

# Fisheries and aquaculture emergency response guidance

Review recommendations for best practice

FAO Workshop  
15–16 March 2012, Rome



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## Review recommendations for best practice

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**FAO Workshop**  
15–16 March 2012, Rome

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## Preparation of this document

This document represents the proceedings of the FAO workshop on “Fisheries and Aquaculture Emergency Response Guidance: Review Recommendations for Best Practice”, held from 15 to 16 March 2012 in Rome, Italy. The workshop is a part of a process to develop fisheries and aquaculture emergency response guidance that also contributes to FAO’s new strategic objective on building livelihoods resilient to threats and crises. The workshop was supported by the Netherlands and Sweden through the FAO Multidonor Mechanism (FMM/GLO/003/MUL). Experts in the fields of fisheries and aquaculture policy and management, post-harvest practices and trade, fishing operations, environment and of social development and vulnerable groups contributed technical background papers relating to the challenge of responding to emergencies that affect the fisheries and aquaculture sector. The workshop was streamed online, using Adobe-Connect software to enable participation from those authors not able to attend the meeting at FAO headquarters in Rome. The papers that were presented and discussed at the workshop are included in these proceedings as submitted. The proceedings were compiled and technically edited by B.H. Cattermoul, FAO Consultant (the United Kingdom of Great Britain and Northern Ireland), D. Brown of the FAO Fisheries and Aquaculture Department (Rome) and F. Poulain of the FAO Fisheries and Aquaculture Department (Rome).

## Abstract

This document contains the proceedings of the FAO workshop entitled “Fisheries and Aquaculture Emergency Response Guidance: Review Recommendations for Best Practice”, held from 15 to 16 March 2012 in Rome, Italy. Experts in the fields of fisheries and aquaculture policy and management, post-harvest practices and trade, fishing operations, environment and of social development and vulnerable groups contributed technical background papers relating to the challenge of responding to emergencies that affect the fisheries and aquaculture sector.

Populations that depend on fisheries and aquaculture for their livelihoods are threatened not only by natural hazards but also by human-induced events and other developments beyond their control. Responding to an emergency situation in fisheries and aquaculture presents a range of complex issues. The demand for improved guidance for response and recovery in the fisheries and aquaculture sector was voiced by FAO partners including recently in a series of consultation meetings relating to disaster risk management held in 2009 and 2010 (FAO, 2010(a), FAO 2010 (b)). In response, FAO is leading a process to develop guidance for disaster response and recovery in fisheries and aquaculture.

The fisheries and aquaculture emergency response guidance (the Guidance) will compile the best practice in disaster response and recovery for fisheries and aquaculture and in turn help to ensure that disaster response and recovery for fisheries and aquaculture is consistent with the Code of Conduct for Responsible Fisheries. The Guidance will support both the saving of lives and the saving of livelihoods through two key strategies: by assisting in the identification of the most appropriate fisheries and aquaculture interventions in emergencies; and by setting out the best practice and providing guidance notes for these interventions.

In the process of developing the best practice and guidance, a team of experts were invited to identify best practice and guidance across a range of technical areas. This workshop was designed to provide the opportunity for discussions around the recommendations for best practice and how these could be presented in the form of guidance. This document consolidates the outcomes from these discussions and presentations in three areas: (i) the challenges to implementing best practice in an emergency context; (ii) the opportunities presented by the emergency context; and (iii) the recommendations for best practice as presented by each of the technical experts.

In the closing session of the workshop, the challenges of bringing response efforts across the elements of fisheries and aquaculture to create coherent guidance were emphasized as was the need to take advantage of the opportunities presented by an emergency situation to make a contribution to long-term development by “building back better”. In supporting the use of the Guidance, the participants emphasized the importance of a programme that enables it to be disseminated in the most effective form for the target users.

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## Abbreviations and acronyms

ALDFG	abandoned, lost or otherwise discarded fishin gear
Code	Code of Conduct for Responsible Fisheries
GRP	glass-reinforced plastic
MCS	monitoring, control and surveillance
NGO	non-governmental organisation



**Resilient Livelihoods: Disaster Risk Reduction for Food and Nutrition Security** - The four pillars of the FAO's Disaster Risk Reduction framework are aligned to support countries in implementing action plans under the Hyogo Framework for Action. FAO's strategic objective within this framework is to increase the resilience of livelihoods, including those of fishers and fish farmers, to threats and crises.

# Workshop summary

## WORKSHOP BACKGROUND

Fisheries and aquaculture contribute to food supplies, employment, export earnings and income in national and local economies. In 2010, capture fisheries and aquaculture supplied around 148 million tonnes of fish (128 million tonnes being used for human consumption). This had an approximate value of US\$217.5 billion. At the same time, fish and fish products contribute more than 16 percent of the world population's intake of animal protein and 6.5 percent of all protein consumed providing about 3 billion people with almost 20 percent of their intake of animal protein. Fishery products are one of the most highly traded food and feed commodities, globally. The number of fishers and fish farmers has been growing faster than employment in traditional agriculture in the past three decades, mainly in developing countries (FAO, 2012). Fish has a highly desirable nutrient profile as it is an excellent source of quality animal protein, essential fatty acids, vitamins and minerals. The fisheries and aquaculture sector may also be an important source of foreign exchange earnings in many developing countries.

Populations depending on fisheries and aquaculture for their livelihoods are threatened not only by natural hazards but also by human-induced events and other developments beyond their control. Most small-scale fishers and fish workers live in developing countries and they often face a multitude of problems that increase their vulnerability to hazards, such as pollution, environmental degradation, overexploitation of resources, high levels of accidents at sea and conflicts with industrial fishing operations. Many communities dependent on fisheries and aquaculture are also particularly vulnerable to hazards because of their poverty and food insecurity.

Support to countries and partners in building livelihoods resilient to threats and crises and in response to disasters and emergencies is becoming a greater part of the work of international agencies. The FAO, in its role as technical agency concerned with Agriculture, food and nutrition security has become increasingly involved in disaster response and emergency assistance to fisher, fish farmers and their communities suffering from disasters. This area of work also now constitutes a significant part of the FAO Fisheries and Aquaculture Department's work. A recent analysis showed that the Fisheries and Aquaculture Department of FAO has been involved in more than 134 emergency projects, valued at more than USD 154 million, in at least 30 countries. The Department provides assistance to a very broad range of support areas that are required in disaster response and recovery, including needs assessment; response and transition planning; sector coordination; technical and policy advice; capacity development; partnership building; repair of infrastructure and provision of livelihood assets; and promotion of community-based disaster risk management approaches.

As the levels of activities have increased, so has the body of experience and best practice. However, this experience and best practice are not readily accessible to the people that need them and at a time when they need them (i.e. very quickly in the aftermath of a disaster in a form that helps them to respond). Responding to an emergency situation in fisheries and aquaculture presents a range of complex issues that can be difficult to understand in the absence of appropriate analytical tools and lessons from experience.

The demand for improved guidance for response and recovery in the fisheries and aquaculture sector was again voiced by FAO partners in a series of consultation meetings held in between 2009 and 2011 (FAO, 2009, 2010 (a+b), FAO 2011(a+b)). In these meetings, it was recognized that fisheries are crucial for the livelihoods of many people throughout the world and that fisheries interventions are often a feature of relief responses. Respondents also recognized the inherent vulnerability of the sector to disasters. The respondents highlighted the fact that, while technical manuals on specific challenges facing fisheries and aquaculture in disaster situations did exist, there were no comprehensive and accessible/available guidelines. They also noted that there was a clear need to develop capacity within the development/humanitarian partners to understand and respond to disasters in the sector. In response to this demand, FAO is leading a process to develop guidance for disaster response and recovery in the fisheries and aquaculture sector.

### **PROCESS TO DEVELOP THE FISHERIES AND AQUACULTURE EMERGENCY RESPONSE GUIDANCE**

The fisheries and aquaculture emergency response guidance (the Guidance) will compile the best practice in disaster response and recovery for fisheries and aquaculture and help to ensure that disaster response and recovery for fisheries and aquaculture is consistent with the Code of Conduct for Responsible Fisheries (the Code). The Guidance will support both the saving of lives and the saving of livelihoods through two key strategies: by assisting in the identification of the most appropriate fisheries and aquaculture interventions in emergencies; and by setting out the best practice and providing guidance notes for these interventions.

In the process of developing the best practice and guidance, a team of experts have been invited to develop best practice and guidance in identified technical areas. The experts will contribute to three stages:

1. The development of background papers – providing the evidence for the Guidance by documenting past experiences, international commitments and setting out areas of best practice in respect to a range of technical challenges (undertaken in February and March 2012).
  2. Process to agree the best practice (workshop on 15-16 March 2012).
  3. Drafting the Guidance document (undertaken in March–May 2012).
- This workshop is concerned with the second stage of this process.

### **WORKSHOP OBJECTIVES AND EXPECTED OUTPUTS**

The overall objective of the workshop was to support the development of the Guidance. More specifically the workshop was designed to:

1. Review the areas of best practice to be included in the Guidance.
2. Establish the next steps in the process of developing the Guidance.

### **WORKSHOP PROCESS**

The workshop was streamed online, using Adobe-Connect software to enable participation from those authors not able to attend the meeting at FAO headquarters in Rome. To accommodate the time differences, the workshop was held over the course of two days split into two sessions of four and a half hours each, held between 08.30 and 13.00 hours on each morning.

The opening session of the workshop included a presentation that provided an overview of the work and experiences of the FAO Fisheries and Aquaculture Department in emergency response.

Following this session, the key sessions of the workshop included presentations and discussions covering each of the background papers for the Guidance. The presentations covered:

- fisheries and aquaculture management and policy;
- fishing operations: fishing vessels and safety at sea;
- fishing operations: fishing gear;
- fishing operations: fisheries infrastructure;
- aquaculture;
- post-harvest practices and trade;
- responding to the needs of vulnerable groups; and,
- building partnerships.

Each of the presentations was designed around a common format that aimed to demonstrate how the recommendations for best practice have emerged from the wide range of experiences that have been shown in the background papers.

In the final session of day two, the process for consolidating the statements of best practice and the next steps were discussed.

## WORKSHOP OUTPUTS

In this section of the report, the key outcomes of the discussions are set out. These cover: (i) the challenges of implementing “best practice” in an emergency context; (ii) the opportunities presented by the emergency context; and (iii) the recommendations for best practice as presented by each of the technical experts.

### The challenges of implementing “best practice” in an emergency context

Across all of the presentations and during the subsequent discussions, recognition of the difficulties faced in emergencies was emphasized as were the challenges for implementing “best practice” under such conditions. This helped to highlight the need for developing best-practice statements that are pragmatic and that are flexible enough to give direction to response efforts in different locations and under different emergency scenarios. Some of the key challenges identified are set out below:

#### *Recognizing the importance of the sector and the skills required to engage effectively with fisheries and aquaculture*

- Fisheries and aquaculture are often overlooked during risk assessments, and there is a need to ensure that they are incorporated more effectively into the assessment process.
- Unless recognition and resources are given to including the fisheries and aquaculture sector in the disaster needs assessments (or indeed in the disaster preparedness strategies), it is unlikely that the complexity of the challenge of responding to the sector will be dealt with in the project proposals for relief and rehabilitation work.
- In the emergency context, challenges can be encountered in finding appropriately competent personnel to support the process of rehabilitation.

#### *Coordinated information and coherent action*

- In post-disaster relief, each individual organization is often required to do its own assessments. These will all have a different focus (livelihoods, sector-specific, replacement of assets, gender, marginalized groups, humanitarian, etc.) and will often use different methods for research and reporting. This can lead to disjointed and often overlapping actions. However, if a mechanism is created to look at all of the information holistically, then the chances of coherent actions that have long-term significance is greatly improved, has been seen with the use of clusters where they have been formed.

### *Maintaining policy integrity*

- The presentations highlighted how the discussion of fisheries and aquaculture issues in emergency response inevitably cuts across the fisheries/aquaculture sector (subsectors), emphasizing the need for a coordinated holistic approach that provides consistency and clarity across the technical areas.
- It was also emphasized how emergency responses need to bear in mind pre-existing policy priorities in the sector and reflect these priorities during their implementation.
- In this respect, the need for best practice statements also to reflect the guidance presented in the Code was highlighted.

### *A race to be included*

- In the immediate aftermath of a disaster, there is intense pressure on agencies to limit the time spent on assessments and to identify measures and interventions quickly. Indeed, it was observed that there is a basic assumption that agencies that fail to become involved from the start in supporting and implementing relief activities are liable to be excluded from the relief and rehabilitation process. This encourages rapid deployment by agencies, sometimes at the expense of proper assessment and analysis of needs.
- The dangers associated with an overemphasis on short-term objectives were emphasized during the discussion. This can create risks of abandoning recognized frameworks for fisheries and aquaculture development and undertaking measures without giving due consideration to technical, social, institutional, economic and environmental sustainability. The frequent failure to address market issues properly was also mentioned.

### *Short-term reconstruction vs. long-term development*

- Best intentions regarding “good practice” in fisheries and aquaculture management are often ignored in the post-disaster rush to provide immediate relief and to replace lost physical assets.
- Donor and government priorities for relief and reconstruction may differ, with governments placing more emphasis on rapid reconstruction of infrastructure and replacement of lost assets, while donors might be more concerned with re-building appropriate capacity.
- Undertaking longer-term strategic planning early on in the response process is critical. However, in practice, exit strategies are often dictated more by the availability of funds and donor support rather than by any systematic planning process that links humanitarian relief to long-term development.
- Ensuring, from an early stage, proper inclusiveness and participation by stakeholders in assessing needs, planning interventions and implementing and monitoring, is a significant challenge in the rush to respond to an emergency with proposals for projects.
- Vulnerable groups, such as women, children, old people, ethnic minorities or the extremely poor in disaster-affected communities, are particularly at risk as a result of a focus on short-term relief and rehabilitation objectives and a focus on “hard” development solutions. These groups tend to require different approaches and more time to become effectively engaged and identify solutions that are appropriate for them. A focus on delivery and expenditure can often lead to their special needs being ignored.

### *Demands for visible deliverables*

- Understandably, a high priority is placed on the production of tangible outcomes (e.g. new vessels, rebuilt facilities, and fishing gear) by projects designed to

respond to emergencies. However, it is important that these be accompanied by many of the “softer” inputs that address human capacity and longer-term development needs (skills, technical advice, capacity development, counselling, education, organization, etc.). These are needed to equip people with the ability to move away from the emergency relief and to take charge of their own development in the longer term. This aspect of emergency relief work needs to be much better recognized and valued by donors and by agencies involved in providing emergency responses.

### *Changing contexts*

- The differences in the challenges and opportunities that different types and intensities of disaster present in terms of policy and management are also important. This emphasizes the inappropriateness of “one size fits all” solutions and the need to undertake proper assessment in each emergency situation.
- It was also noted how differences in the scale and extent of disaster impacts could have an important influence on the types of intervention that is likely to be appropriate in the wake of a disaster.

### *Information uncertainty*

- In a post-disaster situation, complete information is rarely available, and so it is important that best practice statements make allowances for this reality.

### *Need to find the balance between what is considered “best” and what is most appropriate to the local context*

- “Best practice” may often conflict with what is economically sustainable or manageable in a particular local context. For example, better, safer and more efficient vessels may prove to be too costly to operate and so prove to be unsustainable for fishers. This emphasizes how flexibility and adaptability are required in applying best practice on the ground and, while it is important to keep these standards in mind, pragmatism is always likely to be required in adapting them to real-life emergency situations.

### **Opportunities presented by effective emergency response**

Although the challenges in applying “best practice” under an emergency situation are considerable, the experts also identified significant reasons why this should be aimed for. As highlighted by the disaster risk management framework, emergencies, if responded to in an effective way, provide a significant opportunity for enabling communities to “build back better”. In the context of fisheries and aquaculture, the experts identified a range of outcomes that could help to articulate what is meant by this very powerful goal. These include those listed below:

#### *A better balance between fishing capacity and fishing opportunities*

- The replacement of fishing equipment after a disaster can be used to redirect fishing effort away from destructive practices. Fishers are often aware of this possibility but do not have the means or experience to make a change without assistance.
- With appropriate expertise and financial assistance, lost gear can be replaced with more selective gear that has lower habitat impacts and lower rates of by-catch.

#### *Improved planning and specification in aquaculture*

- The replacement of aquaculture facilities such as ponds, supply canals and supporting infrastructure provides the potential for either a straightforward rebuild or a more considered restoration. Many aquaculture developments

may have been planned using environmental and technical criteria that are now out of date. In recent decades, there have been considerable improvements in spatial planning, thus offering the opportunity to restore aquaculture in a more sustainable way, improving yields and efficiency, and reducing the risk of biosecurity and pollution issues.

### ***Strengthened knowledge base for fisheries and aquaculture management and development and resilience***

- Establishing or strengthening management information systems can significantly improve fisheries and aquaculture management. This could be done through documentation of existing vessels, gear, infrastructure, safety at sea and operations (which may be done in the damage and needs assessments), and through provision of details of the assets provided during the emergency response.
- Establishing or updating systems of vessel registration and documentation can provide increased safety and confidence in the community. Knowing where and when vessels are fishing and who else is operating in the same fishing area can be life-saving in the event of a marine accident.
- Introducing risk assessment and contingency planning measures can reduce both: (i) the likelihood of exposure; and (ii) the consequences of a disaster through increasing resilience. This should be made an integral part of routine planning processes, and the experience from previous disasters can also be used to review and update risk assessment and contingency plans. It is particularly important that such disaster preparedness planning be included not just in fisheries and aquaculture management frameworks, but also in sectoral planning to ensure that it is suitably represented in national level contingency plans.

### ***Increased participation in policy and management decisions and implementation***

- Disasters may provide an opportunity for previously disparate groups to work together, especially in the initial response phase. This provides an opportunity to forge longer-term partnerships, with potential for participatory policy development and comanagement arrangements.
- Longer consultative processes may lead to fishers being convinced to leave the fishery voluntarily, especially where the fishery was on the verge of economic collapse.
- While post-disaster situations may create opportunities to address structural inequalities and improve the situation of particularly vulnerable groups, interventions have to be realistic and recognize that such processes of structural change are often long-term.

### ***Improved skills and knowledge***

- Provision of training and skills upgrading in boatbuilding can improve the strength and longevity of vessels as well as improving efficiency in material use.
- Provision of training in safety at sea at a basic level can, at little cost, reduce the likelihood of serious accidents. At the same time, this can improve the confidence of those remaining on shore that members of their family and community will return from their time at sea in safety.

### ***Improved economic performance***

- Introducing minor changes to vessel design and equipment can provide improvements in operating efficiency and improved revenues. Possibilities exist with refining hull shapes, introducing different motors or the addition of a gearbox. Even something as simple as correctly sizing and installing a propeller and stern gear can dramatically increase fuel efficiency.

- The post-disaster phase provides an opportunity to review fishing methods and gear that were economically problematic in the first place.

### *Improved infrastructure*

- Supply chains and infrastructure can be disrupted by natural disasters (damage to ports, roads, bridges, chill/cold storage, and other infrastructure) and complex emergencies (lack of security and reduced maintenance). In the re-building process, particular focus can be given to improving infrastructure so as to correct previous weaknesses and imperfections. This might include poor location and design of infrastructure, and weak cold-chain management and supply chains. Rehabilitation processes would also provide an opportunity to introduce improved management of new facilities to ensure proper administration, maintenance, and cost recovery.

### **Recommendations of best practice**

The experts presented a series of recommendations for best practice applicable to each of the main technical areas in an emergency response context. The statements of best practice (below) are qualitative in nature and specify the desired levels to be attained in response. They should be applicable in any disaster situation. Therefore, they are, formulated in general terms. These statements will form a basis for the Fisheries and Aquaculture Emergency Response Guidance. Within the Guidance, the statements of best practice will be consolidated and complemented with indicators (demonstrating the key elements of the best practice that should be seen) and more detailed guidance notes.

### *Fisheries and aquaculture management and policy*

- Government sector representatives, the disaster-affected population and all other relevant stakeholders are actively involved in planning for disasters, and in defining policy and management responses, in their implementation, and in their monitoring and evaluation.
- Governance policy and management systems, fora and arrangements for implementation, are resilient to disasters.
- Support is provided to government staff, sector representation, and other stakeholders so as to increase capacities to prepare for and respond to emergency situations.
- Policy and management responses strive to adhere to any robust policy and management frameworks, and to relevant guidelines and standards that may already be in place. At the same time governance is responsive to conditions on the ground, and adapts policy and management measures to the specific needs faced in emergency situations.
- Policy and management responses are based on sound information, data and local knowledge, while a lack of information is not used as an excuse for a lack of action. Information is used to reduce exposure to risk, and information about responses is shared.
- Lessons learned during and from emergency situations are used to improve fisheries and aquaculture governance.
- Fishing vessel capacity and design reflect the fishing opportunities available and the local conditions.
- Fishing gear maximizes selectivity and reduces ecosystem and environmental impacts.
- Aquaculture rehabilitation takes place in the context of ecosystem functions and services with no degradation of these beyond their resilience capacity.

- Monitoring Control and Surveillance (MCS) functions continue to operate.
- Action is undertaken to reduce abandoned, lost or otherwise discarded fishing gear (ALDFG) following disasters.
- Integration of fisheries and aquaculture sector planning and responses with wider environmental planning and response frameworks.
- Building back better for more sustainable exploitation of fish resources and minimization of negative ecosystems impacts.
- Replacement of lost or damaged assets (vessels, gear, cages, and infrastructure) is completed so as to ensure that fishers and aquaculture operators can catch or produce fish and minimize disruption to production volumes. Food security is thus ensured not just for fishers and aquaculture producers, but also for the wider community.
- Fishers and aquaculture producers whose livelihoods have been disrupted are targeted for involvement in any re-habilitation and clean-up operations resulting from the disaster.
- Vessels provided as part of post-disaster responses are seaworthy and appropriate for local conditions.
- The health of consumers is protected through assessment of the impacts of any contamination/pollution of fish, and through re-instatement of the cold-chain.
- The quality of jobs is improved and jobs are made more secure, and the health and livelihoods of both fishers and consumers are protected.
- Subsidies and post disaster support in the form of public provision of infrastructure serve to support financial viability of fishing and aquaculture operations.
- Provision of credit and micro-finance, and establishment of savings schemes.
- Marketing channels maintained or created. Economic viability of businesses supported through successful efforts to ensure the marketing of fish, and exports also serving to generate macro-economic benefits.
- Building back better for improved economic benefits from fisheries and aquaculture. The financial viability of those engaged in the sector is sustainable, and economic benefits are increased (without negative impacts on environmental or social benefits) compared with pre-disaster situations.

#### *Fishing operations – fishing vessels*

- A detailed understanding of the technical and social situation in the affected community should be developed using appropriate assessment techniques.
- The expectations of the community are managed and the realistic assistance likely to be available is made clear.
- Plans include a detailed assessment of the technical details of the boats lost, their fishing activities and other activities that the vessels may be used for.
- Activities involving replacement and repair of vessels should contribute to and be part of the process of achieving better governance in fisheries.
- Sources of boatbuilding materials, such as timber and GRP, are demonstrated to be sustainable and economically viable.
- The structures to support the repair / replacement of fishing vessels are economically viable and are re-established in a timely manner.
- Operations to repair / replace vessels build on local strengths.
- Replacement and repair of vessels should be part of the process of achieving a more sustainable fishery and providing long-term livelihoods.
- The scale of boatbuilding activity planned should reflect the management and supervision capacity available.
- The improvement of safety at sea is central to the reconstruction efforts.

### *Fishing operations – fishing gear*

- Fishing gear is provided in a manner to support the long-term sustainability of fisheries livelihoods and the economic development of the community.
- The rehabilitation response strengthens the information base for improved fisheries policy and sustainable fisheries management within the country.
- The provision of fishing gear contributes to the local and national fisheries policy and strategic objectives.
- The conditions under which fishing gear is provided should contribute to the improved protection of the fisheries resources and the ecosystems within which they live.
- Action is taken to mitigate the effects of ghost fishing.
- Fishing gear is delivered according to the needs of the community and the planned timeline to ensure that it matches the seasonal requirements.
- The provision of fisheries technical support promotes the contribution of fisheries to food security and food quality, giving key priority to the nutritional needs of local communities.
- National, regional and international efforts are coordinated in a manner that takes into consideration the technical, socio economic, legal, political and environmental aspects of governance and natural resource management in the rehabilitation process.
- Financial instruments such as microfinance, insurance, cash for work and voucher systems are used to facilitate early recovery of the fisheries sector.

### *Fishing operations – fishing infrastructure*

- The infrastructure that supports fisheries and aquaculture operations is effectively covered in the Damage and Needs Assessment Guidelines.
- The infrastructure plans are aligned with community aspirations, fisheries and aquaculture development strategies and the long-term development plans for the nation.
- The design of new or replacement infrastructure is based on robust technical and economic assessments of viability.
- Reconstruction activities are designed to strengthen community and national management regimes.

### *Aquaculture*

- Recovery plan is aligned with the national aquaculture development strategy and plan (which in turn is expected to be in line with the country's social and economic development goals); and adopted by the stakeholders.
- The essential physical components and technical support for resumption of production are in place. These relate to the provision of seed, feed, production structures and technical support services.
- Farmers are trained in good area management practices at the area level and better farm management practices at the production level.
- An appropriate monitoring and evaluation system for the implementation of the production programme and the results is in place.
- Expertise in livelihood development and training and technical assistance; technical expertise in better management practices; professional and scientific advice from relevant institutions including the NGOs; and microfinance institutions is included.
- Small scale village enterprises preferably based on aquaculture and based on a market chain study are identified and piloted.

- Ability of farmers to better access markets is strengthened through organized marketing, access to market information, and adoption of product certification scheme.
- Farmers' access to market-based financial services is facilitated.
- A farmer/women association managed mutual savings fund, if appropriate, is promoted and members are trained in its concept and management.
- The management of restoration and long term development is strengthened through a balanced combination of mandatory, market based and voluntary management mechanisms.
- Associations of farmers and women are professionalized through more intensive management training; leadership training is provided to selected members.
- Codes of conduct and better practices are promoted for adoption by seed producers including brood farms, hatchery and nursery operators
- The restoration builds back and improves ecosystems and habitat, improves the adaptive capacity of the community and increases its self reliance.
- Opportunities for improving the supportive ecosystems for aquaculture are explored and supported.
- Where applicable, a fishery resource conservation and enhancement project is developed.
- Energy conservation, waste recycling and water conservation measures are introduced and promoted for adoption. Integrated farming is promoted where applicable.
- The feasibility of developing an ecotourism activity is studied and, if found feasible, resources are leveraged to initiate the project.
- Participation of the youth in community projects is encouraged.
- Capacity of farmers is strengthened to comply with legal standards and to adhere to voluntary codes of practices and certification standards.
- Capacity of local government and extension agencies for management and provision of technical assistance is strengthened through training.
- Community participatory processes in decision making are encouraged and improved on an "as needed" basis.
- Formal links are established between the community and national and sub-national providers of services and technical assistance.

#### *Post-harvest practices and trade*

- Response plan is based on a detailed analysis of the post-harvest sector.
- The response incorporates the diversity of the stakeholders in the post-harvest sector at the local and national level.
- Replacement infrastructure is appropriate to the community and is based on an analysis of its role in the value chain and technical and economic feasibility.
- Actions respond to market demands and are consistent with trade regulations.
- An effective communication strategy is developed.
- Emergency assistance is delivered in line with government policy and strategy.
- Systems are established to monitor and report on the safety and sustainability of the resources.

#### *Vulnerable groups*

- Decision-making regarding relief and rehabilitation measures is inclusive and is taken in consultation with the affected population and paying attention to the inclusion and engagement of vulnerable groups.

- Specific attention to gender-related issues and efforts to address those issues in interventions, are regarded as a requirement at all stages of the emergency relief and rehabilitation process.
- Flexibility and responsiveness in the planning and implementation of relief and reconstruction in the fishing and aquaculture sector are maintained to ensure that the needs of vulnerable groups can be responded to.
- Monitoring and evaluation of relief and rehabilitation measures are carried out in a participatory fashion and use approaches that ensure that the perceptions and opinions of vulnerable groups on impacts are taken into account.

