitting decisions.

Where the sectoral agency is responsible, EIA is likely to be better informed (technically), more streamlined and predictable. However, there may be a tendency of bias in favour of development. Similarly there are advantages and disadvantages of more centralized as oppose to more local decision-making. The latter will have a better grasp of local issues, the former will be less constrained by local politics and better placed to take account of national and higher level strategic interests.

*Whatever approach is taken, it is important that the fisheries/aquaculture institutions do have a significant role in advice, planning and decision-making.*

# Institutions and decision-making

Many countries have detailed legislation relating to environmental assessment, and procedures are often set down in some detail. However, environmental assessment and monitoring should be associated with effective and consistent decision-making if these procedures are to feed back into better management of the sector.

While some of the decisions may be relatively straightforward and objective (for example a water quality threshold will be breached), others may relate to highly uncertain or subjective issues.

Impacts on ecology and biodiversity for example are often highly complex and uncertain, and the values associated with different elements difficult to agree. Impacts on society and other users may present difficult trade-off decisions. Impacts on landscape are largely subjective. Perceptions and values in relation to these issues may vary between local and national level and between different interest groups.

*This split between relatively objective issues, uncertain issues and subjective issues should be clarified and reflected in decision-making processes.*

*Ideally the more objective issues are dealt with through sound science, standard regulation and protocol; uncertain issues are dealt with through more rigorous risk analysis; and the more subjective and local issues are dealt with through case by case EIA or local planning procedures.*

# Monitoring

There is little point in applying EIA or other management tools in the absence of effective environmental monitoring.

*Monitoring should be a key issue to be addressed in any national or regional aquaculture strategy.*

## TYPES OF MONITORING

*A monitoring programme for the industry should encompass a range of monitoring requirements:*

- *Monitoring the implementation and effectiveness of mitigation measures identified in EIA or SEA;*
- *Monitoring compliance with and effectiveness of codes of practice or other good practice instruments;*
- *Monitoring compliance with and effectiveness of standard regulation (e.g. wastewater limits);*
- *Farm level environmental monitoring to enhance environmental and economic performance, and where possible to complement wider environmental monitoring schemes;*
- *Monitoring in the wider environment by regulatory authorities to ensure that national standards are not breached and that appropriate adaptive management is put in place.*

## SCOPE AND FOCUS

With regard to monitoring in the wider environment (usually undertaken by government authorities) the main problems identified in the regional reviews related to the ambition and scope of such monitoring, and the lack of resources and capacity to analyse, report and use this data to improve management of the sector as a whole.

*Monitoring should be focused on key parameters defined through a rigorous process of risk analysis and value of information analysis.*

*The scope of monitoring should take account of resource availability and capacity to usefully analyse the data generated.*

## ANALYSIS AND FEEDBACK

Inadequate or limited analysis of monitoring data, and lack of feedback mechanisms to adjust management interventions in the light of such analysis (at both farm and sector level), were widely reported in the regional reviews.

*Clear procedures should be established for the analysis and reporting of monitoring data, and the effective use of this information to adapt and refine the management response.*

# Overall

The regional reviews and the deliberations of the workshop which took place from 15 to 17 September 2008 at FAO headquarters in Rome suggest the following key messages:

1. EIA and monitoring should be applied within a wider environmental management system for aquaculture guided by aquaculture strategies developed at national and waterbody level.
2. EIA and monitoring procedures should reflect the diversity of aquaculture, environments and the social, economic and political context.
3. Duplication and complexity should be minimized to reduce the bureaucratic load on farmers.
4. The focus for EIA and monitoring should be refined through rigorous risk analysis to identify and prioritize key issues.
5. Environmental management mechanisms should be developed to address cumulative impacts associated with small-scale aquaculture which typically fall outside the scope of EIA and associated monitoring.
6. Estimates of environmental capacity should be made for identifiable waterbodies, and permitting procedures or allocations should be used to keep aquaculture development within this capacity.
7. Decision-making procedures, and the role of public participation, should reflect the diversity of decision types: technical/objective; uncertain; subjective.
8. Monitoring data should be analysed regularly and the results used to identify management needs and refine management interventions.
9. Capacity building (human and institutional resources) might be needed to facilitate the development of effective aquaculture sector specific environmental management systems.

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