## WAYS FORWARD

In the discussions about the next steps, participants emphasized the need for a guidance document that is accessible to the key stakeholders in the emergency context. Within this discussion, the need for a range of communications tools was emphasized along with a programme to support the uptake and use of the guidance.

## WORKSHOP CLOSE

Mr Ababouch, Director of Fisheries Planning and Economics Division, made the closing statement for the workshop and emphasized that the Guidance was a good fit with the direction of the FAO Fisheries and Aquaculture Departments strategic priorities. While the Code is a solid base for fisheries and aquaculture, it does not directly address the emergency context and, therefore, the Guidance should be complimentary to the Code.

It was also recognized that while the challenges of bringing response efforts across the elements of the fisheries and aquaculture to create coherent guidance were significant so were the opportunities presented by an emergency situation to make a contribution to long-term development by building back better.

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## Appendix 1 – Agenda

FAO Workshop on “Fisheries and Aquaculture Emergency Response Guidance:  
Review Recommendations for Best Practice”  
Rome, Italy  
15–16 March 2012

<b>Day 1: 15 March 2012</b>		
<b>Time</b>	<b>Activity</b>	<b>Responsibility</b>
<b>Session I Introduction</b>		
08:30–08:45	Overview of workshop objective and expected outputs Introduction of participants	Facilitators
08:45–09:00	Fisheries and aquaculture emergencies	Jessica Stewart and Niklas Mattson
<b>Session II Presentation of technical best practices</b>		
09:00–09:30	<b>Fisheries and Aquaculture Management and Policy</b> Presentation Questions and Discussions	Graeme Macfadyen
09:30–10:00	<b>Fishing operations: Fishing Vessels and safety at sea</b> Presentation Questions and Discussions	Daniel Davy
10:00–10:30	<b>Fishing operations: Fishing gear</b> Presentation Questions and Discussions	Jean Gallene
10:30–10:45	<b>Tea break</b>	
10:45–11:30	<b>Fishing Operations: Fisheries Infrastructure</b> Presentation Questions and Discussions	Jo Sciortino
11:30–12:15	<b>Post harvest practices and trade:</b> Presentation Questions and Discussions	David James
12:15–12:30	<b>Review of the day and Outline of day 2.</b>	Facilitators

<b>Day 2: 16 March 2012</b>		
<b>Time</b>	<b>Activity</b>	<b>Responsibility</b>
08:30–08:35	Introduction to Day 2	Facilitators
08.35–09:15	<b>Aquaculture</b> Presentation Questions and Discussions	Pedro Bueno
09:15–09:45	<b>Responding to the needs of vulnerable groups:</b> Presentation Questions and Discussions	Phil Townsley
<b>Session IV</b>	<b>Next Steps</b>	
09:45–10:30	<b>Proposed structure for the Guidance and Identification of Gaps</b> Presentation Discussion	Facilitators
10:30–10:45	<b>Tea Break</b>	
10:45–11.30	<b>Process to complete the guidance</b> Discussions	Facilitators
11:30–12:00	<b>Developing partnership for implementation:</b> Presentation and discussions	Chris Grose
12:00–12:15	<b>Workshop Close</b>	Lahsen Ababouch

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# Fisheries and aquaculture policy and management

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# 1. An introduction to fisheries and aquaculture policy and management, implementation capacity, and challenges presented by emergencies and emergency responses

## 1.1 BACKGROUND

The Food and Agriculture Organization (FAO) and its international partners have been key participants in the international response to large-scale disasters around the globe that may impact the livelihoods of those engaged in capture fisheries and aquaculture. Following a number of major disasters in recent years, FAO is now assembling guidance on emergency response and recovery based on the lessons learned and the overall concept of “building back better”. The Fisheries and Aquaculture Emergency Response Guidance (‘the Guidance’) will consolidate the best practice in disaster response and recovery for fisheries and aquaculture and in turn help to ensure that disaster response and recovery for fisheries and aquaculture is consistent with the Code of Conduct for Responsible Fisheries.

This thematic background paper is one of a number of papers contributing to the Guidance. This particular paper is focused on **fisheries and aquaculture policy and management** responses in post disaster situations, and capacity for implementation. It is useful therefore to start by considering what we mean by these terms.

‘*Fisheries*’ in the context of this paper is taken to mean fisheries sector activity related to the capture of wild fish, molluscs, crustaceans and aquatic plants in marine, brackish and inland/freshwater areas. Capture fisheries are extremely diversified, comprising a large number of types of fisheries that are categorized by different levels of classification. On a broad level, capture fisheries can be classified as industrial, small-scale/artisanal and recreational. A more specific level includes reference to the fishing area, gear and the main target species. While capture fisheries encompass thousands of fisheries on a global scale, they are often categorized by the capture species, the fishing gear used and the level at which a fishery is managed nationally and/or regionally<sup>1</sup>.

‘*Aquaculture*’ is taken to mean the farming of aquatic organisms (including fish, molluscs, crustaceans and aquatic plants) in inland and coastal areas, involving intervention in the rearing process to enhance production and the individual or corporate ownership of the stock being cultivated (FAO, 2008a). Farming thus implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, and/or protection from predators. Farming also implies individual, group or corporate ownership of the stock being cultivated. Aquaculture may take place in marine, brackish, or fresh water. Aquaculture operations too can be vary varied in nature depending on the production system (e.g. use of ponds, cages, etc), size of operation, and species being farmed.

<sup>1</sup> <http://www.fao.org/fishery/topic/12306/en>

In referring to the fisheries and aquaculture sectors, we also include both the businesses providing inputs to the fish catching or fish production sector, sometimes referred to as ‘upstream’ business or input/service suppliers, as well as activities once fish has been landed or harvested i.e. its subsequent transportation, processing and/or marketing – these activities are collectively often referred to as ‘downstream’ activities.

‘*Policy*’ is the course of action for an undertaking adopted by a government, a person or another party. Instruments that exist to support policy and tools used to achieve policy objectives include some or all of the following: societal instruments, economic and command-and-control instruments, direct government involvement and institutional and organizational arrangements (FAO 2008a). Government policy can be considered as the principled guide or political vision of the State. It may consist of formal and well documented policy documents including targets and objectives, legislation and/or regulations, or more informal decisions. Fisheries and aquaculture policy thus forms the basis on which the fisheries/aquaculture sector is managed. Importantly, it should also be recognized that policy may be specified not just at national level, but also at a wider geographical scale (e.g. by regions or the international community), as well as at a smaller regional or local level within a country. Thus national fisheries policy may be influenced by international policies, guides or strategies for the sector. In the context of responding to emergencies, policy may legitimately need to be adapted (and indeed post disaster situation may represent a timely opportunity to make positive policy changes so as to ‘build back better’), but as will be discussed later, policy processes (i.e. how policy is defined) and any changes to policy content in post-disaster situations, should remain true to principles of best practice. There are also implications of emergencies for policy in terms of (i) developing policies that incorporate sufficient risk assessment and contingency planning, and (ii) post-disaster policy development where lessons learned (both from within a particular country and from elsewhere) are incorporated and ‘mainstreamed’ into policy for the future.

‘*Management*’ is the integrated process of information gathering, analysis, planning, consultation, decision-making, allocation of resources and formulation and implementation, with enforcement as necessary, of regulations or rules which govern fisheries [and aquaculture] activities in order to ensure the continued productivity of the resources and the accomplishment of other fisheries [and aquaculture] objectives (Cochrane 2002). It is therefore the means/actions and capacity by which policy is implemented. When we talk about fisheries and aquaculture management, we refer to the tools used to control and guide the sector in a way that conforms to the policy vision. In the context of responding to emergencies, new/changed policies may in turn require different or amended management strategies, while at the same time disasters may seriously impact on the ability of governments to ensure good management of the fisheries and aquaculture sector, for example due to loss of government assets or personnel, or due to a lack of political will to adhere to good management practices.

For the reader less familiar with the fisheries and aquaculture sector, Appendix 2 provides some examples of fisheries and aquaculture policy and management, and the sorts of issues and measures involved.

## **1.2 THE RELATIONSHIP BETWEEN DISASTERS AND FISHERIES AND AQUACULTURE SECTOR POLICY AND MANAGEMENT**

Fisheries and aquaculture operations and communities, especially those in low-lying coastal areas, are vulnerable to both natural and man-made disasters. The recent major tsunamis in Japan (2011) and the Indian Ocean (2004) show how devastating such events can be, in human, economic and environmental terms.

Westlund *et al.*, (2007) reviewed FAO’s work with regard to natural and human-induced disasters in the fisheries and aquaculture sector, together with the lessons

learned and experience gained on how to improve disaster response, preparedness and prevention in these sectors. They categorize disasters into three main groups as follows:

- **Natural disasters:** *hydro-meteorological hazards* (e.g. floods, waves and surges, storms, droughts), *geological hazards* (e.g. earthquakes, volcanic eruptions) and *biological hazards* (e.g. epidemics, insect infestations);
- **Technological disasters:** directly related to human activity and as a result of failure of a technology or of management e.g. oil or chemical pollution from tankers, pipelines and drilling accidents, nuclear disasters; and
- **Complex emergencies:** humanitarian crisis resulting from military conflict and for which external assistance is needed.

This categorization is a useful one, and in the text below we consider the respective impacts of these different types of disasters, and the risks they pose to individuals, communities, and countries. We also note however the observation of a recent 'Postnote' by the Houses of Parliament of the United Kingdom of Great Britain and Northern Ireland on resilience to natural hazards in developing countries (UK Houses of Parliament, 2012). This Postnote highlights that in the last ten years, over 500,000 people have lost their lives and around 1.5 billion people have been adversely affected due to rapid-onset natural hazards such as earthquakes, tsunami, floods and tropical storms, and argues that that are no 'natural disasters', just 'natural hazards' i.e. disasters occur when people are in harm's way and preparation is insufficient. However, for the purpose of this paper we use the term natural disaster to mean a natural hazard that has resulted in a disaster.

Disaster risk is a function of a disaster or emergency, and the vulnerability and exposure of the community or society to that disaster/emergency. In physical terms, low-lying areas with inadequate coastal defenses, poor communications and sub-standard infrastructure tend to be the most vulnerable - a good example is the human cost of the 1999 floods in deltaic Bangladesh. Less obvious, however, is the vulnerability to inadequate policy directives and management capacity, and governments are themselves vulnerable in terms of the delivery of sound policy and management responses in emergency situations. In general terms the vulnerability of governments lies with either their capability to respond effectively within the existing policy and legal framework (i.e. is the framework too rigid to enable a rapid response, or do policies exist that can be used to coordinate responses in a flexible way), or from their own capacities i.e. do they have the capacities to play the role needed of them?

While it is difficult to systematically categorize different types of disasters as having different impacts, there are certainly often differences in impacts, and therefore in required policy and management responses, between the three different types of disasters/emergencies. For example an earthquake might have an impact on infrastructure and assets *throughout* a whole fisheries or aquaculture value-chain i.e. have an impact on all upstream, productive, and downstream businesses, and destroy roads and the means to get fish to markets. Whereas, a flood may have an impact just on a specific part of the value-chain i.e. just the catching or aquaculture production sector, leaving the main infrastructure and the principal upstream and downstream businesses, unaffected. In such instances, the scale of impacts, and the policy and management response would therefore be much more focused.

In the following sub-sections, we examine some of the typical linkages between different types of disaster, their impacts, and the fisheries and aquaculture policy and management responses. The inclusion of a particular impact/response under one of the three main types of disaster/emergency situations is not meant to imply that such an impact/response could not be also experienced in one of the other disaster/emergency situation.

### 1.2.1 Natural disasters

Natural disasters are usually unforeseen, at least until just before they occur, and thus inherently difficult to mitigate against. Their impacts can have very significant consequences on the environmental, social and economic sustainability of fisheries and aquaculture, and therefore on the achievement of government policy objectives and on the implementation of management measures associated with these pillars of sector management.

**1. Human losses.** Natural disasters can result in the considerable loss of life, with an impact on both the ability of the sector to continue to catch or produce fish and to supply local and export markets, as well as on capacity to manage the sector, when such losses include fisheries officials and sector representatives engaged with (co-) management arrangements (see Box 1). Impacts may also be felt not just through loss of life, but also if individuals are displaced following a disaster. The loss of fisheries department staff has implications for the institutional capacity to manage fisheries, both in the short-term (e.g. during the emergency response period) and medium-term e.g. over the recovery period when livelihoods are resuming. This has implications for key management functions such as monitoring, control and surveillance (MCS) and other operational capacities. Furthermore, natural disasters may have broader-ranging impacts in terms of the changing relationships that communities may have with governments in an emergency – the relationships may provide potential for both greater inclusion or marginalization, while at the same time having a significant impact in terms of the potential for disasters to build or reduce community feelings of ownership over the resource, and to erode aspirations for, or optimism over, long-term management of the sector for development.

**2. Loss of or damage to government infrastructure.** This impact is described more fully in the related background paper on infrastructure, and readers are directed to that paper for more information. Fisheries managers and policy makers often face situations in post-disaster scenarios where the infrastructure they need to effectively govern the sector has been destroyed or seriously damaged. For example, such impacts may include damage or destruction to offices and related equipment (e.g. computers) and files/documents, vessels and other assets used for MCS activities, and/or fish laboratories used to assess the quality of fish (see Box 1).

#### Box 1 – Human and institutional losses in Nanggroe Aceh Darussalam Province of Indonesia (Indian Ocean Tsunami, 2004)

Around 36 staff members of the Provincial-level Dinas Kelautan dan Perikanan (DKP-P) died and the total loss of staff and family was 133 (Banks, 2006). In addition to DKP-P's losses, other institutional support losses included:

- The Ujung Batee Regional Brackish Water Aquaculture Centre, including loss of staff, infrastructure, fish and shrimp stock
- DKP-P's quality control laboratory at Lampulo
- The Quarantine centre – Station Karantina Ikan
- Fisheries Vocational Education Centre
- The DKP-P extension unit on Gano (Ule Ule sub-district) and Simeulue island
- The DKP-P hatchery (Balai Benih Ikan Pantai, BBIP), already with an investment of Rp. 1.2 billion, located in Simeulue Timor sub district (partly destroyed).
- The Badan Musyawarah Pembudidaya Tambak (Tambak Operators Association) and the empowerment of these groups was considerably weakened.

Source: Huntington *et al.*, 2006

**3. Loss of privately owned assets in fisheries and aquaculture.** An immediate goal following many natural disasters is the replacement of lost and damaged vessels, engines and fishing gear, as well aquaculture assets (e.g. cages, nets, pumps, etc). Such responses reflect the very significant impacts that natural disasters can have on privately-owned assets. The accumulation of assets may take individuals and companies many years to acquire, but can be wiped out overnight. While some subsidies can be considered as 'good', many have very negative impacts on sustainable fisheries. However in post-disaster situations, the loss of assets may indeed require the use of subsidies, if carefully planned as to what they are used for, who should receive them, and for how long they are to be provided, so as to ensure that economic and social objectives can be met.

**4. Reduced food security.** The loss of human capacity, government infrastructure, and privately owned assets described above, all have the potential to impact significantly on food security, which as highlighted in Section 1.2 is often a key government policy objective. Interruptions to the supply of fish from capture fisheries and aquaculture can impact on direct food security from subsistence fishing activity, or on indirect food security from fishers being able to sell their produce and buy food with the proceeds. National level food security may also be impacted through disruptions to production and if exports of fish products are reduced, thereby reducing foreign exchange earnings which may be required for food imports. This may have policy implications depending on whether a country is pursuing either an-export led policy or a domestic food security policy – and so governments may need to be flexible to allow for and prioritize a humanitarian response which focusses on domestic food security. These sorts of impacts can also be considered in a pre-emergency planning context, particularly in the context of aquaculture and the siting of productive activities in areas which are less vulnerable to natural disasters.

**5. Environmental impacts.** Environmental impacts on wild fish resources and product in aquaculture operations may arise from disturbance or damage to fish habitats (e.g. reefs, mangroves, seagrass, fish ponds/cages), and changes in water quality (e.g. salinity, turbidity, etc) resulting from extreme weather or geological events. These effects may result in physical or behavioural impacts on fish (e.g. direct mortality, or impacts on migrations, spawning, growth rates, location). In addition for aquaculture there is an additional risk of escapements and loss of product. Readers are directed to the paper on Environment for additional comment on this issue.

### 1.2.2 Technological disasters

In terms of fisheries and aquaculture, technological hazards tend to be water-borne (e.g. oil, chemical and radiological pollution), influencing both impacts and responses. The main policy and management-related issues can be categorized as follows (following on from the previous listing).

**6. Release of toxic or noxious materials that can kill, damage or taint wild fish and aquaculture stocks, and represent a possible threat to human health.** An important role of government is therefore the monitoring of hazards to both fish and human health, and making appropriate decisions on management responses as a situation unfolds. This may include the closure of certain fisheries or areas, harvesting bans, and in the case of aquaculture, the possible mandatory destruction of tainted stock (see Box 4 and 5). Governments must therefore have the legal ability to take such action. All these steps, primarily designed to protect consumers and the livelihoods of those in non-affected areas (see point 8 below), have considerable economic and social consequences for producers in an affected area. Post-disaster policy responses typically also involve the assessment of appropriate levels of compensation, and governments may need to refer to standards and guidelines for assessing compensation levels. In such situations compensation may be appropriate to cover:

- the *direct* impacts of the spills on productive sectors (fisheries, aquaculture); and
- the *indirect* impacts on others involved in the value-chains for the productive sectors impacted e.g. upstream inputs businesses and downstream processors and traders.

As mentioned above, the consequences of technological disasters are more predictable than natural catastrophes. Therefore they are more responsive to recurrent contingency planning and risk assessment processes that should result in both reducing the magnitude of the hazard itself and the exposure in the event of a disaster. Risk assessment is particularly important, as it allows managers to identify the likelihood and consequences of a particular disaster occurring, and thus to allow the prioritization and focusing of resources on key mitigation options, as well as identifying and responding to likely vulnerable communities. Contingency planning allows the establishment of set responses and standard operating procedures in the event of a certain emergency e.g. oil spills, allowing the advanced training of staff, stockpiling of equipment and materials and engagement with vulnerable communities to raise awareness and response processes.

**7. Loss of market confidence.** The possible tainting or contamination of seafood products from technological disasters may have serious impacts on market confidence, resulting in reduced demand in both local and overseas markets, which may be long-term unless handled intelligently. Governments need to work with seafood producers, wholesalers, retailers and consumer groups to ensure that markets and consumption patterns are normalized as quickly as possible. The use of closed areas and harvesting bans and food safety testing mentioned above are typically an important tool in this regard.

### 1.2.3 Complex emergencies

Complex emergencies include humanitarian crisis's resulting from military conflict and those for which external assistance is needed. They are characterized by dysfunctional governance, deteriorating public infrastructure and support, restricted movement, a lack of economic opportunity and growth, as well as danger to human life, well-being and property. They are often drawn-out over many years. The main policy and management-related issues can be categorized as follows (following on from the previous listing):

**8. Reduced government authority and capacity in affected areas.** Fisheries and aquaculture-related public sector presence in militarized zones is often minimal. As a result, both the ability to plan and implement 'normal' management functions for governance of fisheries and aquaculture can be severely restricted. In particular, this may result in high levels of illegal, unregulated and unreported (IUU) fishing, with potential consequences in terms of resource depletion, as well as exclusion from traditional fishing grounds and rights. While such situations may impact negatively on resource sustainability, the reverse can also be true if such emergencies prevent fishing activity due to security concerns. Other impacts of complex emergencies include a reduction in government services available to fishers and aquaculture producers such as seed availability and extension services, severely reduced information collection for targeting management responses, and a breakdown of established public-private sector partnerships and co-management groups.

**9. Disruption to production, distribution and marketing of seafood.** Efficient seafood processing (e.g. preservation), distribution, marketing and storage are key elements of maintaining national food security. There are thus impacts and associated policy response imperatives and opportunities for reducing the impact of complex emergencies on the availability of fish. For instance the lack of security, refrigeration and other fish preservation means that fish production from coastal areas may not be able to reach the key inland famine hotspots.

**10. Corruption and the informal costs of doing business.** Fisheries policy and management, as well as broader non-sectoral government policy, should strive to reduce the costs of doing business for the sector, and good management implies cost-effective use of funds that result in effective, efficient, relevant, coherent and sustainable interventions. In complex emergencies lasting several years, a particular feature due to the general breakdown in governance that is often associated with such situations, is the rise of corruption and the associated increase in costs associated both with managing the sector, and experienced by fishers and aquaculture producers.

### **1.3 OPPORTUNITIES TO IMPROVE FISHERIES AND AQUACULTURE POLICY AND MANAGEMENT**

Opportunities to improve policy and management responses relate both to things that can be done prior to a disaster/emergency (the first two points/paragraphs below which related to preparedness), and things that can be done better after such disasters/emergencies strike (the remaining paragraphs in this section).

**Introduction of risk assessment and contingency planning measures.** Greater risk assessment and contingency planning can reduce both a) the likelihood of exposure and b) the consequences of a disaster through increasing resilience (Clinton, 2006). This should be part of routine planning, but the experience from previous disasters can also be used to review and update risk assessment and contingency plans. It is particularly important for such preparedness planning not just to be included within fisheries and aquaculture management frameworks, but also for the sector to ensure it is suitably represented with national level contingency planning. As with the inclusion of the fisheries sector in Poverty Reduction Strategy Papers (PRSPs), this could serve to increase the profile of the sector at national levels. Whilst this is often an expert-led activity, community participation is often highly valuable to ensure that known vulnerabilities can be reduced in future, and to ensure that local knowledge of how best to respond to disasters can also be incorporated into contingency planning.

**Developing robust management information systems (MIS).** Effective policy and management in a post-disaster situation is critically dependent on good information on which to base recovery strategies. If relevant information is not already being maintained, it is very hard for policy makers and managers to make appropriate policy and management responses to disasters. Improvements in post-disaster response can therefore be ensured through the establishment of effective management information systems prior to such disasters, containing relevant information likely to be important in a post-disaster situation. Most obviously of course such information needs to include information by area of: numbers of fishers and related upstream and downstream activities; vessel and gear types; aquaculture production systems; costs and earnings information; local management arrangements; local stakeholders and their representation; etc.

**Improved fishing capacity assessment & management.** Excess levels of fishing capacity are one of the greatest challenges facing fisheries policy makers and managers (see FAO 2008b). Based on best policy and management, and underpinned by a precautionary approach, re-building a fishing fleet can take place so that fishing capacity better matches fishing opportunities. This may imply both the re-introduction of fewer vessels than were previously operating in the fishery, as well as the provision of different types of vessels, and may need to be accompanied by other aspects of post disaster responses focused on the creation of alternative livelihood opportunities.

**Introduction of lower impact and more selective fishing gear.** With appropriate expertise and financial assistance, lost gear can be replaced with more selective gears that have lower habitat impacts and lower rates of bycatch. A high level of stakeholder consultation is typically required to ensure that such techniques are both appropriate

and can be adapted to local conditions. This particular issue is the subject of the background thematic paper on fishing gear.

**Improved aquaculture.** The replacement of aquaculture facilities such as ponds, supply canals and supporting infrastructure provides the potential for either a straightforward rebuild or a more considered restoration. Many aquaculture developments were planned long ago, and there have been considerable improvements in spatial planning since then, thus offering the opportunity to restore aquaculture in a more sustainable way, thus improving yields, efficiencies and reducing the risk of biosecurity issues (see thematic paper on aquaculture). Coastal aquaculture is also dependent upon the status of the local ecosystem. Natural systems such as mangroves may have been lost in a disaster and replacement of these should be factored into the disaster response. Experience from Indonesia after the Indian Ocean tsunami shows that the community-based rehabilitation of mangroves can endow greater ownership of the rehabilitation process, and provide a short-term income whilst a more permanent livelihood can be restored and increase overall environmental awareness (NACA *et al.*, 2007).

**Developing clear and transparent strategies for short-term income support, subsidies and access to resources for recognized emergency situations.** An important policy element is a consistent response to the short-term disruption to livelihoods and household incomes as a result of emergency situations. Whilst reducing long-term dependency on government support may be a legitimate policy aim, it is important to recognize that vulnerable communities may need to be supported during unusual situations, and that in some cases subsidies may be justified (Béné *et al.*, 2007). Such decisions are best made on a planned basis, rather than in the heat of an emergency situation. The three opportunities above can be underpinned and supported by a revised approach to the potential planned use of fisheries subsidies after a disaster. Post-disaster situations may provide justification for the use of subsidies in a carefully targeted and strategic manner, so as to ensure that only ‘good’ rather than potentially ‘bad/harmful’ subsidies are used. Improved management and ‘building back better’ can be incentivized through subsidy support with higher government contributions, for example for low impact fishing gear or low impact aquaculture production systems. It may also be the case that policy in response situations allows for fisheries to be used as a safety net in times of emergency with fisheries opened up (i.e. rules of access relaxed) to give people access to food and income. However such policy decisions should be very carefully justified in terms of their potential impacts on resource sustainability, and the duration for which they might apply.

**Increased participation of local communities in fishers & aquaculture planning and development.** Disasters may provide an opportunity for previously disparate groups to work together, especially over the initial response phase, as highlighted in the aftermath of the Orissa cyclone (IMM, 2001). This provides an opportunity to forge longer-term partnerships, with potential for participatory policy development and co-management arrangements. Involving stakeholders in the needs analyses process and, for instance, in environmental rehabilitation (e.g. mangrove replantation) can improve ‘ownership’ of the restoration process and form the basis for or improve positive on-going relationships with government. As already observed, disasters also pose the risk of a breakdown in participation by some groups in the policy and management process, but they also offer opportunities for building enduring partnerships for long-term management of fisheries and aquaculture.

**Building resilience and improvements into the seafood supply chain.** Supply chains and infrastructure can be disrupted by natural disasters (damage to ports, roads, bridges, chill/cold storage, and other infrastructure) and complex emergencies (lack of security and reduced maintenance). In the re-building back process, particular focus can be given to improving infrastructure so as to correct previous weaknesses and

imperfections, not just in infrastructure location and design and its implication on cold-chain management and supply chains, for example, but also in the management of infrastructure, i.e. provision of new infrastructure can be associated with improved management of such facilities to ensure proper administration, maintenance, and user payments. The reader is referred to the background paper on infrastructure.

#### 1.4 THREATS TO GOOD POLICY AND MANAGEMENT PROCESSES IN POST-DISASTER SITUATIONS

Whilst a response to an emergency situation may be well intentioned, there is also the potential for actions in post-disaster situations to negatively impact on the effectiveness of policy and management in fisheries and aquaculture. Some examples are:

**Over-emphasis on short-term and poorly targeted economic and social support objectives** coming at the expense of longer term environmental sustainability, on which long-term economic and social sustainability is also dependent. Whilst it may be understandable for those in a position to provide support (e.g. government, NGOs) to affected communities, to want to provide quick support, this can easily take the form of subsidies or support that does not suitably balance the needs for economic, social and environmental objectives (for example, the provision of too many fishing vessels and resulting over-capacity [see Box 3 for discussion about the over-provision of fishing vessels in Sri Lanka]), and which pose long-term risks to the achievement of all three objectives. There is a growing body of literature on the legitimacy of subsidies in terms of the World Trade Organisation (WTO), and on the impacts of subsidies, particularly on the environment and the fulfillment of environmental objectives - some subsidies may be considered 'bad' subsidies in terms of the impacts on fishing capacity and therefore on stock status. Governments may be especially tempted by the benefits of providing subsidies in post-disaster situations because of the short-term social and economic benefits to stakeholders.

**Lack of coordination of post-disaster responses outside of the recognized policy and management frameworks already in place.** While providing the opportunity to build back better, in many countries fisheries policy and management frameworks are robust and have been developed following extensive consultation with stakeholders. Special care should be taken in post-disaster situations for decisions not to be taken outside of such policy and management frameworks unless there are special reasons and benefits of doing so. Disasters can be used as the basis for the introduction of politically motivated support that may not be in the long-term interests of the sector.

**Loss of human capacity and assets for management.** Loss of life of key government personnel or key sector representatives, or their movement to other locations, can have a very significant impact on the ability to effectively manage the fisheries and aquaculture sector (see Box 1 provided earlier). Likewise, the loss of management-related assets can directly reduce the management of the sector. For example, fisheries data collection systems may break down, fish hygiene inspectors may not be available, and there may be an increase in IUU fishing due to weakened government (see Box 6 and Box 7) and/or co-management MCS partnerships, and the loss of MCS assets as a result of a disaster.

**Restoration of aquaculture systems, fisheries infrastructure, or other physical assets without sufficient assessment of technological suitability and environmental impact assessment.** There is obviously a balance needed in post-disaster response situations between the need to act very quickly and the need to ensure that sufficient research and planning takes place before support is provided. In post-disaster situations there is understandably great pressure to provide new assets very quickly, but this poses considerable risks. This is perhaps especially the case for the provision of infrastructure and physical assets. For example, much coastal aquaculture has been developed in the absence of modern spatial planning tools, resulting in damage to coastal ecosystems,

vulnerability to biosecurity breaches and inefficient water exchange systems. Such a situation can be perpetuated and exacerbated by a poorly planned attempt to rapidly reinstate aquaculture-based livelihoods following a natural disaster. Likewise, fisheries infrastructure can easily be sited in unsuitable locations, or be poorly specified, if insufficient technical feasibility studies are completed, or low quality expertise is used to advise on requirements.

**Marginalization of communities needed for the policy and management process.** While natural disasters may encourage previously disparate groups to work together for improved management of the sector, disasters can also lead to a breakdown in communication and community participation in co-management initiatives. This can lead to a combination of isolation and for more vulnerable groups, marginalization. Furthermore there may be reduced ownership or commitment to government-initiated recovery programmes.

**Long-term dependency on government aid.** Whilst direct short-term income and livelihood input support may be appropriate, there is also a danger of government and NGO aid resulting in an over-dependency on external support, if such support is long-term in nature, or periodic but frequent in the case of recurring disasters, without addressing the underlying threats to sustainable livelihoods.

**Best practices and building back better may have economic/financial implications, or cultural issues, that are not acceptable to communities.** For example, the introduction of safer vessels or more selective fishing gear may imply higher costs of assets, and/or lower operational costs (although this may not always be the case and improvements can generate environmental and economic benefits at the same time). This may threaten the long-term sustainability of any post disaster support, with fishers reverting back to traditional types of vessels and gear when the time comes to replace them. Equally, there may be strong cultural or social norms which reduce the acceptance by individuals or communities of new and improved equipment.

**Undesirable market responses to seafood shortages or quality issues.** A typical consequence of technological emergencies in particular is a reduction in fisheries or aquaculture production resulting from a loss of access to fisheries, ecological consequences on fisheries productivity and the contamination or tainting of products. A poorly considered approach to this can have negative and even long-term effects on the market (e.g. markets may be lost permanently to competitors). In order to prevent this, careful steps have to be taken to take considered actions to safeguard public health yet reassure the public over what is - and what is not - safe to eat (see Box 4 and 5). This in itself requires an intelligent approach to communication. This response needs to be informed by timely, robust and targeted monitoring of possible contamination in the environment and supply chain.

## 2. A review of best practices and lessons learnt from supporting fisheries and aquaculture policy and management capacity in emergency response

### 2.1 REVIEW OF PREVIOUS RESPONSES BY FAO AND ITS PARTNER ORGANIZATIONS

Disaster response and disaster risk management (DRM) can be described as a sequence of events or phases, each requiring different and specific actions. Generally a disaster cycle or emergency sequence includes the following main types of actions (FAO, 1998).

1. Prevention of events and processes that could result in disasters;
2. Preparedness to respond rapidly and effectively if disasters occur;
3. Early warning to provide information before potentially disastrous events and as soon as possible immediately afterwards;
4. Impact and immediate needs assessment following a disaster;
5. Relief or emergency response to address immediate humanitarian needs and to protect livelihoods following a disaster;
6. Rehabilitation to initialize the restoration and rebuilding of livelihoods;
7. Reconstruction for replacing destroyed infrastructure; and
8. Sustainable recovery for longer-term re-establishment and enhancement of livelihoods and livelihood support structures.

Fisheries policy and management measures and decisions play a significant role in all of these steps.

The text below considers responses to natural disasters, technological disasters and complex emergencies by examining six case studies: Myanmar cyclone Nargis; Indian Ocean tsunami; Sea Empress oil spill; Fukushima nuclear meltdown; the Sri Lankan civil war; and Democratic Republic of Congo conflicts.

Throughout the case studies provided below, the text highlights the policy and management processes and content described in Appendix 2, and Section 1.4 and 1.5 above, and provides a link back to earlier text through text placed in bold format in the case studies below.

#### 2.1.1 Examples of natural disasters and lessons learnt

Case studies for Myanmar cyclone Nargis and Indian Ocean tsunami are provided in Box 2 and Box 3.

Immediate responses after a disaster generally focus on emergency relief and needs assessments. Efficient, thorough, locally specific and well documented needs assessments are essential for relief measures to be effective, and should be undertaken by a team of experts including aquaculture/fisheries specialists where appropriate. From a fisheries perspective it is vital that short, medium and long term objectives are set out at this stage, ensuring that sustainability is considered from the onset.

Measures to ensure food security through provision of fishing vessels and gear can be effective at progressively removing need for food aid and reinstating minimum

employment conditions. However, decisions on how many and what type of vessels and gear should consider input (e.g. limited licensing), output (e.g. minimum landings size) and technical (e.g. mesh size restrictions) management measures.

Policy decisions have to be made very quickly post disaster and this can impact the extent to which such decisions can remain participatory and consultative. A good example where a key decision remained participatory occurred after the Indian Ocean tsunami: in response to pressures from donors to accept inappropriate donations of foreign boats, FAO organised a European workshop between donors and government officials which succeeded in stopping donations (see Box 3). This resulted in reduced potential for fleet overcapacity and promoted local production/repair of boats. Despite this overprovision of boats, and/or increased capacity of replacement boats remained a significant risk to future sustainability of fish resources and also to the development of an aid dependency culture in many communities. This highlights the importance of licencing and registration of all vessels – including undamaged/refurbished and new vessels. An effective Fishing Vessel Registration (FVR) system and boat marking scheme implemented in Indonesia post-tsunami was successful in allowing stronger management and monitoring by fisheries departments and local authorities and is intended to be applied throughout Indonesia. This scheme was implemented in 2007; two years after the event, and earlier application of such a licensing and registration system would have undoubtedly reduced impact of overcapacity and overfishing (see Box 3).

### Box 2 – Myanmar cyclone Nargis, 2008

**The Event:** Cyclone Nargis struck Myanmar on 2-3 May 2008 causing severe destruction to 11 townships in the Ayeyarwady Delta region. Fisheries and aquaculture were impacted through damage caused by high winds and storm surges, as well as flooding and intrusion of salt water. Approximately 27,000 fish workers died, 140,000 boats (including inland, inshore and offshore vessels) were lost and 280,000 sets of fishing gear (mainly push and cast nets) were destroyed. Fish processing installations were damaged or destroyed including 55 cold storages. The damage to aquaculture included loss of stock when ponds were flooded and damage to ponds, cages and infrastructure - the estimated impact on private sector aquaculture was damage to over 15,000 ha of ponds. The total production loss of fish as a result of the cyclone (both from capture fisheries and aquaculture) was estimated at 150,000 tonnes of fish.

**Fisheries policy and management issues and responses:** The immediate establishment of a FAO Emergency and Rehabilitation Coordination Unit (ERCU) in Yangon ensured a **participatory and transparent approach** to the overall relief and rehabilitation programme. The ERCU was fast acting, coordinated, efficient, informed and integrated, and allowed pooling of resources and lessons learnt to be shared. The ERCU, as well as establishment of a Fisheries Technical Working Group, facilitated many key discussions surrounding fisheries licensing systems, fish processing activities, gear catch efficiency and concerns of overfishing etc. In addition it ensured that extensive contacts were maintained with NGOs and agencies in Yangon and the field which encouraged information/data sharing and lessons learnt to be shared.

A needs assessment was undertaken which identified clear **short and medium term objectives for fisheries**, including:

- 0-6/12 months: Emergency Supply of Fishing Gear, Boat Repair and Processing Implements
- 0-24 months: Rehabilitation of Fishing Fleet and Basic Sector Services
- 0-24 months: Small-scale Aquaculture Rehabilitation

**Box 2 – Myanmar cyclone Nargis, 2008 (cont.)**

Rehabilitation and recovery projects were harmonized to ensure **compatibility with existing national policy**. Myanmar national policy for the fishery sector focuses on increasing fish production for domestic consumption and exporting surplus production, expansion of aquaculture and improving the socioeconomic conditions of fishing communities, while conserving the freshwater and marine resources and biodiversity.

In Myanmar fish forms an essential part of people's diet (second only to rice) and therefore emergency response measures **to ensure food safety** were considered a priority and implemented through provision of equipment (fishing gear, boats, processing tools). In relation to fishing gear an ongoing complication was the variation in size and design of gear used across the Delta and inshore/offshore waters, together with the wide variation in requests from beneficiaries. It was concluded that unless specifications of fishing gear were very similar (or the same) for the targeted communities, where possible, the fishing gear should be supplied as kits of materials that could be used by recipients to make up gear that suited local needs and preferences (Teese and Kyi, 2010).

While compatibility with existing fisheries policy was cited in project proposals and needs assessments, **no explicit** consideration to **improving technical management measures**, such as mesh sizes to improve selectivity were made when considering gear replacement.

Refitting, repairs and construction of boats was facilitated through provision of boat building tools to boat builders who lost their implements, which allowed them to **resume income generation**.

**Post-harvest hygiene and food safety issues** were recognized as part of the short-term objectives and focused on providing replacement implements to women fish processors to resume storage, transport and processing preparations. This assisted in restoring **minimum employment conditions** in the fisheries sector without gender bias. In terms of **infrastructure**, assistance to damaged ice production facilities was prioritized although it was dependent on the resumption of electricity supply.

Medium term objectives gave more consideration to an **ecosystem approach to fisheries** with the aim to rebuild the fishing fleet to sustainable levels (and not simply to return to the status quo) and reinforced the need to understand the status of marine resources, the knowledge of which was lacking pre-cyclone.

Significant effort was made to strengthen the artisanal boat building capacity through a training programme on boat design, construction techniques and safe fishing operations (including **safety at sea**), which also informed a disaster risk management and preparedness plan.

Before the cyclone, the Department of Fisheries kept records of motorized vessels operating in the inshore and offshore fisheries, however, a large number of small-scale, part time and subsistence fishers using small un-mechanized vessels were **un-registered**. While records were maintained of the number of boats provided as part of rehabilitation, it is not clear whether this instigated **licensing and registration of all vessels**.

Medium term objectives for aquaculture prioritized **restoring livelihoods and income** to the most vulnerable groups by restoring production in small-scale commercial and household ponds. The project focused on returning damaged backyard and government hatcheries and restocking with brood stock to allow supply of fingerlings and seed. Capacity building was delivered to farmers through **training to improve husbandry practices** with the overall aim to improve production and resilience with respect to disaster impact and disease control. The training and capacity building component of the programme ensured that the assistance generated durable contributions to the food security and livelihoods of the farmers involved.

### Box 3 – Indian Ocean tsunami, 2004

**The Event:** The tsunami of 26 December 2004 impacted many countries in Southeast Asia and beyond; states of emergency were declared in Indonesia, Sri Lanka and the Maldives. Indonesia had the highest overall death toll, with the Aceh Province one of the hardest hit. In this region approximately 9 400 fishers and 36 Provincial fisheries management staff were lost, as well as 14 500 vessels, fishing gear and infrastructure including 55 percent of fishing harbours and ports. Approximately 20 000 ha of tambaks (fish ponds) were damaged and another 5 000 ha were out of production due to damaged water supplies.

**Fisheries policy and management issues and responses:** included numerous **short term projects** (see **Error! Reference source not found.**) focused on interventions in the fisheries sector during the massive post-tsunami response. These projects prioritized immediate relief measures to restart fisheries production with the objective to **restore coastal livelihoods** as well as to **ensure food security**. Measures centered on rebuilding the fishing fleet, replacing lost gear and reconstructing the coastal tambaks (fish ponds) and their supply canals.

One of the needs assessments, undertaken in March 2005, identified the **risk of potential overprovision of boats leading to increased fishing capacity** and unsustainable pressures on fish resources. A follow-up workshop in Europe between potential donors and Government officials of Indonesia and Sri Lanka **stopped inappropriate donations** of foreign boats in the region, thus greatly promoting local production while also ensuring that available boats were adapted to suit local contexts.

With regard to vessel replacement in Sri Lanka, the FAO developed and maintained a **detailed inventory** of donated boats, matching this number with the number reported lost, and source of donation. This proved too late to avoid early donations, but is thought to have reduced the anticipated surplus by half – down to an oversupply of 2 000 boats.

This called for more efforts focused on coordination for planned sector development based on an understanding of fisheries resources and more attention on capacity building and strengthening of local institutions. **Medium-long term** projects implemented from mid-2005 onwards, placed emphasis on developing **participatory management** of coastal fisheries, ensuring the **environmental and socio-economic sustainability** of coastal aquaculture and **improving incomes** through improved utilization and **value-adding** of their combined produce. An example of this was the American Red Cross and FAO (2005) project which focused on ensuring factors of fisheries vulnerability and unsustainability were not re-created through rehabilitation efforts aimed to **resolve four key problem areas: (i) weak coordination and planning; (ii) inadequate management of coastal fisheries resources; (iii) unsustainable aquaculture management practices; and (iv) poor post-harvest and marketing systems.**

In April 2006, FAO submitted a project framework proposal “Rehabilitation and sustainable development of fisheries and aquaculture affected by the tsunami in Aceh Province, Indonesia” with three main objectives: (i) improvement of coordination, planning and **Monitoring and Evaluation** of post-tsunami rehabilitation and development activities in the fisheries and aquaculture sector; (ii) **enhancement of the capacity** of the government and the participating communities to manage aquatic resources; and (iii) **increase of incomes** in participating coastal communities.

Although the aforementioned projects recognized the need for sustainable exploitation of resources, most government organizations were still driven by the need to increase production through a combination of tsunami-related restoration activities, technical assistance and training initiatives. There remained very little emphasis or engagement in practical capture fisheries management approaches, such as effort control or fisheries regulation. One notable example however has been the IFAD-funded Post-tsunami agriculture and fisheries rehabilitation programme (PTAFREP) in the Maldives, which has had specific funding elements focusing on improvement of fisheries management and MCS.

In 2007 a FAO project in Indonesia also assumed a coordination function and focused on **institutional development** aimed at promoting more **sustainable management** of fishing assets and practices. This FAO project laid foundation for coordinated efforts in rebuilding and provision of

**Box 3 – (cont.)**

technical advice, but perhaps most importantly it launched a framework for **monitoring, control and surveillance** (MCS). Key successful outcomes of this project included:

- Development of **Fishing Vessel Registration** (FVR) system, followed by a boat marking scheme which together allowed for stronger monitoring by fisheries departments and local authorities;
- Establishment of an Integrated Coordination and Technical Team to bring together key stakeholders and support FVR and MCS;
- Development of **MCS guidelines** and framework emphasizing low-cost monitoring and surveillance;
- Improved institutional support and **fisheries management skills for local authorities**.

The FVR system demonstrated successful collaboration between local and national stakeholders and is anticipated to be implemented throughout Indonesia. Despite the complex and rapidly changing political and social situation in Aceh, the central Government now considers the Aceh fisheries sector as a model of management for the rest of the country.

Sources: American Red Cross and FAO 2005; Begiri 2006; Bourne 2006; FAO 2006a; FAO 2006b; FAO 2007; Huntington *et al.*, 2006; NACA *et al.*, 2007; Asian Development Bank 2009; FAO 2010b; FAO 2010c; de Ville de Goyet and Morinière, 2006.

### 2.1.2 Technological disasters

Case studies for Sea Empress oil spill and Fukushima nuclear disaster are provided in Box 4 and Box 5.

Risk assessments and contingency planning are essential in limiting the potential damage of technological disasters and provide the best opportunity for managers to select an appropriate response strategy. For fisheries and aquaculture, food safety issues are the priority, to ensure that contaminated fish and shellfish do not enter the market, while maintaining consumer confidence in products by demonstrating responsible post disaster management.

Key to reducing risk of fish and shellfish contamination is pollution minimization through recovery and/or treatment processes. In combination with this, or where treatment is not possible, closed areas tend to be put in place. Having a structure to allow quick and effective implementation of closed areas is important, for example the area closure after the Sea Empress oil spill was initially voluntary, and later formalised through a Sea Fisheries Committee byelaw.

Disasters where treatment is not possible and contamination may occur across a wider area (and affect highly mobile/migratory species) will have a larger overall impact requiring species specific management. For example the Fukushima nuclear disaster required a comprehensive monitoring programme with many countries implementing import controls on fisheries products from Japan.

#### Box 4 – Sea Empress Oil Spill, 1996

**The Event:** Sea Empress oil tanker went aground at the entrance of Milford Haven, Wales, releasing 72,000 tonnes of light crude oil into the environment over a 7 day period in February 1996. The local marine and coastal environment is of exceptional conservation interest with a range of coastal and marine nature designations.

**Fisheries policy and management issues and responses:** Immediate responses focused on **pollution minimization** through at-sea oil recovery and chemical dispersants sprayed from aircraft at sea and applied before high tide across beaches. This was followed by an environmental monitoring programme which sampled fish and shellfish tissues, edible seaweeds, seawater and surface sediments.

Local fishermen implemented a voluntary ban on fishing immediately after the grounding of the Sea Empress in response to potential **food safety issues**. An assessment analyzed the likely spread of oil and potential area of contamination and based on this, under the 1985 Food and Environment Protection Act (FEPA), the South Wales Sea Fisheries Committee issued a closure order to prevent fishing across an area of approximately 2,100 km<sup>2</sup>, including all freshwater and streams discharging into that area. The restriction was a precautionary measure, intended to protect consumers from potential danger from eating contaminated seafood. The controls prohibited all commercial and casual collection of fish (including salmon and sea trout), shellfish (crabs, lobsters, cockles and mussels, etc.), and seaweeds.

**Previous habitat and biotype surveys and routine plankton surveys** allowed the environmental impacts to be assessed relative to baseline conditions. Routine monitoring, including taint testing, was undertaken for all commercial species, and other species (e.g., clams, carpet shells, dogwhelks, periwinkles, razor shells, trough shells) were analyzed either following stranding events, or to provide spatial coverage as available. In some instances, for example the whelk fishery, the fishermen chose to extend **closure on a voluntary basis** due to concerns regarding **export market potential**.

The fishery restrictions were removed in stages and on a species by species basis, as and when monitoring results showed that concentrations of hydrocarbons and PAH had declined to levels so low as to pose no further risk to consumers, and that the species involved were free of taint. These criteria were similar to those established after the *Braer F.V.* spill in Shetland in 1993.

Controls on fish and crustaceans were removed relatively quickly (within 3 to 8 months respectively), and the major intertidal cockle beds reopened 5 – 7 months after the grounding. The restrictions covering intertidal mussels in the south-east of the closure area and oysters within Milford Haven were the last to be lifted, remaining in place for about 19 months. Selective restrictions have remained in place for long periods following earlier spills, for instance, seven years for Norway lobsters and mussels off Shetland following the *Braer F.V.* oil spill in January 1993, but this was a result of oil becoming entrained in subtidal sediments, which did not occur in the case of the Sea Empress.

Total landings for crustacean showed a marked decrease in 1996 (due to the closure order), but significant growth was seen in 1997 compared to previous years.

The aerial application of dispersants, in particular, was found to reduce the impact of the Sea Empress spill on coastal shellfish fisheries considerably by significantly reducing the amount of oil which reached the shoreline.

A Sea Empress Environmental Evaluation Committee (SEEEC) was set up and **recommended continued environmental resource monitoring** as well as the following recommendations which were supported by the Government and delegated to appropriate agencies for action:

#### Box 4 – Sea Empress Oil Spill, 1996 (cont.)

- Need for national and local contingency planning including assessment of environmental impacts with focus on rapid response, adequate resourcing and validated treatment procedures;
- Procedure for costs of properly designed and government approved environmental impact assessments to be met by those responsible for the spill; and
- Research into sensitivity of key stone species & further development of biological monitoring methods.

Sources: Edwards and White 1996; ITOFP 2004; Law and Kelly 2004

#### Box 5 – Fukushima nuclear disaster, 2011

**The Event:** Following the Tōhoku earthquake and tsunami on 11 March 2011 a series of equipment failures and nuclear meltdowns at the Fukushima Nuclear Power Plant resulted in releases of radioactive materials into the atmosphere and ground and ocean waters. The devastation caused by the tsunami (including destruction of over 25,000 fishing vessels and damage to 319 harbours) is not considered within this case study which focuses on the responses specifically related to the nuclear disaster.

**Fisheries policy and management issues and responses:** The Japanese Fisheries Agency implemented a fisheries **closed area** within 30 km of the Fukushima-1 site and, in addition, **bottom trawling was banned** in northern Ibaraki. These fishing bans are currently still in place (as of February 2012). A strategy to ensure that contaminated fish landed from Japanese waters did not enter the market place was then implemented by the Japanese Fisheries Agency. In accordance with this strategy, titled *Basic Policy for Inspections on Radioactive Materials in Fishery Products*, sampling and inspections were conducted for a range of fish, shellfish and seaweed species living at surface, middle column and bottom of the sea on a weekly basis, at the major fishing ports in Fukushima and neighbouring prefectures.

For species where the radioactivity levels exceeded the Provisional Regulation Value distribution has been restricted in accordance with instructions by the Government of Japan or fishing activities have been restricted in accordance with the official requests made by the Prefectural Governments.

Species outside the closed areas are included as part of this **monitoring programme** and commercial operations are only allowed as and when analyses for these commercial species confirm levels to be below Provisional Regulation Value. After resuming fisheries operations inspections continue once a week at the main landing ports in order to confirm safety of fishery products. Furthermore sampling inspections continue at the main landing ports on a weekly basis for migratory fish species such as skipjack tuna, chub mackerel and Pacific saury.

The Fukushima disaster instigated a change to the Regulation Value of iodine-131 in fishery products to be consistent with the standard used for vegetables in Japan (2,000 Bq/kg).

Many countries implemented **import controls** for products from Japan. The EU introduced Regulation No 351/2011 (11 April 2011) imposing special conditions governing the import of feed and food originating in or consigned from Japan following the accident at the Fukushima nuclear power station which restricted imports and re-set Maximum Permissible Levels to be consistent with those set in Japan. The EC also recommended that all fish and shellfish coming into the EU from Area 61 (Pacific Northwest) be monitored.

A technical meeting in May 2011 was held **on preparedness** and response to nuclear and radiological emergencies affecting food and agriculture, including the application of countermeasures and remediation strategies. The meeting focused on enhancing FAO strategies, action plans and inter-agency agreements for **early, short, medium and long term responses** to nuclear emergencies. Key responses in relation to food safety were considered to be:

**Box 5 – Myanmar cyclone Nargis, 2008 (cont.)**

Early	Short term	Medium-long term
Coordination with international stakeholders; Food restrictions and food trade; Sampling strategies and methodologies; Mechanisms to deal with contaminated commodities.	Provision of advice on the production of commodities in other affected countries; and National and international trade issues.	Strategies for resumption of aquaculture/re-opening of fishing grounds; and Development of traceability mechanisms to help ensure food safety, food authenticity and to support trade in foodstuffs.

Sources: Nomura 2011; FAO 2011a.

### 2.1.3 Complex emergencies

Case studies for Sri Lankan civil war and Democratic Republic of Congo conflicts are provided in Box 6 and Box 7.

Global fisheries are a key component of food and income security in regions of the world where civil conflict has been most prevalent during the past half-century. A recent study by Hendrix and Glaser (2011) examined the effects of civil conflict on reported marine and inland fish catch, focusing on the effects of conflict through redeployment of labor, population displacement, counter-insurgency strategy and tactics, and third-party encroachment into territorial waters. The first three mechanisms apply to both inland (freshwater) and marine fisheries, while the fourth primarily affects marine capture fisheries.

Hendrix and Glaser (2011) found a statistically robust and negative relationship between civil conflict and fisheries, with civil wars depressing catch by over 16 percent relative to prewar levels. The authors did recognize, however, that civil conflict could lead to lower reported fish catch by increasing IUU activity, but did not test this scenario. Post-conflict fisheries were not found to bounce back quickly to prewar catch levels due to more rapid growth. Analysis of conflict episodes indicated that conflict intensity, measured by battle deaths, negatively affects fish catch, while population displacement and conflict proximity to the coast did not.

Conflicts can undermine confidence and trust in the present laws, formal and informal rules and regulations and hence governance. Post-conflict co-management and community management arrangements are vital in encouraging buy-in to existing or up-dated management measures, as well as harmonizing where necessary across territorial waters. However while there is certainly a broad governance issue of inadequate institutional connectivity related to conflict, it is not always easy to tease out specific effects or how these have changed after the conflicts. Many fisheries policy and management deficiencies in conflict areas may continue long-after conflicts cease, indicating that conflicts may not have been the sole cause of such deficiencies.

A combination of complex emergencies and natural disaster impacts can lead to cumulative issues. For example post-tsunami the civil conflict in Sri Lanka made effective engagement with local communities in the conflict zones more difficult.

### Box 6 – Impacts of the Sri Lankan conflict

**The Event:** The Sri Lankan Civil War was a conflict beginning on July 23, 1983, with an on-and-off insurgency against the government by the Liberation Tigers of Tamil Eelam (the LTTE, also known as the Tamil Tigers), a separatist militant organization which fought to create an independent Tamil state named Tamil Eelam in the north and the east of the island. After a 26 year long military campaign, the Sri Lankan military defeated the Tamil Tigers in May 2009. In relation to fisheries, impacts in the Jaffna district were especially pronounced with 15,000 fishers displaced into refugee camps, 12,000 fishing community homes destroyed and loss of 6,000 fishing craft as well as fishing gear and engines. Also in the Jaffna region 11 ice plants, 2 net factories and associated infrastructure were destroyed.

**Fisheries policy and management issues and responses:** During the war, the conflict, which was particularly focused in the north-east of the country, placed a wide range of limitations on ensuring effective implementation of fisheries and aquaculture policy and management. One such problem was the **difficulty in gathering complete and accurate data on fish catch and effort** throughout the conflict period on which management measures should have then been defined (note this problem was not unique to the conflict area). There was also **no proper boat registration or licensing** of fishing operations introduced under the 1996 Fisheries Act. Again this problem was not unique to the conflict area, and boat registration became an issue following the tsunami, when it quickly became apparent that the MFARD / DFAR had little idea how many boats there were in the country before the tsunami (there were district totals but these were not based on actual data from the villagers). The conflict situation also meant that the ability of donors to support the government in implementation fisheries management projects in the north-east was severely reduced. For example, a project funded by the Canadian International Development Agency (CIDA) executed by FAO and implemented by the Ministry of Fisheries and Aquatic Resources (MFAR) during 2007 to 2010, was **not able to complete stock assessments and to develop co-management arrangements and fisheries management plans in the north-east**, although it did so in other areas of the country. The conflict also **reduced the ability or focus of the government on preventing IUU fishing**, and there were many reports of illegal activities by Sri Lankan vessels in the waters of other countries, and of Indian vessels in the north-east which are thought to continue today. This latter point is potentially of great significance in terms of the sometimes-held view that security measures have effectively created a virgin fishery with huge potential for increases in production – this is not the case.

Fishers themselves were also strongly impacted by the conflict. One example was migration of fishing boats to the more peaceful south and west coasts thus potentially resulting in **overcapacity in these other areas** (Flewwelling and Hosch, 2003). The conflict also impacted on movements of fishermen into the conflict area, particularly for fishermen using small fiberglass vessels which were transported on the back of lorries - traditionally Sinhala fishers migrated from western and north-western areas in particular at certain times of the year, but with increased conflict in the north-east, **these migrations were drastically reduced**. But perhaps the most important impact of the civil war for fishers was that there were a number of what were called “**surveillance zones**” in the periphery of High Security areas. This made it compulsory for all the fishers going out to fish to register themselves with the check points and it was mandatory that they came back within the permitted time limits (and no night-time fishing was allowed). Another policy connected with security was the **restriction on the power of engines** (to 15 hp) since there was concern from the military about the use of powerful engines for activities related to the war (engines were taken off the boats every night and locked in a guarded compound). In addition the **transport difficulties** due to the large number of checkpoints impacted on **prices and fish quality and in some cases the ability to get fish to market** at all. A measure of the impact of all these factors can be gauged from the fact that fisheries production in Jaffna and Mannar declined from just under 70,000 tonnes in 1983 to just 21,000 tonnes in 2009.

### Box 6 – Impacts of the Sri Lankan conflict (cont.)

After the end of the conflict most of the aforesaid restrictions (surveillance areas, restricted fishing times, and engine capacities) were removed. At the same time there was a lot of rather ‘unplanned enthusiasm’ to rebuild the fisheries in the north and east, with accelerated development programmes which were sometimes **politically rather than technically motivated**. However, a positive role of the Government (more generally rather than specifically focused on the fisheries sector), was to coordinate the various inputs being made by different donors to the re-building process immediately following cessation of hostilities.

Thinking ahead to the future, The ‘Fisheries Sector Development in the Northern Province of Sri Lanka’ (MFAR 2010) includes the following targets for the **introduction of boats and engines** in the four districts of Mullaitivu, Jaffna, Kilinochchi and Mannar up to 2013:

- 2,569 17 -24 ft fibreglass boats
- 1,822 Vallams/kattumaram (single hull craft)
- 150 log craft
- 2,009 outboard marine engines
- 300 one day boats with engines
- 30 multi-day boats

There is now also a strong policy to increase production in the Northern Province, with a **production target** of 78,000 tonnes from the coastal waters of this province by 2013 specified in the Plan for the North. This plan also has clearly specified **objectives** for the sector, as well short- and medium-term strategies, which cover issues such as **conservation measures, food security and increasing export earnings**. There are some encouraging features of the programme to support fisheries in the north-east. One is the emphasis on the **development/rehabilitation of badly neglected fisheries infrastructure** (including better landing facilities, ice water, electricity, access roads) while a second is the **rehabilitation of sector representative organizations** which were historically some of the strongest in Sri Lanka (note also that MFARD has recently introduced the concept of ‘Rural Fisheries Organisations’, as the village level partner for all future fisheries development. There is a desire not to work with cooperative societies as they are legally the responsibility of the cooperative department, not DFAR).

Finally, the post-conflict situation has thrown up some interesting policy choices for government and donors. One post-conflict issue was the problem of the ‘unit cost’ of supporting **fishers versus farmers** – Rs 15,000 (US\$120) buys a farmer a starter package (e.g. seeds, chicks, tools) whereas ten times that amount may be required to get a fishermen back on the water. There are policy lessons for governments trying to attract donor support, when donors are looking to maximise the impact for their money.

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Source: FAO 2004; Flewelling and Hosch 2003; Fernando, C., Pers. Comm., 2012; Joseph, L., Pers. Comm., 2012; consultants’ own experience; Diffey, S., Pers. Comm., 2012; Creech, S. Pers. Comm., 2012; Ministry of Fisheries and Aquatic Resources Sri Lanka 2010.

### Box 7 – Democratic Republic Congo conflict, 2003

**The Event:** In 2003 the Democratic Republic of Congo (DRC) officially ended a five-year conflict between government forces (supported by Angola, Namibia and Zimbabwe) and rebels (supported by Uganda and Rwanda) which left a fragmented and traumatized society. The Congo civil war was largely confined to the eastern provinces, far from the country's ports, however it did impact a number of inland fisheries including Lake Albert and Lake Edward which both border with Uganda.

**Fisheries policy and management issues and responses:** The fish stocks in Lake Albert and Lake Edward are reported to be declining in species diversity, overall production, and the average size of fish caught, mainly due to the extensive use of destructive and partly **illegal fishing gears and methods** by Ugandan and Congolese fishermen. Sensitive habitats, spawning grounds and nursery habitats were degraded due to **unsustainable practices which were uncontrolled during the period of conflict** (and which may have also continued post-conflict i.e. the conflict was not the only reason for poor fisheries management although probably contributed to it).

The lack of control and management was exacerbated by a number of **fisheries management projects being reluctant to work in the area**, or having their project interventions impacted. For example on the Integrated Lake Management (ILM) Project which ran for five years from 1999 to 2004, staff were initially hesitant about selecting Lake George as a pilot area because of the conflict and insecurity in SW Uganda. This was related to the DRC situation, and at that time in Uganda the Lords Resistance Army (LRA) was causing problems of banditry, robbery and murder. The project had to bring all its local team based in Kasese to stay in Kampala during the worst attacks. A critical issue and influence on fisheries in DRC during the conflict was also the **disconnect between central and local decision-making power**. The local military controlled most activities around Lake Albert. During the ILM, project staff found it extremely difficult to work with DRC on Lake Edward simply because of the lack of government influence at local level and the center-regional-local disconnects in terms of communication and authority.

While agreements on the **minimum mesh size of fishing nets** existed between Uganda and the DRC before the Congo Wars, some Congolese fishermen reportedly ignored this guideline since enforcement was difficult during the conflict. While the Ugandan law on fishing prohibits use of gillnets of less than five inches on Lake Albert, no such law exists on the DRC side (and this may be true today, meaning that the problem was not just the result of the conflict).

While projects have worked to assist approximately 13,500 former combatants to establish new livelihoods as fishermen throughout DRC, with the aim of providing economic opportunities to a number of communities and working towards strengthening community security, this has led to **increased pressure on fish resources**. Numbers of fishers have increased on lakes throughout the region so this is not simply a conflict influence – but it may have been exacerbated by the inclusion of misguided post-conflict measures to increase employment via fisheries.

At the international level, the Nile Basin Initiative (NBI) and particularly its Nile Equatorial Lakes Subsidiary Action Program (NELSAP), with funding from the African Development Bank, financed several small-scale projects for improved resource management in the Lake Albert region, through the Lakes Edward and Albert Fisheries (LEAF) Pilot Project. The LEAF Project was designed to address the problem of lack of coordination in regulations on fishing between the riparian countries of Lake Albert through the development of an Integrated Lake Management Plan. The LEAF project addressed the following four components:

1. Fisheries Studies and Preparation of Lakes Management Plan;
2. Community Co-Management of Lakes Edward and Albert;
3. Community Development Activities; and,
4. Pilot Project Coordination and Institutional support

### Box 7 – Democratic Republic Congo conflict, 2003 (cont.)

The LEAF project identified a key constraint in natural resource management of the Equatorial lakes region to be the general **lack of active community participation in management programmes**. Usually the government imposes regulations on fishing communities who may not understand or even be aware of the regulations. This creates conflicts between the government law enforcement officers and the communities, particularly where conflict or civil war are underway. Furthermore, the communities are rarely involved in planning and implementation of the regulations. The LEAF project therefore involved full participation of fishing communities and other stakeholder in planning and implementation of co-management activities. It also worked to **harmonize fishing policies and regulations across the two countries**, again with the aim of reducing conflict while improving resource sustainability.

In its pilot phase, the LEAF project succeeded in establishing transboundary contacts through the introduction of the **fisheries co-management** concept, including the **prevention of conflicts** through a social system of “early warning”. This early warning system works in an informal way: when persons cross the borders and are arrested or accused of illegally exploiting resources, informal networks enable calling the person in charge of the project in the other country who intervenes to solve the dispute peacefully (Westerkamp and Houdret, 2010).

Sources: UNDP 2009; TVE 2010; Westerkamp and Houdret 2010; Johm *et al.*, 2003; Scullion, J., Pers. Comm., 2012)

## 2.2 KEY REQUIREMENTS FOR IDENTIFYING FISHERIES AND AQUACULTURE POLICY, MANAGEMENT AND CAPACITY NEEDS IN EMERGENCY SITUATIONS

The key requirements in identifying policy and management needs and capacities are threefold. Firstly a review should be completed of existing policy and management content and processes, and the extent to which the policy framework is already enabling for post disaster responses (i.e. is it clear, is it flexible, it is robust and based on best practice, etc). Secondly, existing data and information of relevance should be obtained from secondary/tertiary sources about the impacted area (e.g. vessel numbers, area-specific management measures, species landings volumes and values, etc). Thirdly, field-based surveys should be completed of the impacted areas. The completion of these three steps should be consultative and participatory, and completed by government and sector experts working with local communities and civil society to ensure that policy and management needs and potential actions are fully supported by local stakeholders.

Completing these steps requires a certain level of skill and capacity in policy and management issues, and in dealing with response situations. Assessment of such capacities before disasters occur can also help Governments and outside agencies to prepare for emergencies and to assess whether the policies and capacities are likely to be suitable and sufficient in a post disaster situation (and can therefore help to identify what is needed before disasters occur). Their completion before disasters occur may also be beneficial as they can be completed in a more robust/thorough way than after disasters when less time may be available.

Whether completed before or after disasters, the completion of these three steps can help to determine the extent to which existing policy and management processes and content:

- Are already robust and relevant, and therefore provide a good framework for post-disaster responses;
- Are generally robust, but require modification due to the special circumstances resulting from the disaster (e.g. should particular management measures be relaxed for certain periods, should special subsidies be used which would otherwise not be approved, etc); or

- Are generally weak, and the post-disaster situation thus provides an opportunity to 'build back better' (e.g. longer-term objectives should be given greater priority, weaknesses in vessel licensing and registration, over-capacity in the fleet can be addressed through the process to control the provision of new vessels to communities, management support can be used to establish fisheries management plans which were previously not in existence).

Once the three steps above have been completed, those involved with post-disaster responses can then assess the potential costs of the fisheries and aquaculture policy and management requirements, compared to the resources that are available. A careful process of prioritization of policy and management responses is then required, again based on full stakeholder participation and set in respect to short-term and long-term objectives. This prioritization should involve both the timeframe for implementation of support, as well as the relative importance of potential policy and management responses and actions, so as to maximize the impacts of the financial and human resources available in the post-disaster context.

As evident from the text already presented in Section 1, fisheries and aquaculture policy and management needs and capacity may vary depending on the type of emergency or nature and extent of the disaster.

For natural disasters the immediate focus is often on measures to alleviate food shortages working towards food security and removing reliance on food aid, thereby building towards sustainable livelihoods. In this context the provision of assets, including vessels and fishing gear, is often a priority, and from a policy and management perspective should be consistent with the ecological resources available, ensuring that overcapacity does not occur by, for example, implementing vessel registration and licensing systems, and by making sure that gear is compliant with existing regulations and promotes sustainable fishing (e.g. mesh size etc). The loss of personal (through loss of life or displacement) as a result of a disaster can severely impact on institutional/governance capacity to implement all forms of fisheries and aquaculture policy and related management measures. Policy and management measures that have been developed and previously implemented through a co-management approach, rather than through an imposed top-down approach, may be more likely to be sustainable in post disaster situations. Other policy objectives and management measures of relevance also often relate to the re-establishment of processing and landings infrastructure and re-instating supply chain linkages (and the quality of product) to market.

For technological disasters the immediate focus is typically on the policy objective of food safety standards to ensure contaminated fish and shellfish does not enter the supply chain. The principal fisheries management measure implemented in the case studies examined was area closures based on impact assessment of the contamination extent. Detailed monitoring and sampling programmes covering landings at sea and at port are critical in such contexts in determining safe resumption of production. An impact not explored within the case studies is the displacement of fishing effort as a result of area closures, which could lead to overexploitation of other resources or conflict over diminished fishing grounds.

For complex emergencies the immediate focus may need to be on establishing conflict resolution mechanisms, harmonizing management across boundaries/territorial waters, reducing corruption, ensuring effective enforcement of legislation, and supporting movement into fisheries livelihoods (where sustainable) and alternative livelihoods, through training and provision of productive assets.

Post complex emergencies, in situations where fisheries policy and management may previously have been severely lacking and given a low focus, special support may be needed to conduct stock assessment of resources, and then to work with stakeholders to establish policy and related management measures.

### 2.3 LINKAGES BETWEEN POLICY MAKERS AND MANAGERS WITH OTHER ELEMENTS OF THE EMERGENCY RESPONSE PARTNERSHIP

Fisheries and aquaculture policy and management provides the overall framework for guiding the sectoral linkages, and also potentially for the linkages with non-sectoral support. Additional text is not provided here, as earlier text has already highlighted the need for good linkage between the different dimensions of the EAF, between short- and longer-term needs, and between specific policies and management responses. Other thematic background papers to the Guidelines consider the linkages between support for those topics (e.g. infrastructure, fishing gear, etc) and other services provided to the fisheries and aquaculture sector in the context of emergency responses. The reader is thus referred to the relevant sections of other background thematic papers for more discussion.

### 2.4 SUMMARY OF LESSONS LEARNED

The case studies and related discussion above highlight a number of important lessons learned:

1. **The impacts of disasters and emergencies can in many cases be greatly reduced if policy and management frameworks include contingency planning** for when such disasters take place. For example early warning systems can dramatically reduce both the loss of life (which might otherwise impact on management capacity), as well loss of physical assets, thereby helping to ensure that policy objectives in terms of sustainable livelihoods are not compromised as much as they would otherwise have been.
2. **Processes to develop fisheries and aquaculture policy are, in many countries, weak.** More inclusive and transparent mechanisms for defining and implementing policy and management tools can greatly increase their efficiency, effectiveness, sustainability and relevance to stakeholder needs and aspirations. This implies that both in terms of pre-disaster planning, as well as post-disaster responses, particular efforts should be made to ensure that policy and management responses are based on inclusive and transparent decision-making.
3. **There can be significant challenges in balancing environmental, economic and social objectives (i.e. the EAF dimensions) in post-disaster/conflict situations,** in particular by short-term pressures to support individuals and communities in their efforts to rebuild livelihoods, which may result in long-term negative environmental (and social and economic) impacts. These challenges are usually present before a disaster/emergency, become more pressing in post-disaster/conflict situations. There may be legitimate reasons for altering policy and management objectives, shifting policy priorities, or introducing new/changed management measures in post-disaster situations, but such changes should be carefully considered for their potential impacts.
4. **Existing policy and management frameworks may already provide robust guidance for the sector,** which can and should be used to inform post-disaster efforts e.g. what is the existing policy on fishing net mesh sizes, what is the policy with regards to subsidies, what is the policy with respect to the zoning of aquaculture developments?. As already noted, they can be examined before disasters to identify gaps and requirements for improvements which will support more robust post-disaster actions.
5. In cases where policy and management frameworks provide only weak guidance for the sector, **post-disaster situations may provide an opportunity to ‘build back better’** and for actions taken post disaster to become embedded in new policy and management processes and content. This may be particularly the case on cessation of complex emergencies/military conflicts, when donors may be especially keen to provide support, and where a lack of existing policy

- and management (its definition and its application) may provide an almost 'clean-sheet' for the specification of future policy and management content and processes based on best practice.
6. As with policy and management decision-making and actions in normal situations, those engaged with policy and management in post-disaster situations may be faced with less than perfect information on which to base their decisions. While decisions should of course be based on all available information, in cases **where information is lacking, this should not necessarily mean that actions should not be taken.** Through a precautionary approach to interventions, and one based on careful risk assessment, it should be possible to take and implement policy and management decisions which will speed up the short-term benefit to stakeholders, while reducing longer-term negative impacts of such decisions. But the lack of perfect information can also argue for the need for 'learning as you go'.
  7. Because of their different impacts, **different forms of disasters/emergencies may have very different implications in terms of policy and management requirements and responses.**
  8. In post-disaster situations, and particularly in the context of complex emergencies, **loss of human capacity (from loss of life and/or displacement) may have very significant impacts on the ability of those usually involved in policy and management decision-making, to continue to do so.** The impacts of disasters on human capacity relates not just to government staff, but also to key representatives within fishing communities and civil society who may be involved in co-management arrangements. This poses particular challenges in ensuring that good policy and management decisions are taken.
  9. Needs assessments should consider **both short-term and medium-term recovery objectives**, and policy and management experts and other stakeholders can play a crucial role in informing this distinction.
  10. While being a slightly circular argument, the case studies and past experience of post-disaster situations suggest that a key lesson learned is that **lessons should be learned!** Support for this learning process can be provided by structured monitoring of post-disaster responses while it is ongoing, as well as by rigorous and timely evaluations of post-disaster responses once they have been completed. These monitoring and evaluation processes should clearly document the main successes and failures of such responses, and provide recommendations for improved responses in the future.
  11. There is typically a strong benefit of establishing a **mechanism for emergency relief coordination** and a **sector specific task force** that can help to ensure that emergency response efforts are aligned to sector objectives.



## 3. Review of existing standards and guidelines relevant to fisheries & aquaculture policy and management capacity in the context of emergency response

### 3.1 OVERVIEW OF EXISTING GUIDELINES AND STANDARDS RELEVANT TO EMERGENCY SITUATIONS

Existing standards and guidelines that relate to fisheries and aquaculture policy and management, and which may be relevant for policy makers, managers, and relief workers in post-disaster situations, can be divided into three main types: fisheries specific standards and guidelines; aquaculture-specific standards and guidelines; and more generic emergency response guidelines.

Some of the key standards and guidelines are presented below, but the text below is certain to be far from a complete review, especially given national-level guides and standards which may be available.

This section thus focusses most specifically on international and regional standards and guidelines that exist, and which may be useful in emergency response situations. The section is not intended to provide any great detail on each standard/guide, but rather just to highlight their existence for the reader.

Other standards and guidelines also exist around a large number of other areas, which are not presented here in the form of summary paragraphs, but which include a) guidance on policy and management topics and b) tools and frameworks for understanding the sector and therefore informing policy and management responses, as follows:

- Port State Measures i.e. the responsibilities of States to manage fishing;
- Flag State responsibilities i.e. the responsibilities of countries giving flags to vessels and having vessels on their vessel registries;
- The FAO Compliance Agreement (1993);
- The United Nations Fish Stock Agreement (UNFSA (1995));
- Traceability and Hazard Analysis Critical Control Point (HACCP) guidelines as they pertain to fisheries and aquaculture;
- The EC IUU regulation (effective from 2011) and the related requirements for catch certification schemes;
- Value-chain analysis as a framework for understanding fisheries and aquaculture;
- The use of Participatory Rural Appraisal and Rapid Rural Appraisal in fisheries;
- Livelihoods analysis; and
- Fair trade issues.

#### 3.1.1 Fisheries policy and management frameworks and guidelines

The FAO Code of Conduct for Responsible Fisheries (CCRF) was adopted in 1995 to promote long-term sustainable fisheries. The CCRF sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources,

with due respect for the ecosystem and biodiversity. It actually covers both fisheries and aquaculture, but Section 3.1.2 below discusses the aquaculture-specific guidelines associated with the CCRF as well as other aquaculture standards and guidelines. The CCRF recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all those concerned with the fishery sector. The FAO has published 27 **technical guidelines** to support implementation of the code. A number of these relate to the ecosystem approach to fisheries (see next paragraph) or to aquaculture (see Section 3.1.2), but others with perhaps most relevance to this background paper and the emergency response guidelines include:

- Fisheries management. 4. Marine protected areas and fisheries
- Fisheries management. 3. Managing fishing capacity
- Inland Fisheries. 1. Rehabilitation of inland waters for fisheries
- Increasing the contribution of small-scale fisheries to poverty alleviation and food security.
- Implementation of the International Plan of Action to deter, prevent and eliminate, illegal, unreported and unregulated fishing
- Fisheries management. 1. Conservation and management of sharks
- Indicators for sustainable development of marine capture fisheries
- Fishing operations. 1. Vessel monitoring systems
- Fisheries management.
- Inland fisheries.
- Integration of Fisheries into coastal area management.

The **Ecosystem Approach to Fisheries (EAF) Fisheries management 2. The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries No.4 Suppl.2** (published in 2003), provides a practical set of guidelines for implementing EAF including a range of management measures, approaches and processes. A series of expert workshops have studied the development and use of indicators for EAF relevant to ecological well-being, human well-being and ability to achieve (FAO 2010) and provide additional guidance. Other FAO technical Guidelines include.

- Fisheries management. 2. The ecosystem approach to fisheries. 2.2 The human dimensions of the ecosystem approach to fisheries.
- Fisheries management. 2. The ecosystem approach to fisheries. 2.1 Best practices in ecosystem modeling for informing an ecosystem approach to fisheries.

In Fletcher *et al.*, (2012) provide a set of **technical guidelines based on the outcomes of the Report of a Workshop on a Toolbox for the Ecosystem Approach to Fisheries (EAF)**, held in Rome, Italy, 26-29 February 2008. The Technical Document is consistent with the newly drafted interactive web-based version of the EAF Toolbox which is located on the **FAO EAFNet website**. The development of the EAF toolbox website and technical guidelines document was conceived as a method to support the overall implementation of EAF, particularly for those in developing countries. It focuses on the planning processes required to develop and implement an EAF based Fishery Management Plan by breaking this process down using a stepwise but comprehensive approach along with a description of various options to complete each of these steps. The technical guide is supported by a series of web-based EAF Tool Fact Sheets (which are located on the EAF Toolbox website) that provide the details on the variety of tools that are now available to assist complete this management planning process.

**FAO International Plans of Action (IPOAs)** are voluntary instruments elaborated within the framework of the CCRF and apply to all States and entities and to all fishers. Four IPOAs have been developed to date: IPOA-Seabirds; IPOA-Sharks; IPOA-Capacity; and IPOA-IUU. The FAO website provides technical notes in some cases (e.g. on seabirds) on developing national plans of action, as well as full details on the IPOAs.

Hall *et al.*, (2005) **Guidelines for designing data collection and sharing systems for co-managed fisheries** is composed of two parts. Part I is a practical guide for co-managers and facilitators working in the field and offers simple and practical advice on helping stakeholders identify their information needs in relation to their management objectives and responsibilities, and developing collaborative ways of collecting and sharing the information in the most effective way. Part II provides technical guidelines with more technical detail on each of the sections in the practical guide, including: examples of the types of data that might be of interest to different stakeholders; data collection methods and sources; the design of sampling programmes, and some guidance on data analysis and interpretation.

**Poverty Reduction Strategy Papers** (PRSPs) are documents required by the International Monetary Fund (IMF) and World Bank before a country can be considered for debt relief within the Heavily Indebted Poor Countries (HIPC) initiative. PRSPs are also required before low-income countries can receive aid from most major donors and lenders. PRSPs are prepared by the member countries through a participatory process involving domestic stakeholders as well as development partners. They are updated every three years and describe the country's macroeconomic, structural and social policies and programs to promote broad-based growth and reduce poverty. In some countries PRSPs specifically highlight fisheries and aquaculture as a priority sector, and may outline particular strategies for the sector. All PRSPs and so-called interim PRSPs (IPRSPs) can be found on the website of the International Monetary Fund.

**United Nations Convention on the Law of the Sea** (UNCLOS) defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The convention introduces a number of provisions including exclusive economic zones, continental shelf jurisdiction protection of the marine environment, scientific research, and settlement of disputes.

**Regional Fishery Bodies** (RFBs) are a mechanism through which States or organizations that are parties to an international fishery agreement or arrangement work together towards the conservation, management and/or development of fisheries. There are RFBs worldwide covering the following regions: global and trans-ocean (4), Pacific Ocean (12), Mediterranean, Black Sea and connecting waters (1), Indian Ocean (5), Atlantic Ocean (14) and Inland waters (7). 20 of these RFBs have a management mandate and 22 have an advisory (scientific and/or management) mandate. These RFBs have published and agreed Resolutions (binding on members) or Recommendations (voluntary but advisable), many of which cover fisheries policy and management issues.

In addition to the internationally recognised policy and management standards and guidelines highlighted above, there are also other frameworks and documentation that may be of benefit in emergency situations because of their focus on policy and management issues. For example, the **Marine Stewardship Council** runs a fishery certification program and seafood ecolabel which recognises and rewards sustainable fishing. The MSC has developed standards for sustainable fishing based around three main principles: sustainable fish stocks; minimising environmental/ecosystems impacts; and effective governance and management. Each principle is assessed against a number of very specific performance indicators. The MSC framework complies with the CCRF and its guidelines on eco-labelling, and can be used a useful framework for benchmarking the performance of particular fisheries against best policy and management practice. Another example relates to policy and management on climate change, where standards and methodologies exist to assess Green House Gas emissions from fisheries, which can underpin related management efforts to reduce such emissions. For example the **British Standards Institute PAS 2050 Life Cycle** standard is an internationally applicable standard that provides a method for assessing the life

cycle greenhouse gas (GHG) emissions of goods and services (jointly referred to as “products”). It can be used by organizations of all sizes and types, in any location, to assess the climate change impact of the products they offer.

### 3.1.2 Aquaculture-specific guidelines and standards

Within the aquaculture sector, a lot of examples of best practice can be found in case study material and grey literature, in published articles, and in private standards attached to various labels, in national guidelines, or in international guidelines, on issues such as genetic risk analysis, ecological risk analysis, spatial planning and zoning, aquatic animal health, etc. However, while there are some international guidance documents as discussed below (the following list does not include any journal articles), there are few internationally negotiated standards having a legal basis with which producers must comply, mainly because aquaculture has traditionally been seen as a strongly national matter and not the subject of international regulation. This notion is being challenged with global trade and the entry of NGOs advocating policy and management changes.

**Aquaculture development (FAO Technical Guidelines for Responsible Fisheries No. 5)** is a technical guidelines document prepared by FAO in support of the CCRF (FAO, 1997) providing a framework for responsible aquaculture development including good aquaculture feed manufacturing practice. Other technical guidelines and related supplements include:

- Aquaculture development. 6. Use of wild fishery resources for capture-based aquaculture
- Aquaculture development. 5. Use of wild fish as feed in aquaculture
- Aquaculture development. 4. Ecosystem approach to aquaculture.
- Aquaculture development. 3. Genetic resource management.
- Aquaculture development. 2. Health management for responsible movement of live aquatic animals.
- Aquaculture development. 1. Good aquaculture feed manufacturing practice.

Brugère *et al.*, (2010) provide **practical guidance to aquaculture policy-makers and implementers** on policy formulation and processes. The Paper starts by reviewing governance concepts and international policy agendas relevant to aquaculture development and proceeds by defining “policy”, “strategy” and “plan” while explaining common planning terminology. The paper proposes practical steps for improving policy formulation processes. This paper followed an FAO expert consultation on the same topic (FAO, 2008d), which elaborated guidelines for improving planning and policy development in aquaculture highlighting steps towards good planning, policy formulation and implementation for the sustainable development of the aquaculture sector.

In **Fisheries and Aquaculture Technical Paper. No. 527**, Philipps *et al.*, (2009) provide a **compilation, review and synthesis of existing Environmental Impact Assessment (EIA)** and environmental monitoring procedures and practices in aquaculture in the Asia-Pacific region, the largest aquaculture-producing region in the world. This review gives special consideration to four areas related to EIA and monitoring in aquaculture including: (1) the requirements (2) the practice (3) the effectiveness and (4) suggestions for improvements.

Chapter 10 of **FAO Fisheries Technical Paper No. 402** (FAO/NACA, 2000) provides guidance on the important issue of import risk analysis in aquaculture. This issue is also covered in **FAO Fisheries and Aquaculture Technical Paper. No. 519** (Arthur *et al.*, 2009) with each chapter providing pointers to existing guidelines/standards.

**FAO Technical Guidelines on zoning and carrying capacity** (related to the implementation of the Ecosystems Approach to Aquaculture – EAA) are in preparation (and should be issued in 2013).

**Technical Guidelines on aquaculture certification** (FAO 2011b) provide guidance for the development, organization and implementation of credible aquaculture certification schemes (see below).

The **International Principles for Responsible Shrimp Farming** (FAO, NACA, UNEP, WB and WWF, 2006) provide guidance for implementing the CCRF and Aquaculture Development technical guidelines, and have been adopted by the FAO's Committee on Fisheries (COFI). They consider technical, environmental, social and economic issues associated with shrimp farming and provide a basis for industry and government management to improve the overall sustainability of shrimp farming at national, regional and global levels.

The **ICES Code of Practice on the Introductions and Transfers of Marine Organisms 2003** was originally developed for marine aquaculture activities, but in recent years, by far the largest number of introductions has been for re-stocking or enhancement purposes but the same principles should apply. The Code follows the precautionary approach adopted from the FAO principles (FAO 1995) with the goal of reducing the spread of exotic species.

An **Aquatic Animal Health Code** is provided by the World Organisation for Animal Health (OIE) (2011). This Code sets out standards for the improvement of aquatic animal health and welfare and veterinary public health worldwide, including through standards for safe international trade in aquatic animals (amphibians, crustaceans, fish and molluscs) and their products. The health measures in the Aquatic Code should be used by the veterinary authorities of importing and exporting countries to provide for early detection, reporting and control of agents pathogenic to aquatic animals and, in the case of zoonotic diseases, for humans, and to prevent their transfer via international trade in aquatic animals and aquatic animal products, while avoiding unjustified sanitary barriers to trade.

The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) is an advisory body, established in 1969, that advises the United Nations (UN) system on the scientific aspects of marine environmental protection. **GESAMP Environmental Quality Standards (EQSs)** for marine, freshwaters and sediments have been developed and although there are no global values many countries have their own standards which are used to assess pollution levels in the aquatic environment.

The **Global Aquaculture Alliance Best Aquaculture Practices (BAP)** standards address environmental and social responsibility, animal welfare, food safety and traceability in a voluntary certification program for aquaculture facilities. BAP certification defines the most important elements of responsible aquaculture and provides quantitative guidelines by which to evaluate adherence to those practices. Standards exist for salmon, shrimp, tilapia, and *Pangasius*.

The World Wildlife Organisation (WWF) has been working since 1994 on the development of **Aquaculture Dialogue standards**. Four of the eight sets of standards are now complete (on tilapia, abalone, bivalves, and catfish [*Pangasius*]). Standards for freshwater trout, salmon, shrimp, *Seriola* and cobia will also shortly be finalised.

Closely linked to the aquaculture dialogue standards highlighted above, are the **Aquaculture Stewardship Council (ASC) standards**, which are to be used in the certification of responsible aquaculture production. ASC has created a set of tools and supporting documentation to help farmers, supply chain actors and certification bodies, and the ASC standards themselves are based on the aquaculture dialogue standards.

### 3.1.3 Emergency response guidelines and standards

The **Hyogo Framework for Action (HFA)** is a 10-year plan to make the world safer from natural hazards. It was adopted by 168 Member States of the United Nations in

2005 at the World Disaster Reduction Conference. The HFA is the first plan to explain, describe and detail the work that is required from all different sectors and actors to reduce disaster losses. It outlines five priorities for action, and offers guiding principles and practical means for achieving disaster resilience. Its goal is to substantially reduce disaster losses by 2015 by building the resilience of nations and communities to disasters.

The **FAO Response Analysis Framework (RAF)** was developed to generate interagency consensus around response analysis concepts and process. It defines response analysis as: the process by which a range of appropriate and feasible options to address the existing and/or likely food or nutrition insecurity of target populations is identified (FAO, 2011c).

The **Strengthening Decision Making in Relief and Recovery Improved Response Analysis Capacity Project** aimed to make World Food Programme (WFP) food security analysis products more useful for programmers by strengthening the links between assessments and programme design. In order to achieve this the project aimed to: (a) mainstream response analysis by ensuring better alignment between assessment results and project design cycle; (b) strengthen methods and tools so that assessments can identify the most appropriate food assistance responses, and (c) ensure strategic linkage with the FAO RAF project.

**Oxfam GB's Response Analysis for Emergency Food Security and Livelihoods Programme** uses two sets of criteria to determine appropriate actions in emergency response: those related to the needs and livelihoods of the affected population; and those related to the implementing agency's goals, capacity, and the operating environment in which it finds itself.

The **Emergency Market Mapping and Assessment (EMMA)** process consists of three interconnected analytical steps: gap analysis, market analysis and response analysis. It is intended to help agencies responding to emergencies better understand and utilize market systems for improved emergency response and therefore reduce the risk that these responses cause additional harm to market systems and livelihoods

**Market Information for Food Insecurity Response Analysis (MIFIRA)** guides the choice between in-kind food aid, cash transfers or a combination. It addresses two core questions in guiding this decision: 1. are local markets functioning well? and 2. is there sufficient food available nearby to fill the gap?

**Livestock Emergency Guidelines and Standards (LEGS)** assist the identification of the most appropriate livestock-related responses while ensuring these responses adhere to minimum standards. LEGS focuses on immediate actions (e.g. livestock destocking, maintenance of feed supplies & water, etc) that are less appropriate to policy responses which tend to be either proactive or a long-term response.

**IMO/FAO guidance on managing seafood safety during and after oil spills** outlines oil response options (protection, clean-up, chemical analysis) and management strategies, procedures and restrictions for protecting seafood resources in the event of oil spills. IMO also has a range of manuals and guidance on oil pollution, chemical pollution, oil spill responses, and clean-up operations.

**The International Oil Pollution Compensation (IOPC) Fund** have guidelines on **compensation claims** in fishing, mariculture and fish processing, and also **Technical guidelines for assessing fisheries sector claims** with special reference to small-scale operations lacking evidence of earnings.

**The UN Special Envoy for Tsunami Recovery** (Clinton, 2006) developed Key Propositions for Building Back Better based on lessons learned from tsunami recovery.

### 3.2 SUMMARY OF STANDARDS AND THEIR APPROPRIATENESS TO EMERGENCY SITUATIONS

All of the above standards and guidelines may have applicability and relevance to emergency situations. A key characteristic of almost all the guidelines and standards however, is that they have been defined following considerable levels of consultation and technical work completed in their development. Post-disaster responses should therefore benefit from and use such documents rather than trying to ‘re-invent the wheel’ when considering post-disaster fisheries policy and management responses. A critical part of preparedness is therefore ensuring that those involved with disaster responses have the knowledge that such documents exist and the ability to interpret them for the local context.

In reviewing the text above, it is also clear that the characteristics of standards and guidelines are such that they may:

- Cover both fisheries and aquaculture, or may be specific to one or other sub-sector;
- Be non-sector specific and relate more generally to emergency responses;
- Take the form of standards recognized and adopted by Governments, but may also take the form of privately developed standards applicable globally e.g. associated with eco-labeling and certification schemes;
- Be developed at the international or regional level, or may be nationally-specific; and
- Be mandatory (e.g. Resolutions adopted by RFBs which are binding on contracting parties), or voluntary (e.g. RFB Recommendations).

These different characteristics, may in turn impact on how relevant specific guidelines and standards are in post-disaster situations. For example mandatory resolutions of RFBs relating to management issues must still be implemented. Private management standards related to certification schemes may not be mandatory, but may still have a very high priority if export markets are dependent on them being followed and if re-starting fisheries or aquaculture exports is considered a high priority within the post-disaster context.



## 4. Recommendations for best practice and indicators supporting fisheries & aquaculture policy and management in emergency responses

### 4.1 OVERVIEW OF BROAD THEMES OF BEST PRACTICE FOR SUPPORTING FISHERIES & AQUACULTURE POLICY AND MANAGEMENT CAPACITY IN EMERGENCY RESPONSES

This section on best practice is intended to provide clear guidance to policy makers and managers on what they should be doing at the time of an emergency, how they can enable action, and what are some of the key types of decisions and actions that may be required. In the context of emergencies, specific policy and management decisions relevant to the situation may be necessary while still conforming to an overall framework of best practice relevant for non-emergency situations. At the same time, emergency situations are likely to place considerable strain on the ability of stakeholders to implement good policy and management in terms of their capacity to articulate policy and management direction, support coordination, ensure best practice.

In keeping with the EAF and the EAA, it is sensible to think of best practice for fisheries and aquaculture policy and management in emergency response situations in terms of a number of key themes, or dimensions, as follows:

- Best practice associated with ensuring the fulfillment of improved governance and institutions;
- Best practice associated with ensuring the fulfillment of environmental objectives;
- Best practice associated with ensuring the fulfillment of social objectives; and
- Best practice associated with ensuring the fulfillment of economic objectives.

The text below provides a Statement of Best Practice (SBP) for each of these four main themes. Under each SBP a number of lower level statements/indicators are defined which can serve to measure successful implementation of the SBP<sup>2</sup>. Some of the SBPs and indicators below relate to preparedness, while others are focused directly on ensuring the quality of fisheries and aquaculture policy and management responses, and how such responses can serve to strengthen policy and management regimes in affected countries/areas.

Balancing and maximizing social, economic and environmental goals is not always easy, especially in the context of emergencies. In the long-term social, economic and environmental objectives and achievements should be mutually re-enforcing, but in the short- to medium-term governments may have difficult choices to make in terms of trade-offs between policy objectives. Within the context of post-disaster emergency responses, there may be good reasons to change policy objectives or to give greater emphasis to some policy objectives over others.

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<sup>2</sup> This paper does not attempt to provide means of verification for the suggested indicators

## 4.2 BEST PRACTICE STATEMENTS

### Governance issues

**Statement of Best Practice 1.1: Participation.** Government sector representatives, the disaster-affected (or prone/vulnerable) population (not just fishers and aquaculture producers, but also those involved with upstream and downstream-related businesses) and all other relevant stakeholders (e.g. civil society, sector experts, research community) are actively involved in planning for disasters, and in defining policy and management responses, in their implementation, and in their monitoring and evaluation.

#### *Key indicators preparedness*

- All relevant stakeholders are identified through a stakeholder analysis and co-opted into preparedness planning.
- Vulnerable and marginalized groups (e.g. by location, gender, socio-economic status) are adequately represented in response planning.
- A mechanism is established for emergency relief coordination along with a sector specific task force that can help to ensure that emergency response efforts are aligned to sector objectives.

#### *Key indicators response*

- All relevant stakeholders are identified through a stakeholder analysis and co-opted into needs assessments after disasters, are engaged in actions and co-management responses, and are consulted during evaluations on the successes/failures of policy and management responses.
- The mechanism for emergency relief coordination and sector specific task force (see key indicator preparedness above) is established if previously not done so, and is functioning.
- Sector stakeholders engage and coordinate with those involved with non-fisheries/aquaculture sector responses.
- Vulnerable and marginalized groups (e.g. by location, gender, socio-economic status) are adequately represented in response implementation and evaluation.
- Potential conflicts minimized through high levels of participation and appropriate forums to discuss and work through potentially difficult issues and opposing views held by stakeholders.

**Statement of Best Practice 1.2: Resilience.** Governance policy and management systems, forums and arrangements for implementation, are resilient to disasters.

#### *Key indicators preparedness*

- Contingency plans and emergency response planning scenarios are in place.
- Those individuals with key policy and management responsibilities and functions have back-up/replacement staff nominated should they be unavailable to complete the duties.
- Emergency response planning scenarios are prepared prior to disasters.

#### *Key indicators response*

- Core management services and functions are maintained at appropriate levels in emergency situations.

**Statement of Best Practice 1.3: Human capacity development.** Support is provided to government staff, sector representation, and other stakeholders so as to increase capacities to prepare for and respond to emergency situations.

***Key indicators preparedness***

- Longer-term training and capacity development provided to relevant stakeholders in policy and management issues prior to response situations, using appropriate delivery mechanisms (e.g. distance learning, field-based training, mentoring, classroom programmes, etc).

***Key indicators response***

- Existing capacities assessed of public and private sector service providers to be engaged with response situations.
- Rapid training and awareness of policy and management issues provided to stakeholders during response situations, using appropriate delivery mechanisms.

**Statement of Best Practice 1.4: Consistency and adaptation.** Policy and management responses strive to adhere to any robust policy and management frameworks, and relevant guidelines and standards that may already be in place. At the same time governance is responsive to conditions on the ground, and adapts policy and management measures to the specific needs faced in emergency situations.

***Key indicators preparedness***

- Response planning and frameworks for policy and management action take into account existing international and national legislation, policy documents, and management measures.

***Key indicators response***

- Response planning and frameworks for policy and management action are reviewed and any changes to policy and management are sufficiently justified based on participation (see SBP 1.1) relevant information (see SBP 1.5), specific needs at the time, or weaknesses in current policy and management frameworks.

**Statement of Best Practice 1.5: Information.** Policy and management responses are based on sound information, data and local knowledge, while a lack of information is not used as an excuse for a lack of action. Information is used to reduce exposure to risk, and information about responses is shared.

***Key indicators preparedness***

- Management information systems and data collection mechanisms established prior to disasters. Such systems should be resilient to the emergencies themselves, built upon appropriate technology, cost-effective to operate, and have built-in quality control checks.
- Relevant information (including local knowledge) used to inform risk assessments, contingency planning, and response preparedness strategies prior to disasters.
- Early warning systems established and functioning to provide information about impending disasters.

***Key indicators response***

- Baseline surveys and needs assessments completed quickly after disasters, and include local consultation and use of local knowledge as well as more formal information and data sources.
- Risk assessments completed for post disasters policy and management responses in the absence of perfect information so that lack of information does not hold up action.
- Information used to ensure proper targeting of responses.

- Information about social and cultural norms underpins policy and management responses.

**Statement of Best Practice 1.6: Monitoring Control and Surveillance (MCS) functions continue to operate.** Recognition is given to the importance in post-disaster situations of the need to ensure a continuation of effective MCS, especially in the face of fisheries being seen as a livelihood strategy of last resort, or where disaster situations are viewed by rogue operators as an opportunity to illegally catch valuable resources. Fisheries managers continue to protect resources, and to liaise with non-fisheries sectoral responses to ensure that suitable provisions are made to reduce IUU fishing.

*Key indicators preparedness and response*

- Funds provided for MCS activities, and MCS operations completed and recorded.
- Community involvement in policing.
- Sanctions imposed for non-compliance.
- Use of risk assessment to ensure appropriate targeting of MCS on high risk areas, times, stakeholders.

**Statement of Best Practice 1.7: Integration of fisheries and aquaculture sector planning and responses with wider environmental planning and response frameworks.**

*Key indicators preparedness*

- Fisheries and aquaculture sector preparedness included in, and coherent with, any environmental preparedness/contingency planning at national level.

*Key indicators response*

- Fisheries and aquaculture sector preparedness included in, and coherent with, any environmental response frameworks.

**Statement of Best Practice 1.8: Building back better governance.** Lessons learned during and from emergency situations are used to improve fisheries and aquaculture governance.

*Key indicators preparedness*

- Policy and management constraints and weaknesses identified through the preparedness planning or response processes, and strategies developed to reduce weaknesses and to build on key strengths.

*Key indicators response*

- Linkages and partnerships established during response situations to take policy and management decisions, established as potential longer-term policy and management arrangements.
- Evaluations of and lessons learned from post-disaster responses used to inform governance improvements such as necessary institutional changes or capacity development programmes.

## **Environmental issues**

**Statement of Best Practice 2.1: Fishing capacity reflects the fishing opportunities available and the local conditions.** Care is taken in post-disaster situations to guard against the provision of excessive numbers of vessels, engines and gear, which in some cases may be unsuitable for the local conditions. See thematic background papers on vessels and gear for more information.

*Key indicators response*

- Inventories made of all remaining vessels/gear/engines prior to any re-supply.
- All vessels re-supplied to communities licensed and registered.
- The types of vessel/engines/gears/ re-introduced and their respective fishing capacity (e.g. length, Gross Tonnage, kilowatts) carefully considered and recorded.

**Statement of Best Practice 2.2: Fishing gear maximizes selectivity and reduces ecosystems and environmental impacts.** The provision and replacement of any fishing gear is carefully planned to ensure that catches of juvenile fish and bycatch is minimized. Gear is suitable to local conditions and appropriate for local knowledge/skills. See thematic background paper on fishing gear for more information.

*Key indicators response*

- Amounts and types of fishing gear provided based on needs assessments and inventories of remaining gear, involving local stakeholders and in line with existing policies/management measures.
- Types and specification of gear (e.g. mesh sizes, materials, bycatch reduction devices) re-introduced ensure maximum selectivity and minimal ecosystems impacts, as well as reduced carbon emissions (e.g. from reduced fuel use due to appropriate gear design).
- Inventories of all gear re-introduced recorded.

**Statement of Best Practice 2.3: Aquaculture rehabilitation takes place in the context of ecosystem functions and services with no degradation of these beyond their resilience capacity.** Well planned aquaculture development can avoid potentially serious negative environmental impacts. Approval for post disaster development is suitably precautionary in terms of its potential impact. See thematic background paper on aquaculture for more information.

*Key indicators response*

- Re-habilitation based on appropriately informed and justified zoning.
- Re-habilitation based on assessment of carrying capacities and suitable production systems.
- Re-habilitation based on Environmental Impact Assessments (EIAs).
- Re-habilitation based on risk analysis.
- Environmental rehabilitation measures raise long-term environmental awareness in affected communities.

**Statement of Best Practice 2.4: Reductions of abandoned/lost/discarded fishing gear (ALDFG) following disasters.** Measures are taken to reduce ALDFG, and the significant and harmful environmental impacts that ALDFG can have in terms of 'ghost fishing' and the introduction of plastics and chemicals into the food chain<sup>3</sup>.

*Key indicators preparedness*

- Improved marking of fishing gear.

*Key indicators response*

- Technology (such as transponders) used to locate gear.

<sup>3</sup> Natural disasters may have especially large impacts in terms of lost aquaculture gear when such gear cannot be removed from the water prior to a disaster, but considerable amounts of fishing gear can also be lost during storms and cyclones.

- Inventories and reporting of gear losses by stakeholders.
- Clean-up programmes post disasters are implemented to find and retrieve lost gear.

**Statement of Best Practice 2.5: Building back better for more sustainable exploitation of fish resources and minimization of negative ecosystems impacts.** The mobilization of resources (financial and human) during emergency response, and the special motivation that can be engendered in such situations to make improvements to previous policy and management measures as they pertain to sustainable resources and ecosystems, is harnessed to make policy and management improvements.

*Key indicators response*

- Revised policy places suitable emphasis on environmental objectives, with management measures appropriately supporting such objectives.
- Management plans are specified through appropriate levels of participation (see SBP 1.1) and using relevant information (see SBP 1.5). They are based on EAF principles, including being multi-species in nature and consider ecosystems issues e.g. bycatch, endangered threatened and protected species (ETPs), habitats, etc. They include harvest control rules and trigger/reference points, and the use of an appropriate and improved range and mix of input, output and technical management measures so as to ensure that fish catches do not exceed MSY.

**Social issues**

**Statement of Best Practice 3.1: Food security and food safety.** Replacement of lost or damaged assets (vessels, gear, cages, post-harvest infrastructure) is completed (recognizing SBP 2.1 and 2.2) so as to ensure that fishers and aquaculture operators can catch or produce fish and minimize disruption to production volumes and the supply chain. Food security is thus ensured not just for fishers and aquaculture producers, but for the wider community. In addition the health of consumers is protected through assessment of the impacts of any contamination/pollution of fish, and through re-instatement of the cold-chain. See thematic background papers on food security and post-harvest issues for more information.

*Key indicators response*

- Sufficient volumes of fish are being supplied to the local market to meet basic food security requirements (within the limits of sustainable exploitation)
- Time-bound and carefully justified easing of some legislation and/or management restrictions may be appropriate to provide greater access to resources for those especially at risk of food insecurity.
- Monitoring and testing of fish for key contaminants.
- (Re-)Provision of infrastructure to support good fish quality e.g. ice plants, chill/cold stores.

**Statement of Best Practice 3.2: Employment.** Fishers and aquaculture producers whose livelihoods have been disrupted are targeted for involvement in any re-habilitation and clean-up operations resulting from the disaster.

*Key indicators response*

- Jobs created during the post-disasters response for those impacted by the disaster where capacity levels of those affected enable this to be possible.

**Statement of Best Practice 3.3: Safety at sea.** Vessels and gear provided as part of post-disaster responses are seaworthy and appropriate for local conditions. See thematic background papers on vessels and gear for more information.

*Key indicators response*

- Vessel surveys conducted of all vessels introduced to the fishery.
- All vessels have appropriate onboard life-saving, communications, and fire prevention equipment.
- Fishing gear provided minimizes safety risks.

**Statement of Best Practice 3.4: Building back better for improved social benefits from fisheries and aquaculture.** The quality of jobs is improved and jobs are made more secure, and the health and livelihoods of both fishers and consumers are protected.

*Key indicators response*

- Alternative livelihoods/jobs created outside of the fisheries and aquaculture sector during post-disaster responses (note positive impact on SBP 2 through relieving pressure on resources).
- SBPs under environmental issues serve to improve resource sustainability and therefore long-term job security.
- Improved specification and siting of infrastructure supports cold-chain improvements.
- Improved vessel design and provision of safety equipment improves safety at sea.
- Improved/strengthened sector organisations.
- Better use of bycatch utilisation in support of food security.

### **Economic issues**

**Statement of Best Practice 4.1: Subsidies and post disaster support serve to support financial viability of fishing and aquaculture operations.** Subsidies are carefully targeted, time-bound, and based on assessment of potential implications on resource sustainability.

*Key indicators*

- Provision of subsidies for specific periods only, only to groups in special need, and serving to support business viability.

**Statement of Best Practice 4.2: Provision of credit and micro-finance, and establishment of savings schemes.** Access is provided to capital which may be necessary for fisheries and aquaculture businesses to ensure they can re-start or re-invest so as to generate profits. Economic planning and savings schemes serve to reduce vulnerabilities to disasters.

*Key indicators response*

- Access to credit and micro-finance does not marginalize particular groups in most need.
- Loans provided based on careful screening and application processes, and at rates that are affordable to borrowers (specific care taken not to exclude vulnerable/marginalized groups, see SBP 1.1).
- Savings schemes are operational prior to disasters and serve to reduce economic vulnerabilities.

**Statement of Best Practice 4.3: Marketing channels maintained or created.** Economic viability of businesses supported through successful efforts to ensure the marketing of fish, and exports also serving to generate macro-economic benefits.

*Key indicators*

- Export of fisheries and aquaculture products.
- Market information systems established and effective
- Provision of necessary marketing infrastructure.
- National export promotion strategies developed.
- Communication campaigns associated with technical disasters so that producers in non-affected areas are not impacted, and so that at an appropriate time consumer confidence can be obtained for purchases from affected areas.

**Statement of Best Practice 4.4: Building back better for improved economic benefits from fisheries and aquaculture.** The financial viability of those engaged in the sector is sustainable, and economic benefits are increased (without impacting negatively on environmental or social benefits) compared to pre-disaster situations.

*Key indicators*

- Introduction of user charges associated with the provision of infrastructure and assets.
- If appropriate, new management measures with economic benefits introduced e.g. transferable quotas, (community) rights-based management measures.
- More selective subsidies and abolition of subsidies which distort the market and artificially support inefficient producers.
- Improved access to micro-finance for small-scale producers, and provision of a broad range of financial services such as deposits, loans, payment services, money transfers and insurance.

## 5. Key resources that should be available to the fisheries and aquaculture policy and management planners and implementers in post-disaster situations

A number of key resources must be made available if fisheries and aquaculture policy and management responses are to be optimized. Information can act as a key input for preparedness and response planning and decision-making? Such information can come from within the sector but potentially also from outside the sector.

Perhaps first and foremost these include the list of policy and management-related standards and guidelines referred to in Section 3 and in the References. The resources made available should also include all those references to guidelines and standards suggested in the other background thematic papers.

However, for responses to be effective, resources made available must also include high quality technical expertise for the design and implementation of post-disaster initiatives. Such technical expertise should of course have specific sectoral expertise in the area of most importance for a proposed intervention e.g. fishing gear experts to specify fishing gear requirements, livelihoods experts to specify livelihood impacts of disasters and appropriate responses, infrastructural engineers to design new infrastructure or repairs to damaged facilities, etc. However a measure of the quality of such experts is not just their experience and skills in a particular field of specialization, but also their ability to work in, and respond in a culturally sensitive manner to a post-disaster situation, in a way that can ensure local stakeholder participation in the re-building process.

An equally important resource is a suitable forum both for discussing policy and management responses within the fisheries sector, as well as a forum for linking fisheries and aquaculture sectoral interventions with those taken by other sectors to ensure complementary and a lack of duplication. Such forums can ensure that the necessary technical expertise is brought together to jointly define, implement, and monitor/evaluate post-disaster responses.

Sufficient financial resources and time must also be provided, for all stages of the disaster cycle (see Section 2.1). It is of course typical for financial resources to be limited, and for there to be competing demands for monies that are available. This requires the need for careful prioritization of potential interventions, and careful planning of timelines for interventions so as to maximize the resources that are available, potentially so as to leverage and combine financial resources from different sources to enable interventions that any one source of finance might not be sufficient to complete.



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- FAO EAF website** [www.fao.org/fishery/eaf-net/en](http://www.fao.org/fishery/eaf-net/en)
- FAO International Plan of Action for Conservation and Management of Sharks** [www.fao.org/fishery/ipoa-sharks/en](http://www.fao.org/fishery/ipoa-sharks/en)
- FAO International Plan of Action for the Management of Fishing Capacity** [www.fao.org/fishery/ipoa-capacity/en](http://www.fao.org/fishery/ipoa-capacity/en)
- FAO International Plans of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries** [www.fao.org/fishery/ipoa-seabirds/en](http://www.fao.org/fishery/ipoa-seabirds/en)
- FAO (various years) Technical guidelines to the Code of Conduct** [www.fao.org/fishery/code/publications/guidelines/en](http://www.fao.org/fishery/code/publications/guidelines/en)
- FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing** [www.fao.org/docrep/003/y1224e/y1224e00.HTM](http://www.fao.org/docrep/003/y1224e/y1224e00.HTM)
- FAO Strengthening Decision Making in Relief and Recovery Improved Response Analysis Capacity Project** <http://home.wfp.org/stellent/groups/public/documents/ena/wfp194140.pdf>
- FAO, NACA, UNEP, WB and WWF International Principles for Responsible Shrimp Farming** [www.enaca.org/uploads/international-shrimp-principles-06.pdf](http://www.enaca.org/uploads/international-shrimp-principles-06.pdf) [www.enaca.org/uploads/international-shrimp-principles-06.pdf](http://www.enaca.org/uploads/international-shrimp-principles-06.pdf)
- Global Aquaculture Alliance BAP Standards** [www.gaalliance.org/bap/standards.php](http://www.gaalliance.org/bap/standards.php)
- ICES Code of Practice on the on the Introductions and Transfers of Marine Organisms** [www.ices.dk/reports/general/2003/Codemarineintroductions2003.pdf](http://www.ices.dk/reports/general/2003/Codemarineintroductions2003.pdf)
- IMO Various guides and manuals on oil pollution, chemical pollution, oil spill responses, clean up operations** [www.imo.org/Pages/home.aspx](http://www.imo.org/Pages/home.aspx)
- IOE Aquatic Animal Health Code.** [www.oie.int/doc/ged/D10907.PDF](http://www.oie.int/doc/ged/D10907.PDF)
- IOPC Fund Guidelines on presenting a compensation claims in fishing, mariculture and fish processing** [www.iopcfund.org/npdf/Fisheries%20Guidelines%20-%20Claimants\\_e.pdf](http://www.iopcfund.org/npdf/Fisheries%20Guidelines%20-%20Claimants_e.pdf)
- IOPC Fund Guidelines on assessing a compensation claim from the fisheries sector, especially in small-scale fisheries where data may be lacking** [www.iopcfund.org/npdf/Fisheries%20Expert%20Guidelines\\_e.pdf](http://www.iopcfund.org/npdf/Fisheries%20Expert%20Guidelines_e.pdf)
- Marine Stewardship Council.** [www.msc.org](http://www.msc.org)
- Oxfam Response Analysis for Emergency Food Security and Livelihoods Programme** <http://policy-practice.oxfam.org.uk/our-work/conflict-disasters/food-security>
- Poverty Reduction Strategy Papers** [www.imf.org/external/np/prsp/prsp.aspx](http://www.imf.org/external/np/prsp/prsp.aspx)
- Regional Fishery Bodies (RFBs)** (see [www.fao.org/fishery/topic/16800/en](http://www.fao.org/fishery/topic/16800/en))
- Transparency International** ([www.transparency.org](http://www.transparency.org))
- United Nations Convention on the Law of the Sea** [www.un.org/depts/los/convention\\_agreements/texts/unclos/closindx.htm](http://www.un.org/depts/los/convention_agreements/texts/unclos/closindx.htm)
- World Bank's** [www.doingbusiness.org](http://www.doingbusiness.org)
- WWF, Aquaculture Dialogue standards** [www.worldwildlife.org/what/globalmarkets/aquaculture/aquaculturedialogues.html](http://www.worldwildlife.org/what/globalmarkets/aquaculture/aquaculturedialogues.html)

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# Appendix 1 – Examples of fisheries and aquaculture policy and management

This Appendix provides some concrete examples of what we mean by fisheries and aquaculture policy and management, and typically what is considered as best practice with regards to policy and management. The Appendix does not profile the wide range of policy and management frameworks and guides that exist, and which may impact on international, national and local policy and management, as these are itemized in Section 3.1.

## FISHERIES AND AQUACULTURE POLICY AND MANAGEMENT PROCESSES

It is important to consider not just policy and management *content*, but also the *processes* by which policy is defined, and by which management actions are implemented. Policy content and management tools and actions can be improved if the processes used to specify and implement them are both participatory and transparent. Thus fisheries and aquaculture policy should be defined based on a process of stakeholder consultation, which in some cases may be a legal requirement. Such consultation should be broad so that policy is informed both by scientific research, as well as by the stakeholders who will be most affected. Good management practices also involve participation by a wide group of stakeholders, typically referred to as co-management. Co-management can be defined as a partnership arrangement where government, NGOs, the community of local resource users, and other stakeholders (fish traders, boat owners, business people, etc.) share the responsibility and authority for the management of a fishery<sup>1</sup> in the management decision-making process and the implementation of agreed management tools. Successful co-management depends on four main conditions: i) supporting legislation and policies ii) empowered communities iii) good linkages between stakeholders and, iv) appropriate levels of finance and capacity (Macfadyen *et al.*, 2005).

Fisheries and aquaculture policy is often updated at regular intervals as part of national planning processes (often every five years), while associated legislation may be introduced or amended on a more regular basis particular in the form of regulations or decrees (the drafting and enacted of primary legislation in the form of Acts is typically not conducted very often however).

In the wake of disasters, it may be especially difficult, but also important, given the need to act quickly if there is a need to review and potentially adapt policy and management, for policy and management processes to be participatory and transparent.

## FISHERIES AND AQUACULTURE POLICY CONTENT

Fisheries and aquaculture policy should clearly articulate short- and long-term objectives. These objectives are often focused around issues relating to a) sustainable resources/ecosystems b) communities and social welfare, c) contributions of the sector to macro-economic performance, economic efficiency and business sustainability, and d) institutions and governance. A focus on such objectives conforms to the Ecosystems Approach to Fisheries (EAF) described later in this paper, and means that policy typically attempts to balance and maximize social, economic and environmental

<sup>1</sup> The case of community management where communities manage resources alone would be one end of the spectrum of co-management, and is considered to be one form of co-management.

objectives, supported by institutional and governance improvements. Some examples of policy objectives often found in fisheries and aquaculture policy documents related to these main themes are presented in Table 1 below (the table is illustrative only and is not meant to be exhaustive).

TABLE 1  
Examples of fisheries/ aquaculture policy content

EAF dimension	Typical policy objectives
<b>Environment</b>	<ul style="list-style-type: none"> <li>• Ensuring sustainable resource exploitation with catches not exceeding a Maximum Sustainable Yield (MSY);</li> <li>• Minimizing ecosystems impacts of fisheries;</li> <li>• Reducing levels of illegal, unreported and unregulated (IUU) fishing;</li> <li>• Reducing Green House Gas (GHG) emissions; and</li> <li>• Exploitation based on a precautionary approach using risk based management principles so that risks of over-exploitation are reduced to acceptable levels.</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>• Maximizing employment creation; and</li> <li>• Ensuring food security;</li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li>• Increasing value-added;</li> <li>• Increasing export values; and</li> <li>• Increasing the value of aquaculture and/or fisheries production.</li> </ul>
<b>Governance</b>	<ul style="list-style-type: none"> <li>• Strengthening of organisations representing fishers;</li> <li>• Improved cross-sectoral linkages; and</li> <li>• Human capacity development of government organisations.</li> </ul>

Ideally fisheries policy objectives should also be measurable, that is to say that success in achieving them can be assessed, typically through the use of quantifiable indicators (although qualitative approaches to assessing success may also be used). So policy documents often include targets to be achieved over the period covered by the policy e.g. fish exports to be increased by X percent by the year Y.

## FISHERIES AND AQUACULTURE MANAGEMENT MEASURES

In order to give effect to fisheries and aquaculture policy, governments have a wide range of management tools available to them, which can be used to ensure that policy objectives are achieved. This document is not intended as a complete review of such tools, but some common examples are provided in the table below, and are grouped into the main dimensions of the EAF highlighted above.

## THE IMPACT OF NON-FISHERIES AND AQUACULTURE POLICIES ON THE FISHERIES AND AQUACULTURE SECTOR

Policy and management decisions in other sectors can have a very strong bearing on fisheries and aquaculture policy and management, and their successful implementation. Such policies and practices may be enabling, or may impact negatively on the sector. Examples include the ease of doing business as reported by the World Bank's [www.doingbusiness.org](http://www.doingbusiness.org) (which profiles business regulations and norms), levels of corruption as reported by Transparency International ([www.transparency.org](http://www.transparency.org)) which provides an index of perceived levels of public sector corruption), supportive macro-economic and labour market policies to provide an enabling environment, other national policies impacting on fisheries/aquaculture e.g. general development or environmental policy, and policies for other sectors with an impact on fisheries and aquaculture e.g. marine-based oil and gas exploration and development, coastal tourism, environmental/coastal zone management policies, etc. These non-fisheries/aquaculture sector policy issues all provide arguments in support of the need for policy processes to be participatory, and for cross-sectoral communication to take place in the development of sector-specific policies and management implementation.

Post-disaster emergency responses may be especially susceptible to opportunities and incentives for corruption, and to a lack of good cross-sectoral planning and communication.

TABLE 2  
Examples of fisheries/ aquaculture management tools and actions

EAF dimension	Typical management measures
<b>Environment</b>	<ul style="list-style-type: none"> <li>• Licensing and registration of vessels;</li> <li>• Input management measures in fisheries e.g. limited licensing (i.e. licence numbers are limited as opposed to meaning that having a licence is a requirement to fish); effort management e.g. days at sea restrictions; closed areas; MPAs; closed seasons; gear restrictions (i.e. which types of gear can be used);</li> <li>• Output management measures in fisheries e.g. TACs; minimum landing sizes; fish escapement rates; bycatch/discard controls;</li> <li>• Technical management measures in fisheries e.g. mesh size restrictions and bycatch reduction devices (BRDs) to increase selectivity and minimize ecosystems impacts;</li> <li>• Understanding and managing fish resources at Maximum Sustainable Yield (MSY);</li> <li>• Consistency of National Plans of Action (NPOAs) with International Plans of Action (IPOAs);</li> <li>• Compliance with Port State and Flag State duties and measures;</li> <li>• Harvest control rules and trigger/reference points in fisheries which then invoke management actions;</li> <li>• Monitoring, control and surveillance (MCS), ideally based on a mix of 'carrot' (i.e. incentives for improved compliance) and 'stick' (appropriate sanctions in cases of non-compliance);</li> <li>• Specification of management plans in fisheries (species-level, or ideally broader to include multi-species and ecosystems);</li> <li>• Measures to reduce abandoned, lost and discarded fishing gear e.g. communication between stakeholders to reduce gear conflicts, provision of receptacles for unwanted gear in fishing harbours;</li> <li>• Subsidies designed to incentivize improved environmental performance e.g. for research into more selective gear</li> <li>• Green House Gas (GHG) emissions reductions strategies;</li> <li>• Restrictions over the introduction of new species in aquaculture and related biodiversity and genetic risk reduction measures;</li> <li>• Assessment of carrying capacities and zoning in aquaculture;</li> <li>• Waste/effluent management restrictions in aquaculture;</li> <li>• Completion of environmental impact assessments (EIAs) before aquaculture developments take place; and</li> <li>• Animal health measures in aquaculture, to reduce disease outbreaks.</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>• Measures to ensure food security i.e. access to resources by those most vulnerable to food insecurity, or subsidies in the form of social support payments during closed fishing periods;</li> <li>• Measures to ensure minimum employment conditions i.e. compliance with International Labour Organisation's Declaration on Fundamental Principles and Rights at Work, specification of minimum wages, requirements for contracts, contracts covering social welfare issues (such as medical insurance, pensions, etc);</li> <li>• Safety at sea;</li> <li>• Social subsidies; and</li> <li>• Programmes to provide alternative livelihoods.</li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li>• Provision of infrastructure as public goods in cases where no private sector investment is likely but where such facilities provide a 'public good' serving to generate and support economic activity;</li> <li>• National post-harvest hygiene and food safety systems to protect export businesses from export bans and which also serve to improve quality and therefore values of sales;</li> <li>• Traceability requirements and strategies;</li> <li>• Programmes, strategies and support for value-addition i.e. new forms of processing;</li> <li>• Provision of credit and micro-finance;</li> <li>• User payments and charges e.g. landings charges; licence fees; harbour dues; import duties; export duties. Such payments can be used to generate funds for the national treasury, or specifically for re-investment by government into the sector for its development and management;</li> <li>• Export promotion strategies e.g. trade shows, reduction of export duties;</li> <li>• Programmes and strategies to reduce post-harvest losses;</li> <li>• Use of transferable rights-based management mechanisms, such as individual transferable quotas (ITQs) which can be expected to support economic efficiency; and</li> <li>• Subsidies to support the profitability of fishing or aquaculture operations e.g. fuel subsidies, tax breaks, funds for vessel construction, nationally funded research into selective breeding in aquaculture.</li> </ul>
<b>Governance</b>	<ul style="list-style-type: none"> <li>• Inclusion of fisheries in Poverty Reduction Strategies;</li> <li>• Development of information and data collection sharing systems;</li> <li>• Transfer of technology, sharing of lessons learned, and replication of successes;</li> <li>• Co-management and community management arrangements, often accompanied by decentralization;</li> <li>• Establishment of conflict resolution mechanisms and forums;</li> <li>• Human capacity development of government staff, representative fisher organisations, civil society; and</li> <li>• Participation in Regional Fisheries Bodies (RFBs) and other international organisations.</li> </ul>



## Appendix 2 – Examples of FAO and other agency managed projects in fisheries sector in response to the Indian Ocean Tsunami, listed by implementation date

Jan – Mar 2005	<ul style="list-style-type: none"> <li>• Emergency assistance to support the rehabilitation in earthquake/tsunami-affected areas TCP/INS/3002 (E) Jan 05 – Oct 05</li> <li>• Emergency provision of essential inputs for the restart of small-scale food crop production and fisheries activities within tsunami-affected communities (OSRO/INS/501/BEL) Jan 05 – Dec 05 US\$479 992 Belgium Japan/FAO joint emergency assistance to tsunami-affected coastal communities in North Sumatra and Nias Island (OSRO/INS/502/JPN) Jan 05 – Dec 05</li> <li>• Emergency assistance to support the rehabilitation of small-scale fisheries activities in earthquake/tsunami-affected areas in Aceh, northern Sumatra coastline and in Nias Island (OSRO/INS/504/GER) Jan 05 – Dec 05</li> <li>• Rehabilitation of fish processing capacity in tsunami-affected areas of Indonesia (NAD and Nias Island) (OSRO/INS/507/NOR) Mar 05 – Feb 06</li> <li>• Emergency assistance for the restoration of food security and sustainable livelihoods amongst tsunami-affected farmers, fishers, women and other vulnerable groups in Aceh Province, Indonesia (OSRO/INS/509/EC) Mar 05 – Jun 06</li> </ul>
Apr – Jun 2005	<ul style="list-style-type: none"> <li>• Emergency Assistance to the Tsunami-affected Fishing Communities in Southern Thailand (THA/05/002) May 05 – Jun 06</li> <li>• Indonesia: Earthquake and Tsunami Emergency Support Project No: 39127 Asian Development Bank Jun 05 – Jun 09</li> <li>• Emergency assistance to tsunami-affected coastal communities in Aceh and North Sumatra (OSRO/INS/512/SPA) June 05 - May 06</li> </ul>
Jul – Sep 2005	<ul style="list-style-type: none"> <li>• Emergency in-kind assistance – boat engines (OSRO/INS/511/CPR) Aug 05 – Mar 06</li> <li>• Strengthening the coordination and assessment of fishing resources and inputs provided by tsunami emergency relief, Thailand (OSRO/THA/505/CHA) Aug 05 – Jun 06</li> <li>• Joint ARC-FAO inception mission for the sustainable rehabilitation and development of livelihoods of coastal communities affected by the earthquakes and tsunami in Aceh Province and Nias Island, North Sumatra Province, Indonesia, and in Sri Lanka (OSRO/RAS/506/ARC) Sep 05 - 2009</li> </ul>
Oct – Dec 2005	<ul style="list-style-type: none"> <li>• Rehabilitation and development of sustainable livelihoods of tsunami affected coastal communities in Indonesia and Sri Lanka American Red Cross and FAO Dec 2005</li> <li>• A rapid assessment of the status of the fisheries in tsunami-affected areas of Indonesia and Sri Lanka (OSRO/RAS/504/LAO) Dec 05 – Jun 06</li> <li>• Rehabilitation of livelihoods in the fisheries sector affected by the tsunami and earthquake in Indonesia (GCP/INS/076/GER) Dec 05 – Oct 08</li> </ul>
2006	<ul style="list-style-type: none"> <li>• Regional information management and co-ordination on strategies for early recovery of agriculture in coastal regions in Indonesia, Maldives, Sri Lanka and Thailand affected by tsunami (OSRO/RAS/503/CHA) Mar 06</li> <li>• Rehabilitation assistance to fishing communities in the tsunami affected areas of Nanggroe Aceh Darussalam (NAD) Province- Reconstruction of a fish landing centre in Seunudon, Aceh Utara District, Indonesia (OSRO/INS/515/ITA) Mar 06 – Jun 07</li> <li>• Rehabilitation assistance for agriculture and fisheries based livelihoods on Nias Island through supply of primary production inputs, training and marketing support (OSRO/INS/602/EC) May 06 – Apr 07</li> <li>• Earthquake and tsunami emergency support project (fisheries component), Indonesia. Asian Development Bank Sep 06 – Dec 08</li> </ul>
2007	<ul style="list-style-type: none"> <li>• Rehabilitation and sustainable development of fisheries and aquaculture affected by the tsunami in Aceh Province, Indonesia (OSRO/INS/601/ARC) Feb 07 – Jun 10</li> </ul>



## Appendix 3 – Acronyms

<b>ALDFG</b>	Abandoned, Lost, Discarded Fishing Gear
<b>ASC</b>	Aquaculture Stewardship Council
<b>BAP</b>	Best Aquaculture Practices
<b>CCRF</b>	Code of Conduct for Responsible Fisheries
<b>DRC</b>	Democratic Republic of Congo
<b>DRM</b>	Disaster Risk Management
<b>EAA</b>	Ecosystems Approach to Aquaculture
<b>EAF</b>	Ecosystems Approach to Fisheries
<b>EIA</b>	Environmental Impact Assessment
<b>EMMA</b>	Emergency Market Mapping and Assessment
<b>EQS</b>	Environmental Quality Standards
<b>EU</b>	European Union
<b>FAO</b>	Food and Agriculture Organisation (of the United Nations)
<b>FVR</b>	Fishing Vessel Registration
<b>GESAMP</b>	Group of Experts on the Scientific Aspects of Marine Environmental Protection
<b>HACCP</b>	Hazard Analysis and Critical Control Point
<b>HFA</b>	The Hyogo Framework for Action
<b>HIPC</b>	Highly Indebted Poor Country
<b>ILM</b>	Integrated Lake Management (project)
<b>IMO</b>	International Maritime Organisation
<b>IMP</b>	International Monetary Fund
<b>IOPC</b>	The International Oil Pollution Compensation (Fund)
<b>IPOA</b>	International Plan of Action
<b>IUU</b>	Illegal, Unreported, and Unregulated (fishing)
<b>LEAF</b>	Lake Edward and Albert Fisheries (project)
<b>LEGS</b>	Livestock Emergency Guidelines and Standards
<b>LRA</b>	Lords Resistance Army
<b>MCS</b>	Monitoring Control and Surveillance
<b>MIFIRA</b>	Market Information for Food Insecurity Response Analysis
<b>MIS</b>	Management Information System
<b>NBI</b>	Nile Basin Initiative
<b>NGO</b>	Non Government Organisation
<b>OIE</b>	World Organisation for Animal Health
<b>PRSP</b>	Poverty Reduction Strategy Paper
<b>RAF</b>	Response Analysis Framework
<b>RFB</b>	Regional Fishery Body
<b>SBP</b>	Statement of Best Practice
<b>UNCLOS</b>	United Nations Convention on the Law of the Sea
<b>UNDP</b>	United Nations Development Programme
<b>UNFSA</b>	United Nations Fish Stocks Agreement
<b>VMS</b>	Vessel Monitoring System
<b>WB</b>	World Bank
<b>WTO</b>	World Trade Organisation
<b>WWF</b>	World Wildlife Fund



# Provision and repair of fishing vessels in response to emergencies

by

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# 1. Introduction to fishing vessels and the way that they are impacted in different types of disasters that affect the fisheries and aquaculture sector

## 1.1 BACKGROUND ON FISHING VESSELS AND SAFETY AT SEA

Fishing vessels are perhaps like local languages and food - extremely complex and diverse. This is because they are part design part evolution and part tradition and are adapted to suit a number of factors including environment, fishing gear, materials, sea conditions, social factors and customs. The variations in vessel design can be numerous and subtle and it is possible to encounter many different categories of vessels in a small geographical area. For example in Bangladesh river fisheries boats with both round and flat hulls are used in the same locations, but for different activities. And in Myanmar there are numerous variations of small flat bottomed boats working in the same areas, the design variations include hull shape, dimensions, design details and even ornamental features. Again the design denotes the activity and gear being used.

It is important to correctly identify the type and class of vessels affected by a disaster and understand the differences in design and equipment. In order to understand this diversity and complexity it is useful to consider fishing vessels in approximate groups or classes. Each of these will have associated with it typical features activities and equipment.

For the purposes of this document it is considered that the typical length (L) classes and associated comments shown in table 1 will be useful.

It should be noted that such divisions may differ according to region /nation and the design of vessels. For example additional length classes may be found such as 7m and 12m. In the UK the (Merchant Shipping Notices) MSN 1756(F) and MSN 1813(F), Codes of Practice for the Safety of Small Fishing Vessels, make use of 7m, 10m, 12m and 15 to 24m as length categories.

TABLE 1  
Typical length classes for fishing vessels

Length (LOA) See Box 1	Under 10m	10m to 15m	15m to 24m	Over 24m
Type	Artisanal	Semi-industrial	Industrial	Industrial
Decked	Rarely	Sometimes	Mainly	Always
Propulsion	Frequently sails or paddles but also motorised with inboard or outboard (petrol or diesel)	Mainly motorised often with inboard (diesel)	Motorised with inboard (diesel)	Motorised with inboard (diesel)
Crew	From 1 to 6	From 3 to 12	Various, could be 6 to over 15	Various, could be over 15
Trips	Typically 1 day	3 to 7 days	7 days and over	7 days and over
Area	Inshore	Coastal	Offshore	Distant waters

TABLE 1 (cont.)

Length (LOA) See Box 1	Under 10m	10m to 15m	15m to 24m	Over 24m
<b>Design &amp; construction</b>	Often of simple traditional designs and fairly crude construction	Based on traditional or modern designs, either timber or modern construction	Often of modern design and mainly modern construction	Mainly of modern design and construction
<b>Material</b>	Mainly timber in traditional style construction. Increasing numbers of simple GRP (Glass Reinforced Plastic) vessels	May be timber, GRP, steel or aluminium construction according to location and fishery. Overall the majority will still be timber.	May be timber, GRP, steel or aluminium construction according to location and fishery. Non timber construction becoming favoured.	As with 15 to 24m, non timber construction becoming favoured. Unless timber is easily available steel can be the material of choice.
<b>Gear</b>	Often small gear manually handled	Large gear often mechanically handled	Large gear mainly mechanically handled	Very large gear mechanically handled
<b>Safety at sea</b>	Record likely to be poor due to simple construction and poor equipment	Improved record especially in decked vessels	Vessel increasing in safety but gear and equipment increasing in danger	Concern can centre on deck equipment and crew protection. Such vessels also venture far from safe haven so require good communication and lifesaving equipment
<b>Registration</b>	Unlikely	Likely	Likely	Mandatory?
<b>Ownership &amp; finance</b>	Often individual fisher. Own or informal finance	Cross over from fisher ownership to investor and from informal to formal finance	Wealthy investor. May have formal finance	Wealthy investor. May have formal finance

### Box 1 – Vessel length

In technical discussions the following definitions are used when referring to vessels:

#### Length (L)

*Should be taken as 96 percent of the total length on a waterline at 85 percent of the least depth, or as the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that length is greater. In vessels designed with rake of keel the waterline on which this length is measured should be parallel to the designed waterline.*

#### Length overall (LOA)

*Should be taken as the distance in a straight line parallel to the design waterline between the foremost point of the bow and the after most point of the stern.*

Also see Appendix 3 – CUNO calculation.

However, generally in non-technical discussions the term ‘length’ is normally used to describe the total length of the vessel which formally would be ‘length overall’ (LOA).

There are numerous alternative methods of classing vessels other than by length and many international organisations and governments will have their own methods. In Indonesia and Peru tonnage (GT) measurements are used to classify fishing vessels. In the UK the Seafish Construction Standards (widely referred to by designers and administrators) make use of Cubic Number (CUNo) for identifying vessel size.

In the region/nation of proposed project activity it is important to understand and adopt the local system of classing vessels when discussing boatbuilding, and important to understand the correlation between methods, such as length (L/LOA) and tonnage (GRT/GT).

The following table provides some commonly used methods of vessel categorisation:

TABLE 2  
Common methods of vessel categorisation

Categorisation	Description	Comments
<b>Tonnage (GRT/GT)</b>	A measure of useable internal volume based on ship volume with correction factors. Gross register tonnage (GRT) was fully replaced by gross tonnage (GT) in 1994 and is no longer widely used in the industry. For information & calculation method see Appendix 2.	Standard in shipping for vessels of 24m in length (L) and over and sometimes used in fishing vessel categorisation. For example in Indonesia (0 to 5, 5 to 10, 10 to 30 and 30+).
<b>Cubic Number (CUNo)</b>	A measure of boat "box" volume, represented by Length x Beam x Depth. For measurement and calculation method see Appendix 3.	Often used in fisheries as it can allow comparison of vessel size in terms of weight (displacement). A more accurate measure of true vessel size than length.
<b>Motorised and Engine power</b>	Whether fitted with a motor or not	Motors can be single, twin, inboard, outboard, petrol, diesel or kerosene. The power in kW or hp is usually quoted.
<b>Decked</b>	Whether fitted with a deck or not	Note that to be considered decked a vessel requires a continuous watertight deck rather than small areas of deck or removable decking.
<b>Wooden</b>	Whether constructed from wood or not	In the recent past the vast majority of small (say less than 12m in length) boats worldwide would have been constructed from timber. This has and continues to change towards GRP and other materials.
<b>Distance from safety</b>	The distance the vessel operates from safe haven.	Usually given in nautical miles (nm) in categories such as 5nm, 20nm, 100nm, 200nm and unrestricted. Other distances are used according to region.
<b>Design Category</b>	A description of the wind and sea conditions for which a vessel is considered suitable, developed by ISO and used in the FAO/ILO/IMO Safety Recommendations. Generally used for recreational craft.	Categories defined as: A - Ocean B - Offshore C - Inshore D - Sheltered waters See Appendix 4 for details

The majority of post disaster interventions are in the under 10m category as these vessels are used in small scale artisanal fisheries and are very numerous. Vessels above 10m in length will also be affected by disasters but are likely to be much less numerous, vessels over 15m are often backed by investors/businesses and may be insured or have access to funds for replacement /repair so are less frequently the subject of reconstruction efforts.

As an example consider vessels in Aceh, after the 2004 tsunami. The table\*\* below shows that 65 percent of the fishing fleet was less than 10 GT or approximately 9m in length. Post tsunami boatbuilding concentrated on these vessels and whilst vessels in the next class (10 to 30 GT) were built they were less numerous.

Size (GT)	Average GT	Approximate (Avg.) Length (LOA)	# Fishing vessels	GT by group
0 to 5	1.5	6m	11 596	41%
5 to 10	8.0	9m	953	24%
10 to 30	15.8	12m	639	18%
Above 30	44.6	>20m	172	18%

\*\* From: Lymer *et al.*, 2009

The differences between vessel types can appear minor or even irrelevant to the untrained eye but fishers can be conservative and they like what they know. This is understandable from the risk point of view as fishing is dangerous to both health and wealth and exposing yourself to an unknown vessel could be disastrous. Whilst the importance of tradition should not be underestimated there are also situations where changes to vessel design or type are adopted rapidly by fishers. It is therefore important to understand the factors which affect the fishers' preferences and discuss these with the communities before planning the manufacture of a particular vessel.

It is important to recognise the key influencing factors which influence the vessels design and construction details, for example:

- A small vessel that needs to be manually hauled onto a muddy shore. It is likely that the hull shape and keel design will be influenced by this and not understanding this factor can lead to boats of a new design being disliked or rejected. For example in Bangladesh many small boats are hauled out of the rivers or dry out as the water levels change. This means that they must be easy to slide over mud and a flat bottom without a keel will be best suited.
- Hand bailing water from a small vessel. Many undecked vessels are bailed with a scoop or bucket, the motion is across the vessel. If an internal keel (hog) is introduced for improved strength this interferes with the scooping motion and fishers will object. In Indonesia and many other parts of Asia constructing a small vessel without an internal keel is common and (considering international regulations) may appear insufficiently strong. However, care will be needed to meet fishers' expectations of how easy the boat is to bail; ultimately users may recognise that a better and stronger design should require less bailing of water.
- Inboard versus outboard motors. An inboard diesel motor is more fuel efficient than a petrol outboard, however, an outboard has advantages such as lower vibrations which could shake the boats structure apart and that it can be removed from the boat and taken home to avoid being stolen or swamped if the boat sinks. Introducing a diesel for improved economy will not impress the fisher if the boat is swamped and engine flooded. In the past projects in many fisheries focussed on replacing outboards with inboards (West Africa) and often factors other than the simple benefit of economy decided the acceptability of the new engines.
- Increase in vessel speed. As the propulsive power of a vessel increases so does its speed and so should its hull form – there is an optimum hull shape for any given operating speed and deviating from this will reduce efficiency. Step changes in power need step changes in design, for example the change from sail to outboard and the change from outboard to powerful inboard. There are numerous examples worldwide of design not following power change adequately. In fisheries that have made the change from sailing vessels to motor vessels, including many in Europe, hull design has often not evolved quickly enough to suit the new speed available under motor.
- Sea conditions. A vessel will need to be suitable for the expected sea conditions and these can vary locally according to water depth, tidal currents and weather variations. What is suitable one side of a headland may not be ok on the other side. In Aceh, Indonesia there is a marked difference in vessel types used in fisheries on the east and west coasts as prevailing wind and sea conditions can be very different.

Fishing vessels are quite unlike most other inputs required in an emergency situation, being more varied and complex than other items of equipment. Additionally unlike, say power tillers, livestock or seeds they cannot simply be bought off the shelf to match the users requirements, they have to be manufactured to a particular specification. This manufacturing process requires specialist knowledge of fishing vessels and the materials used in their construction. And without this poor quality and

potentially unsafe vessels can result. Finally consider the fact that fishing is a dangerous activity and that the vessel is intended to operate in a hostile environment.

It is important to realise that fishing vessel builders may have a long history of work in the sector; on occasion several generations of the family may have been involved in vessel construction. This history can carry huge knowledge of the subtle design (evolution) of fishing vessels which are matched to technical, environmental and social needs in the local fishery. However, it is also possible that more recent changes, such as loss of traditionally used timber species, new materials such as GRP (Glass Reinforced Plastic) and the switch to motorised vessels, can be challenging to those trying to adapt. In Sri Lanka post tsunami boatbuilding and repairing activities revealed a lack of basic GRP boatbuilding skills in some of the boatyards which affected the quality of the work. The lack of clean, dry and shaded work areas and the poor mixing and application of materials highlighted the need for training. It should be noted that GRP is unlike many other materials in that its strength is determined when applied rather than built in when purchased,

Consideration given to safety at sea is often related to wealth - the wealthier the nation and fishery the higher the standard of work place safety. Much of the equipment considered vital to safety at sea may not be available in country or only available at a cost which is out of proportion to the vessel or the fishing revenue. Consider a 6m canoe style vessel which might cost under US\$500 to build, obviously any additional equipment, especially if imported will (in the owners eyes) add significantly to the cost. For example a lifejacket which complies with an international standard typically costs at least US\$80.

Further changing design details to match safety at sea requirements can meet with resistance from fishers as the vessel may not look/feel/function in the manner which they are accustomed to. Consider improved construction which can mean increased weight of vessel, this is much disliked by fishers if it means pulling the vessel onto the shore becomes much harder.

So in the repair / replacement of fishing vessels whilst we consider safety at sea to be of paramount importance, we also need to understand how this fits into the existing wealth and technology situation. And in so doing provide assistance for fishers to achieve improved safety at proportional costs. For example in West Africa a regional training manual in safety at sea was developed and disseminated for use. National trainers were trained in a number of countries, and each team was provided with the necessary safety at sea training manual and kit for continued in-country training. The activities were developed to address the importance of carrying safety equipment onboard every fishing voyage. And to illustrate that the minimum safety equipment need not be costly. See Box 2.

#### Box 2 – Safety at sea training kit for West Africa\*\*

The list of equipment suggested for the safety at sea training in West Africa included:

- Life jackets
- Magnetic compass
- 100 m of rope
- Flash lamp
- GPS
- Hand-held lights
- Floater
- Fire extinguisher
- Radar reflector
- Distress flares
- First Aid kit
- Binoculars
- Orange smoke flare
- Signal lamp

\*\*From: Danielsson *et al.*, 2008.

## 1.2 THREATS TO FISHING VESSELS AND SAFETY AT SEA FROM DIFFERENT DISASTERS

There are numerous threats to vessels and safety at sea which might result from disasters; again it is useful to consider categories of vessels to discuss the threats to fishing vessels and safety at sea.

The main threats to fishing vessels are hurricanes/cyclones, tidal surges / tsunamis and floods and the most devastating to fishing vessels have been cyclones and tsunamis. In port such disasters are all dangerous to vessels and in particular where they are floated out of normal areas into built up areas or damages by falling debris. With a tsunami there can be a key difference between the effects of these on different vessels. Larger vessels are often at sea for long periods and (in deep water) the passing tsunami waves may have little or no affect on a larger vessel. However, smaller vessels which are often on or near the shore are very vulnerable to the affects of a tsunami. The disaster impacts on fishing vessels can be summarised as follows:

TABLE 3  
Impacts of disaster types on fishing vessels and safety at sea

Vessel category	Smaller (under 10m length)	Larger (over 10m length)
<b>Hurricanes / cyclones</b>	Vessels at sea and in port can be affected. Small vessels may suffer severe damage or total loss. Small vessels may be hauled out and thus possibly protected.	Vessels at sea and in port can be affected. Larger vessels may be more seriously affected as they cannot be hauled out and severe damage may result although total loss is less likely. Vessels at sea may be overwhelmed by the wind and resulting waves. Proximity to shore may not be helpful as waves increase in height and steepness as water depth diminishes.
	In Bangladesh and Myanmar the effects of cyclones (in 2007, 2008 and 2009) on the fishing fleet were discussed with fishers. Whilst many vessels were damaged or lost at sea the resulting tidal surge may have accounted for much of the damage.	
<b>Tidal surges / tsunamis</b>	Vessels in port will be more severely affected than those at sea. Small vessels are very vulnerable both in water and hauled out with severe damage, total loss or relocation resulting.	Larger vessels at sea may be unaffected by and even unaware of tsunamis.
	As above vessels in Bangladesh and Myanmar were severely affected by tidal surges resulting from the cyclones. These were sufficiently large to carry away vessels of all sizes which were either lost at sea or damaged on land when the surge receded.	
	In Aceh, Indonesia the tsunami affected all vessels in its path which were on or near the shore. The resulting damage may have resulted from wave impact or vessels being carried away and lost or damaged. Vessels at sea in deep water may have experienced almost no effect from the passing wave. In fact there were reports of vessels returning to land undamaged and becoming part of the rescue effort by picking up persons swept out to sea by the receding wave.	
<b>Earthquakes</b>	Vessels in port may be affected; those at sea less affected (see tsunami). Small vessels very vulnerable to severe damage or loss.	Large vessels vulnerable to severe damage or loss.
<b>Volcanic eruptions</b>	Vessels in port may be affected if in path or area of fallout. Those at sea are unlikely to be affected.	Vessels in port may be affected if in path or area of fallout. Those at sea are unlikely to be affected.
<b>Floods</b>	Vessels in port and especially river ports may be affected where flooding is violent. Small vessels may be severely damaged or relocated.	Large vessels may be severely damaged or relocated unless away at sea.
<b>Oil spills / chemical spills</b>	Safety issues from chemicals. Small vessels near shore likely to be more affected. Damage unlikely.	Larger vessels far offshore may be less affected.
<b>Nuclear leaks</b>	Safety issues from radiation. Small vessels near shore likely to be more affected. Damage unlikely.	Larger vessels far offshore may be less affected.
<b>Drought</b>	Probably none in marine fisheries. Possible affects on resources and on port/landings in river and lake fisheries. Damage unlikely.	=
<b>Fish Disease outbreaks</b>	None	=
<b>Complex Emergencies (civil unrest)</b>	Vessels may be used for various non-fishing tasks and severe damage or total loss may result. Conflicts may make any	Larger vessels at risk of being forced into use for transport of food, equipment, civilians, refugees or army/rebels. Sea based activities can become dangerous or subject to additional controls.

The main implications for livelihoods are loss of assets and loss of income resulting from disasters are complex and far reaching as there is a long chain of other activities dependant on the fish landed by the fleet. Livelihoods such as marketing, processing and transport will be affected by reduced or absent fish landings. Although working on the repair and maintenance of fishing vessels may be benefitted if there are funds available. Some of the implications can be summarised as follows:

TABLE 4  
Implications of those impacts on the livelihoods in fishing communities

Disaster type	Implications for livelihoods in fishing communities
Hurricanes /cyclones	Lost, damaged and relocated vessels causing temporary or permanent loss of income to fishers, traders and processors. Impact possibly over a large geographical area.
	In Myanmar and Bangladesh (in 2007, 2008 and 2009) many 10's of thousands of fishing vessels were damaged or destroyed in the delta/coastal areas. These impacts were observed during numerous field trips.
Tidal surges / tsunamis	As above
	In Aceh, Indonesia (in 2004 tsunami) some 6000 fishing vessels were damaged or destroyed over a large geographical area and the livelihoods of many thousands of fisher families severely affected by this. The impacts were observed during numerous field trips.
Earthquakes	As above but the effects may be localised to a smaller area meaning that outside this fishing activities continue.
Volcanic eruptions	As above
Floods	Vessels in port and especially rivers may be affected where flooding is violent. Small vessels may be severely damaged or relocated. Revenue may be severely impacted.
Oil spills / chemical spills	Fish landing may continue but be unsalable due to contamination OR catch may decline due to death of fish populations. Revenue from may diminish or stop entirely.
Nuclear leaks	A above
Drought	May affect inland fisheries and aquaculture but unlikely to have effects in marine capture fisheries.
Fish Disease outbreaks	Fish landing may continue but be unsalable due to disease OR catch may decline due to death of fish populations.
Complex Emergencies (civil unrest)	Fish landings may decline due to unsafe situations of re-purposed fishing vessels. Landed fish may be diverted away to fighting forces leaving local populations with less.

### 1.3 THREATS TO FISHING VESSELS AND SAFETY AT SEA FROM EMERGENCY RESPONSES

A major threat from poorly planned emergency responses is the delivery of poorly built and potentially unsafe boats produced in attempt to respond rapidly at an early stage after a disaster. This is a threat to fisher safety as well as the longevity of the vessel and thus it's economic usefulness. Such outcomes may result from poor planning and supervision and a lack of understanding of the technical issues. Additionally boatbuilders may be pushed by implementing agencies to deliver numerous boats, quickly and at a low price; the result is often boats of a very low quality. Further the loss of skilled boatbuilders (such as post 2004 tsunami) may result in carpenters, with little or no experience in boatbuilding, claiming that they have the necessary experience to build good boats.

Numerous examples can be related where well meaning but technically ignorant donors/NGOs rush to respond to restore lost livelihoods without considering adequate supervision and quality control of boatbuilding activities. The author has inspected numerous examples of boats which are, from the point of delivery to beneficiaries, not fit for purpose and will either be a danger to the users or have a useful working life of a few years or possibly only months. In Aceh post tsunami some NGOs, lacking experience in boatbuilding, purchased small boats constructed to very poor standards

(Davy, D. 2005. *Report on first of two visits to Aceh Province to prepare construction standards for wooden fishing vessels and drawings of wooden vessels to be constructed under the reconstruction and development programme in Indonesia*. Rome, FAO).

The oversupply of vessels or supply of vessels to those who were not owners prior to Emergency Responses can have a negative impact on the livelihood of fishers and fish resources. Consider the case where fully exploited resources become over exploited as the result of poorly planned Emergency Responses which increased overall fishing effort.

The restoration of vessels of specific design which were engaged in illegal or discouraged fishing activities requires careful consideration. Whilst possibly acceptable in early emergency phase in order to restore food and livelihoods this is unlikely to be an acceptable long term strategy. In Bangladesh the issue of illegal fishing had a large influence on the type of vessels supplied during reconstruction as vessels had to be suited to fishing with less destructive gears than previously used.

Social and community factors should be considered as the restoration of lost assets such as fishing vessels may be complex in the context of the fishers' community. Consider a case where there have been some undesirable ownership and debt/trading patterns prior to an emergency which generally would be undesirable to restore. This might include fishers working as poorly paid labourers on vessels owned by a wealthy and absent business man. Or fishers being tied to trading with a creditor who fixes low prices for catch received or fixes unrealistic ally high interest payments. In Bangladesh new GRP vessels are distributed to CBOs (Community Based Organisations) who are responsible for the use and care of the vessel and sharing the catch proceeds. They are also bound to maintain records of their activities and report catch data to authorities.

The marketing of catch and the management of fishing revenue may also be complex (e.g. controlled by women fish traders) and this could be severely upset or skewed by the donation of new fishing assets to the fishers whilst ignoring the previous ownership patterns. Understanding such social and market structures is complex and may not be possible in the early stages of an emergency response - we should embrace ignorance and not pretend that we can fully understand the issues! The importance of such factors was highlighted in Sierra Leone where efforts to encourage the reduction of fuel use were complicated by traders rather than fishers bearing the cost of the fuel.

Lack of technical support, training and maintenance for vessels the provided can result in these vessels failing prematurely and becoming unsafe at sea or being cast aside by the beneficiaries. Thus their livelihood has only been restored temporarily. Additionally lack of training in proper use of new assets can also result in vessels becoming damages and unusable. In Bangladesh recently donated GRP vessels showed signs of developing small problems which if ignored could result in boats becoming unusable and remaining on the beach. Immediate action was recommended [by the author] to provide support and training to the vessel users so as to avoid such problems.

The delivery of incomplete vessels can also result in vessels becoming unsafe at sea or in their being cast aside by beneficiaries (possibly in favour of a better offer from an enthusiastic donor). Examples include delivery of a boat without key technical items which appear cheap and available – say a rudder or a propeller – but which beneficiaries cannot or choose not to afford. In Aceh the author witnessed a group of 9m fishing vessels which were delivered to beneficiaries without rudders and propellers being left to rot on the shore. There appeared to be no need or urgency to install these relatively small items as other boats were available. The only part of the boats that ended up being used was the engines which were transplanted into other vessels.

#### 1.4 OPPORTUNITIES FOR IMPROVING FISHING VESSELS AND SAFETY AT SEA

By careful consideration of fish resources and the alternatives available a replacement vessel (and associated gear) can lead to a more sustainable activity and more profitable long term future than was being pursued prior to a disaster. In essence a redirection of the effort away from destructive practice can be effected. Fishers are often aware of this possibility but do not have the means or experience to make a change without assistance. In Bangladesh new GRP vessels were supplied with new fishing gear which was selected to be less damaging to sensitive river areas and breeding grounds.

Introducing minor changes to vessel design and equipment can provide improvements in operating efficiency and improved revenues. Opportunities exist with refining hull shapes, introducing different motors or the addition of a gearbox. Even a simple changes such as correctly sizing and installing a propeller and stern gear can dramatically increase fuel efficiency. In the authors experience there are always opportunities for such improvements even in relatively developed fisheries.

Provision of training and skills upgrading in boatbuilding can improve the strength and longevity of vessels as well as improving efficiency in material use. Achieving such improvements is all about detail and the arrangement and connection between timber components can make the difference between poor quality and strong, long lived vessels. Understanding the available timber and using it effectively within the design can allow savings in materials which has obvious cost benefits. In Myanmar the author and the master boatbuilder stressed the need for training to include the preparation and use of the raw materials (timber) in both technical and economic ways.

Provision of training in safety at sea at a basic level can, at little cost, reduce the likelihood of serious accidents. At the same time this can improve the confidence of those remaining on shore that members of their family and community will return from time at sea in safety. Simple checks and maintenance on the boat and machinery can be life saving as can the carriage of inexpensive items such as a torch, mirror and life buoy etc.

Establishing or updating systems of vessel registration and documentation can provide increased safety and confidence in the community. Knowing where and when vessels are fishing and what others are in the same fishing area can be life saving in the event of a marine accident. Involvement of the community, and in particular the family members of the fishers, is important here.



## 2. A review of best practice and lessons learnt from provision and repair of fishing vessels and improving safety at sea in emergency responses

### 2.1 EXPERIENCES IN PROVISION OF VESSELS AND IMPROVING SAFETY AT SEA

#### 2.1.1 Indonesia following the 2004 tsunami

A devastating *tsunami* occurred on 26<sup>th</sup> December 2004 and Aceh Province in Indonesia was one of the hardest hit areas. Loss of life and assets was considerable and initial estimates concluded that some 12000 to 14500 vessels were lost or damaged; this was later downgraded to between 4700 and 6000 boats. Additionally many traditional boatbuilders lost their lives resulting in a significant loss of boatbuilding skills.

FAO was involved from the early stages of the emergency, and its original intention was to replace a large number of boats (around 2500) lost in the tsunami. However, following the appearance of numerous low quality boats delivered by other agencies in the first few months after the disaster, the safety and quality standards of the boats became the key concerns. The result was that it was necessary refocus efforts including those of FAO to combine material inputs with the upgrading of skills to guarantee a longer-term, sustainable rehabilitation. So the number of boats planned for construction by FAO was reduced and the training of boatbuilders and improved boatbuilding techniques became the main focus of FAO's work. The expectation was that this would lead to fewer casualties at sea, better and quicker repairs and more sustainable use of timber resources.

Based on boatbuilding needs assessments, numerous consultations and a fishing boat census the estimated number of fishing boats that needed to be built for the recovery was significantly reduced from approximately 12 000 to 6 000 or less. This was an important re-direction of efforts aimed at avoiding the creation of increased fishing capacity and low quality, short lived boats.

Initially two boatbuilding training courses were conducted in by FAO in different areas of the province and 44 boatbuilders were trained in combination with the delivery of 10 high quality, fully equipped fishing vessels. This training provided a core of boatbuilders in the region who became active in a number of other projects, some becoming trainers themselves, and effectively formed an informal boatbuilding network. The successful combination of boat production with training was a valuable lesson and was taken forward into other emergency responses. In all FAO provided over 200 good quality boats to beneficiaries.

Placing appropriate vessel construction contracts with local boatbuilders was a significant problem and caused difficulty and delay. Making use of already active NGOs or establishing new, local NGOs was the method used to overcome (meet adequately) formal contract requirements. These NGOs were provided with sufficient funding and materials to construct a boatshed; boatbuilding toolkits; and timber and materials to construct the fishing vessels. They were also supported by FAO

technical staff. Safety equipment and fishing gear were also distributed with each boat constructed. The sheer size of the area covered was problematic as it stretched staff and vehicle availability. Some areas including Mulaboh, Similue and Nias were only realistically accessible by air.

FAO's work in Aceh also included assuming a role as lead agency and coordinator in fisheries where it promoted sustainable management, coordinated efforts and provided technical advice to other actors in the sector.

**Lessons learnt:**

- Building large numbers of boats is challenging and significant design, management and supervision will be required to achieve a good outcome. This is no different to regular, commercial shipbuilding activities, see Box 3.
- To improve the quality of fishing vessels and ensure safety at sea it is necessary to build new vessels to recognised, internationally agreed standards of construction and safety, possibly higher than those extant in country at the time of the disaster. Noting that agencies including FAO and others are effectively liable for the quality of boats delivered.
- In practice early boatbuilding objectives may be hard to achieve resulting in subsequent project restructuring and potentially diminished inputs for fisheries.
- Provision of training and technical assistance to boatbuilders is essential the success of fishing vessel repair and replacement programmes.
- Contractual arrangements for construction or repair activities need to reflect the level of the businesses involved and the situation in country. Simple and rapid to establish procedures need to be available to allow contracts to be placed with locally available businesses.
- Agencies, NGOs and donors should acknowledge their lack of technical expertise and supervision experience in the design and delivery of fishing vessels, if this is indeed the case.
- And bridging this knowledge gap by providing technical assistance, coordination and knowledge resources will be invaluable to the success of fishing vessel repair and replacement. Such activities may not be as high profile as delivery of inputs but without them the success and sustainability of the inputs made may be diminished.

**Box 3 – Project costs**

In commercial shipbuilding it is understood that there will be significant design, management and supervision costs and these will be allowed for in planning a project. Typically these may add 10 percent to 15 percent to the cost of the vessel. In this way a reconstruction project aiming to deliver say, 250 small boats costing \$5 000 each is no different, having a value of \$1.25M and thus also requiring significant management and supervision.

**Triangle Generation Humanitaire**, a French NGO, built and distributed over 130 boats for fishing cooperatives in three villages in Aceh: Lhoong, Lhok Nga, and Lampuuk, as well as training local boat-builders. The boats were based on a local design selected to be suitable for the local conditions. When visited by the author construction standards appeared good and the boats were liked by the beneficiaries of the project.

**Lessons learnt:**

- Projects should aim to support local industries during the repair and replacement of vessels, not only will this promote economic activity in the affected area but will ensure that inputs reflect properly traditional knowledge.

- Projects should also recognise and utilise the skills and knowledge of the community as this is the key to understanding the existing situation and assessing future needs
- Building small numbers of boats allows a focus on quality and longevity.
- Using local vessel designs selected by beneficiaries will ensure appropriate inputs are delivered.
- Incorporating boatbuilder training and quality control are essential to a successful boatbuilding project.

**German technical cooperation** (Deutsche Gesellschaft für Technische Zusammenarbeit, GTZ), commissioned the construction of numerous vessels of various types in Aceh. The boats were built at small local shipyards and GTZ encouraged local skilled trades. Using the local boatbuilders experience ensured that the end-products were well suited to the local people's requirements. No new technology was introduced in the production of these vessels, which are replicas of the boats lost by the fishermen in the disaster. This is what they wanted; right down to the tried-and-tested motors from China, because these are the ones they know best.

**Lessons learnt:**

- Making use of experienced local boatbuilders can ensure that vessels appropriate to the area are delivered.
- Basing boats on local designs can ensure that inputs are acceptable to the end users.

The **Agency for Technical Cooperation and Development (ACTED)**, a French NGO, provided training in boatbuilding and distributed boats to replace those lost in the *tsunami*. During its programme ACTED realised that its boat number target, established shortly after the *tsunami*, could not be fulfilled. A new approach was developed with the focus on quality control and monitoring, covering all aspects from the procurement of material to the vessels handover to beneficiaries. ACTED built FAO vessel designs developed in response to the *tsunami* and ensured that the boatbuilders and trainees learned to construct the vessels using best boatbuilding practices, increasing the vessels lifespan, reducing maintenance requirements and the amount of wood required. Beneficiaries were carefully selected by assessing vulnerability, need and qualifications to operate and maintain the vessels.

**Lessons learnt:**

- Building large numbers of boats is very challenging and significant management and supervision will be required to achieve this. In practice the early objectives are seldom achieved resulting in project restructuring and potentially diminished fisheries inputs.
- Starting small by building manageable batches of vessels is likely to be successful and can result in higher quality products.
- Training can increase the quality and longevity of the boats produced.
- Ensuring that selected beneficiaries have the necessary skills to make use of inputs can ensure that they will not be wasted or abandoned.

The **Kuwait Red Crescent Society** donated about 118 GRP vessels to beneficiaries in Aceh in the early months after the *tsunami*. The vessels were not of a local design or locally built, coming instead from a company in Makassar, South Sulawesi. When the boats were tested off the coast of Aceh they were found to be unsuitable for local conditions and prone to taking on water when operated in waves. Even after some modifications the fisherman and the head of the fishermen's association (Panglima

Laot) concluded that the boats were unusable and requested that no more boats of this type should be provided. In addition the boats were considered to be too expensive for use in the local fishery.

(Reliefweb, 2011. <http://reliefweb.int/node/170643>)

**Lessons learnt:**

- Replacement vessels need to be discussed with beneficiaries as they will know what is appropriate to their location.
- The local factors affecting vessel design and selection must be considered to ensure appropriate vessels are delivered.
- Supporting local industries during the repair and replacement of vessels will this promote economic activity in the affected area and will ensure that inputs reflect properly traditional knowledge.
- Importing “alien” designs can provide rapid inputs in large numbers; however, there may be problems with the acceptability of these to beneficiaries.
- Build back better holds some dangers for activities vessel repair and replacement; care is required as it is actually possible to achieve the opposite. ‘Better’ needs to be seen in a local context as what outsiders view as better may not be seen as such by beneficiaries. A careful understanding of the local situation and some tailoring of changes/ improvements will be required to avoid failing to build back better.

**Family Care Foundation**, a United States NGO, used a local boatbuilder to produce vessels based on a vessel design developed by FAO which had been already successfully built by others. They focussed on allowing enough time (about 21 days) to build each vessel so that quality and longevity could be achieved. This was in contrast to other NGOs who were commissioning vessels to be built in about 5 days each, these were often quickly damaged and became non-operational. This NGO criticized various aspects of the reconstruction efforts including: a lack of coordination amongst organizations, financial waste and the pressure from donors to invest a lot of money quickly to produce some visible results. They maintain that the majority of fishing vessels that were built for Aceh fishermen ended up not being used today.

**Lessons learnt:**

- Where large scale building and repair of fishing vessels is being undertaken in an emergency situation it is important not to expect boatbuilders to produce boats which are simultaneously Cheap, Safe and available Quickly. Experience reveals that it is likely that only one or sometimes two of these can realistically be achieved. In particular allowing sufficient time for a reasonable level of quality to be achieved is essential.
- NGOs and other agencies should acknowledge their lack of technical expertise and supervision experience in the design and delivery of fishing vessels, if this is indeed the case. And then seek support and advice from a competent partner such as FAO.

The **Asia Foundation** wrote the Second ARRA (Aceh Reconstruction and Rehabilitation Appraisal) Report in 2006. The report highlights an interesting example summarised as follows:

It is often assumed that any assistance offered is willingly accepted, no matter whether it will actually be useful or not, however, this may not always be the case. Consider the example of a village in Aceh Barat which developed a system for reviewing assistance from aid providers, called the Community Economic Institute (or Lembaga Ekonomi Masyarakat, LEM). This institution maintained a database containing the names and needs of members and records of aid received in order to be able to review offers of

assistance and identify beneficiaries. Following an offer of 60 small boats, the board of LEM and its members discussed the assistance and decided to decline the offer. Their reason was that the operating costs for the proposed boats would be high, and the revenue they earned would not be enough to cover these costs. The meeting also recommended an alternative design of boat but found that the agency involved was unwilling to revise its program. The community did not change its decision realising that if they accepted the boats, they would simply not be used.

**Lessons learnt:**

- Repair and replacement of fishing vessels should be discussed with the community and potential beneficiaries and project plans formulated using this information.
- Consideration should be given to sustainability of the planned interventions. For example can the boatbuilders, service providers and others maintain and repair the new boats and their equipment? And can the vessel user afford to run the new vessel within an existing fishery?

### 2.1.2 Myanmar, following cyclone Nargis 2008

Cyclone Nargis struck the Ayeyarwady and Yangon Divisions on 2 and 3 May 2008 with up to 200 km/hour winds and heavy rains, compounded by a 12-foot storm surge. Human and infrastructure losses were considerable and around 140 000 fishing vessels were lost, including small inshore, coastal and offshore vessels. The majority, some 100 000 or more, are thought to have been small inshore and multipurpose boats which became the focus of FAO boatbuilding activities.

FAO's programme of assistance centred on the recovery and reconstruction of damaged and lost assets, including boats, gear, landing sites and post-harvest facilities. The aim being to enable fisheries workers to resume production, post-harvest processing and marketing and to restore the availability of fishery products for local consumption and in marketing centres.

Boatbuilding activities centred on improved and safer boats, training and skills upgrading, good use of materials and the production of step by step by step manuals for small vessel construction which may be valuable in the event of future similar disasters. Boatbuilding activities started small with 3 boats being built in conjunction with a training and demonstration for carpenters, this also allowed the correction of some design issues before larger production runs were started. Ultimately under these programmes approximately 300 12ft and 18ft multi-purpose boats were constructed using the new designs. After distribution of these boats feedback indicated that in some locations and activities users found the boats not to have the stability characteristics that they would have liked. This is a drawback of trying to produce multi-purpose vessel designs, not intended for full time fishing, and aimed at family users who may undertake various activities.

The reconstruction of boats and replacement of gear aimed to avoid overfishing and ensure the long-term sustainability of fisheries natural resource use. The intention was that most beneficiaries should be small- and medium-scale, inland and coastal fishers.

**Lessons learnt:**

- Starting with small scale boat production is a good way of ensuring the design is ready for production,
- Incorporating demonstration and training into the early (small scale) vessel production is a good method of increasing skills and exposure to new building techniques,
- Giving consideration to activities other than full time fishing is important, this may include multipurpose 'family' boats used for transport and other economic activities,

- Noting that vessels which aim to be multi-purpose may not satisfy users who actually only intend to use them for one purpose, such as fishing.
- Beneficiaries' activities must be understood so that they receive a boat that meets their needs.
- When providing assistance in a country that is frequently hit by natural disasters (typically cyclones) it may be useful to develop step-by-step manuals on how to build typical (local) small fishing vessels. Such manuals will become useful for governments, NGOs, boatbuilders and others should the country's fishing vessels be affected by a future disaster,

The **Agency for Technical Cooperation and Development (ACTED)**, a French NGO, undertook boatbuilding activities in Labutta with the aim of addressing the demand for (small) family fishing boats among the affected communities. Hands on training, during boat production, aimed to promote high quality boat construction skills among local carpenters, and thus provide cash to local labourers as well as a marketable skill.

**Lessons learnt:**

- Projects should use the skills and knowledge of local boatbuilders for the repair and replacement of vessels, not only will this promote economic activity in the affected area but will ensure that inputs reflect properly traditional knowledge.
- Incorporating training activities into boat production can result in better boats and can provide work (cash) and new/upgraded skills for local workers.

The **Department of Fisheries (DOF) in Myanmar** provided 9,500 motorized inland fishing boats (of 21ft class) together with the associated fishing gear as part of an in-kind credit scheme. This activity was completed within about 3 months and, to a large extent, met the rehabilitation needs of this part of the fisheries subsector. As such it may be viewed as a considerable achievement. Little is known about this project by the author; however, visits were made to some of the participating boatyards and samples of boats inspected. The boats were all built to a standard design closely based on a commonly found local boat. Those inspected [by the author] were of serviceable quality but many suffered from the rapidly procured and sometimes poor quality wood used in the project. The project involved the mobilisation of a large number of staff including a management structure and 100s of carpenters and the establishment of eight sizeable boat construction facilities. Materials (timber) were provided via government channels so as to ensure availability of the quantity required. The 21ft design produces is at the smaller end of vessels used for full time fishing

**Lessons learnt:**

- Constructing large numbers of boats requires considerable planning, management and supervision.
- If timber construction is planned timely procurement of the raw material is essential because boatbuilding timber has to be seasoned (dried) for sufficient time. If this is not done the quality and longevity of the finished boats will be impacted.

### 2.1.3 Bangladesh following cyclones Sidr, 2007 and Aila, 2009

FAO originally set out to provide a large number of boats to fishers affected by cyclone Sidr, however, a number of factors combined to ensure that this did not happen. The most important was the discovery that there were technical problems with the design/types of boats being used before the cyclone and this raised concerns about the safety at sea of any new vessels. Also the availability of suitable timber was raised as a concern

as the longevity of existing boats was found to be very poor. Funds intended for boatbuilding in the initial project were re-directed to other sectors.

Later, under other projects FAO designed and constructed a small number of improved 20ft and 30ft wooden boats, trained boatbuilders in their construction and produced simple step-by-step manuals which are intended to be valuable in the event of future similar disasters. The designs are intended to be stronger and safer than traditional wooden vessels and to reflect the relatively poor materials which are available for boatbuilding by introducing better construction details and use of materials.

FAO has distributed 25 GRP vessels developed by a local boatbuilder to replace 9m traditional wooden vessels and will be providing a further 35 of the same type. These are being used in the target communities with some success and some problems. The boats are generally liked by the fishermen's groups because there is little maintenance compared to wooden boats and it is felt that the boat is strong and will last a long time. Negative comments include the statement that the boat is too small and unstable for the fishing they wish to do, which is in the estuaries and inshore at sea. A number of simple additions and modifications were also suggested by users to the boat including items such as a gearbox, a removable shelter and removable decking. The boats were distributed with fishing gear specifically designed to reduce over exploitation of fragile fish stocks in the rivers of the delta.

The experience of fishermen's groups using and maintaining the GRP boats indicates that further demonstration and training in the skills required for GRP repair and maintenance is essential since without this minor problems and failures can develop into issues which make the boats unusable. The intention now is to produce further GRP vessels which reflect the technical comments and training needs and the desire to re-locate fishing effort away from overfished inland rivers.

#### **Lessons learnt:**

- Reconstruction plans need to allow for the actual situation in the artisanal fishery. In this case poor quality boatbuilding and timber quality as well as potentially damaging / illegal fishing activities,
- An early assessment should be made by experienced/expert staff to identify the nature of the damage and the type, size and design of the boats affected.
- Projects should allow for adequate training in the correct use of the assets provided, this is especially relevant if some technical improvements or changes are incorporated,
- When providing GRP boats to a place where such boats do not exist, it will also be necessary to establish maintenance/repair facilities (where new boats could also be built) as well as training for the local boatbuilders and provision of tools and materials,
- It is necessary to consider all existing aspects of the fishing activities being undertaken prior to an emergency situation. Areas of concern should include: use of illegal gears, overfishing, ecosystems and possible conflict with existing government strategy. In this context improved quality may mean improved sustainability and long term profitability.
- When providing assistance in a country that is frequently hit by natural disasters (typically cyclones) it may be useful to develop step-by-step manuals on how to build typical (local) small fishing vessels. Such manuals will become useful for governments, NGOs, boatbuilders and others should the country's fishing vessels be affected by a future disaster.

Taratari shipyard and an NGO, **Friendship Foundation**, have been developing and supplying a 9m GRP fishing boat to provide a long lived and unsinkable replacement

for traditional wooden boats. Boats have been delivered by the NGO to coastal areas such as Kuakatta and by FAO to groups of fishers in river areas. The design is generally considered by users to be good for single day fishing activities but unsuitable for multiday fishing further from safe haven. The key points promoting the design include that it will be long lived, lasting up to 25 years with the correct maintenance; that it is unsinkable as a result of the built in buoyancy tanks and that few days of fishing are lost due to breakages and maintenance.

**Lessons learnt:**

- Follow-up and support will be needed with new technology inputs to increase the confidence and understanding of the beneficiaries. Failure to provide these inputs can result in rapid failure of new vessels and equipment.
- When providing GRP boats to a place where such boats do not exist, it will also be necessary to establish maintenance/repair facilities (where new boats could also be built) as well as training for the local boatbuilders and provision of tools and materials.

#### **2.1.4 Peru. Following earthquake and tsunami, 2007**

In August 2007, a powerful earthquake struck Peru some 161 km south of the capital Lima. The earthquake affected the departments of Ica, Lima, Junin, Ayacucho and Huancavelica and left more than 500 dead, 1000 injured, 39,700 houses and 100 hospitals destroyed. Around 220 artisanal fishing boats were affected by the tsunami caused by the earthquake and the pier in the town of San Andres in Pisco, 250 km south of Lima, collapsed.

The FAO emergency programme in Peru focussed on the rehabilitation of the livelihoods of families affected by the earthquake, including rehabilitation of infrastructure for production: by distribution of tools, inputs for irrigation infrastructures and assistance with production assets for artisanal fishers. Initially it was planned to produce 25 vessels consisting of 10 x 14ft open rowing boats ('Chalana'), 12 x 24ft design, with 40hp outboard motors and 3 x 32ft design, with 60hp motors. These were of the type lost in the disaster. Subsequent investigations and negotiations revealed some problems with this approach. Whilst the 14ft boats were built without problems, the complexity and cost of the larger design meant that it was likely to be outside the available budget. Also there was difficulty in ensuring that the replacement vessels met both the requirements of the fishers in terms of capacity and function and the requirements of recognised standards in terms of safety at sea. Stability was an area of particular concern as it is likely that many of the locally designed boats are not able to meet acceptable stability standards

The problem with maintaining the planned inputs centred on the difference between two larger types of fishing vessels affected by the disaster. The 24ft vessels relatively simple equipment, are relatively inexpensive and are involved in inshore fishing. The larger 32 ft vessels have inboard motors, much more complex machinery and equipment and are relatively expensive and are involved in fishing further offshore (up to 90nm). There appears to have been difficulty in managing the expectations of the fishers possibly because pledges were made regarding certain inputs but certainly because they strongly expressed the need for the larger more expensive class of boats in order to have an economically viable asset. The outcome was that the smaller design was deleted from the plan and the budget transferred to a new project focussing on the completion of a number of the larger vessels. In order to meet the expectations of the beneficiaries the vessels are complex and expensive and thus the number to be produced is lower than initially planned.

FAO is also assisting the government in identifying gaps in their current laws and regulations regarding the design, construction and equipment of fishing vessels, using the FAO/ILO/IMO instruments as a guide.

**Lessons learnt:**

- Building numerous larger boats is challenging and significant management and supervision will be required as well as more time than envisaged. In practice early project objectives are seldom achieved resulting in project restructuring and potentially diminished fisheries inputs.
- Where a boat design delivered to beneficiaries is larger, more complex and intended to be operated in new areas, say from the shore, it is necessary to upgrade the skills of the fishers to handle the vessel and equipment safely. This will include navigation skills and the ability to maintain and repair machinery.
- To improve the quality of fishing vessels and ensure safety at sea it is necessary [for international agencies and donors] to build new vessels to recognised, internationally agreed standards of construction and safety, possibly higher than those extant in country at the time of the disaster.

### 2.1.5 Sri Lanka following the 2004 tsunami

The coastline of Sri Lanka was severely affected by the *tsunami* which caused extensive damage to life and property in 14 out of Sri Lanka's 28 districts. More than 35 000 people were killed and over 500 000 survivors lost their homes and livelihoods. About 70 percent of the country's 1 300 km coastline was affected.

The initial damage assessment of the fisheries sector, carried out by FAO together with Sri Lanka's Ministry of Fisheries and Aquatic Resources (MFAR), indicated that about 24 000 boats, approximately 75 percent of the country's fishing fleet, had been damaged or destroyed. Almost all the fishing gear on boats and ashore was lost and over 3 000 boat engines were damaged. Essential infrastructure including fishing harbours, refrigeration equipment, fuel-tanks, pumps, water-tanks and supply systems were severely damaged. Survivors of the disaster found themselves without a means of livelihood and lacking the tools and capital to restart productive activities. Over 70 000 of these survivors had been involved in fishing and fisheries-related activities before the tsunami.

The destroyed boats included small traditional craft, 17, 20 and 22 foot fibre glass boats with outboard motors and 28 foot fibreglass boats with inboard engines, commonly operated by the most vulnerable sections of the fishing community. Many of the smallest vessels were unregistered and no data was available on their numbers. Larger multi-day boats (MDB) also suffered considerable damage.

From early on, considering the numbers of boats planned to be built by NGOs and others, it became clear that an oversupply of small boats, 15–20 ft long, was possible in some districts. Much of the assistance provided by NGOs concentrated on small building boats rather than on repairing boats, possibly because this didn't generate so much visibility for them. Only a small number of donors and NGOs planned to distribute larger vessels or inboard engines (IBE) for the one day boats (ODB) and multi day boats (MDB). MFAR advised that the ODB and MDB were better equipped to exploit the offshore fish stocks composed of pelagic species and that these are economically important for the local and export market.

FAO activities centred on assistance for the repair of small traditional craft, 17 ft, 20 ft and 22 ft fibreglass boats with outboard motors and 28 ft fibreglass boats with inboard motors. And the repair of damaged 40 ft Multi Day Boats vessels and the replacement of lost fishing gear.

FAO also provided assistance to MFAR in developing the new Fishing Boat Safety (Design, Construction and Equipment) Regulations. The intention was to apply these

regulations to all fishing vessels that were built to replace those lost in the tsunami, many of which were substandard. FAO assisted in the establishment of a Certification Unit under MFAR and the training of staff. FAO also assisted in developing awareness raising material (books, posters, videos) in English, Sinhala and Tamil for fishers, their families, boatbuilders and others.

**Lessons learnt:**

- It is important to consider repair as well as replacement of affected vessels as this may be cost and time effective.
- All relevant types of vessels affected by the emergency should be considered and the efforts of those involved coordinated to ensure appropriate numbers of each category of vessel are planned for.

### 2.1.6 Maldives following the 2004 tsunami

The *tsunami* hit the Maldives with waves reaching four meters and many islands in the archipelago were devastated by flooding and tidal waves, particularly along the exposed east coasts. The agriculture and fisheries sectors, which are critical to the livelihoods of rural Maldivians suffered significant damage. The fisheries sector, the traditional production activity in Maldives and a major driving force of the economy, was seriously affected.

FAO focused its efforts on those fishers who lost small traditional boats called bokkura; a type of boat used for reef fishing and transportation and typically owned by small scale fishers. Assessments identified 89 beneficiaries who lost boats of this type. Consultants recommended that the new design for a bokkura should be GRP and should not be a copy of the existing wooden bokkura.

FAOs work in the rehabilitation of the fishery centred on providing GRP vessels and training in the use of this material for boatbuilding. The project provided 3 boat sheds in island communities and equipped them with boat building tools and materials for the construction small boats. The boat produced was a 4.5m GRP design based on the traditional bokkura, with improved hull design for better performance with outboard engines. To initiate the activities an established GRP boatbuilder based in the Maldives was contracted to produce the plug, 4 complete sets of moulds and 20 of the newly designed bokkuras. The remaining 69 boats were built in the 3 boat sheds, which had been provided with a mould, tools and materials.

The new design was completed by an experienced international naval architect. During vessel construction 39 persons were trained in GRP boatbuilding techniques which have created income generating capacity within the communities in addition to enhancing their means for self-reliance.

FAO was also involved the documentation and review of the 119 vessels which engine damage vessels. A total of 13 engines were and repaired by FAO and JICS (Japan International Cooperation System) while the remaining engines had already been repaired by their owners, who were compensated. In addition FAO assisted MOFAMR with the planning and specification of a new 85foot fishing boat – a GRP development of the existing dhoni designs. Assistance with construction and regulation compliance was provided by the international naval architect.

**Lessons learnt:**

- By carefully considering the factors affecting the choice of local vessels (including material availability), discussing existing practices and listening to the requirements of the communities affected it is possible to produce an updated vessel design which will be accepted by users.
- When providing boats, engines and equipment it has to be ensured that such items can be serviced locally. When providing, for example, GRP boats to a place where

such boats do not exist, there will be a need to provide assistance in establishing maintenance/repair facilities (where new boats could also be built) as well as training for the local boatbuilders and providing tools and materials.

### 2.1.7 Additional notes on FAOs involvement with vessel construction projects

- Whenever FAO is involved in the design and construction of fishing vessels, the Organization becomes liable for its quality and safety and thus always works to an acceptable standard, usually an internationally recognised standard.
- FAOs comparative advantage (based on huge experience) is in developing designs, providing advice and documentation, conducting training for boatbuilders, fishers and other stakeholders and in providing assist in supervising the construction.

### 2.1.8 Case studies

#### Better doesn't necessarily mean bigger - An example from Aceh involving outboard motors

During work with a fishermen's group on the replacement of 8m wooden vessels with GRP versions of the design it became apparent that there was some concern about the power of outboard motor supplied. The fishers view was that the 25hp outboard planned was not sufficiently powerful to undertake the desired fishing activity - trolling for pelagic species.

Investigations lead to the conclusion that, before the tsunami, this class of vessel was mainly powered by 15 and 25hp outboards, larger engines being less common. Post tsunami some restoration and reconstruction projects donated 40hp outboards either due to requests or because these were available quickly. No doubt these engines had advantages in this fishery. However, their presence raised expectations that this was the norm and lead to complaints from the groups receiving the boats with 2hp engines. With little data on catch rates and uncertain resource situation the introduction of an engine consuming large amounts of fuel is unlikely to be sustainable, not being justified by the additional revenue generated.

Note: Because the users have not invested in the asset and have no part in paying for or replacing it they may have little appreciation of its value.

#### Vessels rejected by beneficiaries due to lack of equipment - An example from Aceh involving boats left on the beach

The temptation to supply incomplete fishing equipment should be avoided even though it could be argued that the beneficiaries must be able to add the final 2 percent of cash or physical input to prepare a valuable asset (vessel) for use.

In a number of locations in Aceh fishing vessels were encountered that were obviously not being used [never used]. The reasons varied but often centred on lack of equipment of gear received with the boat, this included the lack of a propeller or rudder or the necessary fishing gear. It might seem reasonable to assume that an individual or group receiving donations of such valuable assets would have the ability to source locally the missing items. However, this is often not the case either due to lack of cash, availability of the item or possibly the wish to await a more complete donation.

#### Activities prior to disaster were unacceptable - An example from Bangladesh involving small boats and illegal fishing

It is necessary to be aware of existing problems with fishing activities undertaken prior to an emergency. Areas of possible concern could include: use of illegal gears, overfishing, and conflict with existing government planning. With such concerns there may be a case for not replacing lost assets with the same boats and equipment, instead

re-directing the fishery to address some of the historical problems. Such action can only be achieved with the inputs of experts in the field concerned.

In Bangladesh there was an initial drive to replace a large number of small vessels (20ft length) which had been active in the rivers and engaged in day fishing. It turned out that these vessels were not only often using illegal gears, such as set bag nets, but were targeting juvenile and breeding fish. And that the grounds close to communities where they fished were already over exploited. As the project progressed the various parties involved resolved that fishing inputs needed to be re-directed towards the provision of larger boats (30ft and above), to allow fishing further out of local river areas. And to the replacement of illegal (or discouraged) gears with less destructive fishing gear, such as a larger mesh gill-net to target a particular species.

### **Slow procurement - An example of impossible contracts in Indonesia**

Large organisations often have difficulty or possibly no mechanism to form contracts with the types of businesses which are likely to be encountered in artisanal fisheries. These are generally artisans and small family businesses or small companies which are not formally/legally registered.

In Aceh it was desired to contract boatbuilders to construct batches of 10 boats in a number of locations along the coast (note the boats were 8m in length and had a unit value of some \$2 000). None of the suitable boatbuilders were legally registered and so unable to enter a contract with FAO. After much deliberation and time passing it was decided that local NGOs should be formed incorporating each builder so that contracts could be given. After a considerable time this system was used and a number of boats were built, however, it can only be described as too slow.

Note: The contracts were impossibly complex and long winded for such small procurements and modest companies. The involvement over some time of HQ based procurement and legal personnel probably had a higher \$ value than the contracts actually let.

### **Importing specialist equipment – An example from Aceh involving boatbuilding materials**

In planning emergency reconstruction activities there may be materials or equipment which it would be desirable to import into the affected area. This requirement may be generated by the non-availability of particular items or the desire to improve the standard of built-back assets. It is essential to evaluate such requirements in light of the additional cost and delays which may be encountered when importing the items into the country.

In boatbuilding the use of plain steel fastenings (bolts and nails) is not considered good practice for seagoing vessels as they will rust and fail in an unacceptably short time. The cheapest, better alternative is hot-dipped galvanised fastenings (where steel items are coated in molten zinc). However, these may not be available to a sufficiently high quality in country or may not be available at all thus necessitating imported items. In the boatbuilding projects in Aceh the availability of galvanised fastenings (imported from New Zealand) was a constant problem and resulted in stoppages and delays in the activities. This may have been due to slow delivery (to Aceh) or to hold ups in customs or, at the end of the process, problems in the FAO warehouse itself. The cost of the imported fastenings was also unsustainable for ongoing boatbuilding activities.

### **Activities other than full time fishing - An example from Myanmar of small, multipurpose boats**

Disasters may have huge impact on vessels other than full time fishing boats, other classes such as family boats and multi-purpose boats may have been severely affected and often belong to the poorest families in an affected area. In Myanmar the government

and other agencies had been focussing on full time fishing boats of 21ft in length, a very common type in rivers and estuaries and much affected by the cyclone. Many thousands of these had already been delivered; however, there was little detailed information about the actual numbers of boats lost in the emergency or the state of the resources targeted by these vessels.

In FAOs boatbuilding activities the focus was shifted to cover multi-purpose and small family boats as these had received less attention at this stage than the 21ft class. Investigations revealed that most families living near water, which is almost all families in the delta, have one or two small boats (12, 15 & 18ft) which are used for fishing, transport, shopping, school and tending livestock such as ducks. It was also unknown how many such boats had been lost as a result of the cyclone. Typically such vessels are small, very numerous and not registered or recorded and so establishing numbers of boats lost or damages will be challenging.

So FAO conducted boatbuilding training and production of boats of 12 and 18ft boats and developed a manual on their construction which will have future value should a similar disaster occur in the future.

### **Following up new technology is essential - An example from Bangladesh involving GRP boats**

If a new technology or material is introduced as part of a reconstruction then particular care will be needed in the monitoring of the success and problems of the beneficiaries in adapting to that technology. If such follow-up is not provided then acceptance of the improvements can begin to falter due to the occurrence of relatively simple but unfamiliar problems.

In Bangladesh a number of replacement boats constructed from GRP have been provided to fishers in relatively remote coastal areas. And whilst some familiarisation with the new material and its care and repair has been provided under the project, the users are not yet confident in making repairs or spotting potential problems with the boats. In addition there are not yet any local skilled providers of such services. Such a situation could result in boats failing or becoming unusable due to relatively minor problems.

### **Avoid planning to build large numbers of boats - An example relevant to many emergency responses**

The experience is that this is extremely difficult to deliver large numbers of boats, large meaning hundreds or thousands. Why? Delivering replacement boats is very challenging from the technical, social, resource and management points of view. And the task is quite unlike delivering many other inputs such as farm machinery or livestock. Planning for, designing, building and supervising boats is a complex and time consuming business and this complexity can and has resulted in the poor performance of fisheries inputs. It is not uncommon for the project phase to be completed when few if any boats have been delivered and this can result in funds being transferred into other 'easier' sectors.

In a number of countries there are experiences where initial planning has produced commitments to build large numbers of boats in a relatively short time. Unfortunately the design, contractual, procurement, construction, supervision and management processes involved are simultaneously vital, difficult and time consuming. This results in a re-think of the boatbuilding activities and generally a reduction in the planned number of vessels.

A factor which can be overlooked is the procurement of materials for boatbuilding, these have to be either imported - in the case of GRP construction - or procured locally in (possibly) large quantities - in the case of timber construction. These processes can be very time consuming and can delay planned progress. In particular timber must be

seasoned and stored correctly before being used in boat construction - it is vital not to take short cuts in this regard. See Box 4.

#### Box 4 – The seasoning and storage of timber.\*\*

Boats should not be built with freshly sawn timber, if this is done shrinking and warping will occur and the boat is likely to be of inferior quality and require more routine maintenance than is acceptable. In particular the boat is likely to leak badly.

The time required for seasoning timber depends on the weather/season. A minimum of four to six weeks is required during dry weather and considerably more during the wet season. Generally it is recommended that the seasoning is extended for as long a period as possible.

Freshly sawn planks should be selected and stacked immediately after sawing. To avoid splitting, plank ends should be painted white. The layers should be separated by small transverse battens of equal thickness, spaced no more than 0.90m (3 feet) apart starting from both ends of the planks with the outer battens as close to the plank ends as possible.

\*\* From: Svensson 2009.

## 2.2 LINKS BETWEEN FISHING VESSELS AND OTHER SERVICES PROVIDED

Provision of fishing vessels has numerous complex links with other areas of support which may be provided. The most fundamental at the operational level are links with provision of fishing gear and with infrastructure. Without these two connections the vessels are useless and are likely to be unused or used very inefficiently.

Ideally fishing vessels should be designed to target certain species of fish (which are considered sustainable), with a certain type of gear (which is legal) and to land in a certain location (into which they fit and are safe).

The link to fisheries policy and management is of paramount importance as it is this which will enable the vessel to reflect current concerns with resources, sustainability and proportional effort / catching power. Some of the links can be summarised as follows:

TABLE 5

Linkages between vessel repair/replacement and wider fisheries policy and management

Areas of Support provided to fisheries sector in emergencies	Linkages between vessel repair/replacement and other support provided	What are the implications for planning? (what considerations should be made)
Food and nutrition security	Improving vessels may change the areas which can be fished and thus the landing sites/ markets which can be accessed. This may change the local availability and cost of fish and the opportunities for marketing and processing.	Discussions are needed with existing fishers and traders to establish likely effects. Links with infrastructure activities may be needed and plans put in place to ensure that certain areas are not negatively impacted as a result.
Provision / repair of fishing gear	Suitable fishing gear needs to be available to match the new vessels and the intended fishing activities. Obviously very important if improved gear or new fisheries are to be accessed.	Master fishermen, boatbuilders and naval architects to work together planning activities.
Provision / repair of infrastructure – e.g. landing sites / market facilities / aquaculture facilities	Fishing vessels are often designed to suit a type of port or landing site. Factors to consider include draft, keel design, weight (for hauling). If improved or larger boats are proposed they should match the available infrastructure and in particular be suitable to haul out of water if no infrastructure is available.	Discussions are needed with existing fishers and owners to establish required parameters.

TABLE 5 (cont.)

Areas of Support provided to fisheries sector in emergencies	Linkages between vessel repair/ replacement and other support provided	What are the implications for planning? (what considerations should be made)
Support for post harvest activities and marketing	Linking to point above the vessels should be able to access landing and marketing sites, i.e. not be excluded because of their design or size.	Discussions are needed with existing fishers and traders to establish required parameters.
Support for fisheries policy and management	New or repaired vessels should reflect current government strategy; the fishing gear is closely linked here.	Project design must reflect government policy and concerns regarding overexploitation and sustainability. Close working with relevant government agencies here is vital.
Provision of specialist services such as (engine) mechanics, traders selling spares an equipment (incl. safety)	To complete vessels ready for delivery and use specialist boatbuilding support services will be required locally.	Discussions are needed with service providers to ensure that they can support the planned projects. Note that incomplete boats (i.e. those lacking such inputs) are unlikely to be accepted by beneficiaries.

### 2.3 IDENTIFYING NEED FOR VESSEL REPAIR / REPLACEMENT IN EMERGENCY CONTEXT

In identifying vessel replacement / repair there are some critical questions to be considered:

- Identification of affected boat owners or users and details about ownership and of vessels. Are the planned inputs attracting new or inexperienced owners to the fishery? Were existing ownership patterns inequitable?
- The design and size of the vessel, the machinery and equipment used and the gear deployed. Are requests being made that increase fishing power, engine size and gear? Are these justified of simply opportunistic upgrades?
- Existing safety and design, construction or safety problems which were concerns before the disaster. Perhaps existing timber cost and availability was forcing lower quality and potentially unsafe boats to be produced. Were existing boats safe?
- Existing maintenance and equipment supply problems which were concerns before the disaster. Were the technical aspects of the designs sustainable?
- The areas fished including distances covered and likely sea conditions. This is critical to appropriate vessel design.
- Details of the impact of the emergency on that vessel, such as damage and loss of equipment and machinery.
- The numbers of vessels lost in various design categories and locations. This may be available from field workers and government sources but it is worth noting that the smallest and most vulnerable vessels (say 6m or less in length) are often unregistered and of unknown number.
- What is the strategy for the fishery in the area and what are the current concerns, such as overfishing and illegal gear. Does the disaster actually present an opportunity to re-direct the activities towards a more sustainable future?

Care will be required to establish correct information and a combination of government records, community based methods and coordination with other agencies active in the sector may be needed. Where other options are unsatisfactory general but intelligent assumptions and simple calculations may reveal useful boundaries, particularly in the case of numbers of boats lost. In Myanmar, some attention was given to very small multi-purpose family boats, under 6m in length. No exact figures were available regarding numbers of these or how many were affected by the cyclone. However, combining ownership patterns of boats in the delta with percentage of families affected provided boundary conditions for boat numbers. See Box 5.

### Box 5 – Estimating boat numbers

Number of families in a geographical area	A	
Percentage of families using a small boat	B%	
Average number of boats per family	C	Can be non-integer, say 1.5
Percentage loss or damage to small boats resulting from emergency	D%	
Number of small boats lost or damaged	E	= $A \times B \times C \times D$
Then try sensitivity by varying figures within upper and lower limits		

It is likely that, even in extreme cases, there will be surviving vessels which can be used as benchmarks to define the size and design preferred in various locations and groups. However, it is important to fully understand the vessels design and use and it is important to use get the advice of experts in fisheries, boatbuilding and naval architecture at an early stage.

Consideration should be given to the opportunity to improve the vessels used; this obviously concerns safety at sea but should also concern opportunities to re-direct fishing activities towards improved sustainability and long term profit.

## 2.4 SUMMARY OF LESSONS LEARNT

- Building large numbers of boats will be challenging.
- Building small numbers of boats allows a focus on training, quality and longevity.
- Starting small and expanding the scope of boatbuilding activities is likely to be successful.
- Management and supervision are required to achieve good results.
- It is necessary to build new vessels to recognised standards of construction and safety.
- Initial boatbuilding objectives may be hard to achieve resulting in subsequent project restructuring.
- Provision of training and technical assistance to the boatbuilders involved is essential
- Contractual arrangements need to reflect the nature of the businesses involved.
- Agencies and NGOs should acknowledge their lack of experience in the construction and delivery of fishing vessels.
- Providing technical assistance, coordination and knowledge resources is essential to the success of fishing vessel repair and replacement.
- Projects should aim to support local industries during the repair and replacement of vessels.
- Making use of experienced local boatbuilders can ensure that vessels appropriate to the fishery.
- Projects should also recognise and utilise the skills and knowledge of the community.
- Using local vessel designs selected by beneficiaries will ensure appropriate inputs.
- Training can increase the quality and longevity of the boats produced.
- Ensuring that beneficiaries have the necessary skills and training to use vessels can ensure that they will not be wasted or abandoned.
- Replacement vessels need to be discussed with beneficiaries as they will know what is appropriate to their location.
- The local factors affecting vessel design must be considered to ensure appropriate vessels.
- Importing 'alien' designs can provide rapid inputs but there may be problems with acceptability to beneficiaries.

- ‘Better’ needs to be seen in a local context as what outsiders view as better may not be seen as such by beneficiaries
- Do not expect boatbuilders to produce boats which are cheap, safe and available quickly - time is required for a quality product.
- Agencies lacking the required experience should seek support from a technically competent partner such as FAO.
- Consideration should be given to sustainability of the planned interventions.
- Incorporating demonstration and training into vessel production is a good method of increasing skills.
- Considering activities other than full time fishing is important .
- If timber vessel construction is planned timely procurement of the raw material is essential.
- Reconstruction plans need to consider the actual situation in the artisanal fishery, for example damaging or illegal fishing activities.
- When providing GRP boats to a place where such boats do not exist, it will also be necessary to establish maintenance/repair facilities (where new boats could also be built) as well as training for the local boatbuilders and provision of tools and materials.
- It is necessary to consider all existing aspects of the fishing activities being undertaken prior to an emergency situation. Areas of concern should include: use of illegal gears, overfishing, ecosystems and possible conflict with existing government strategy. In this context improved quality may mean improved sustainability and long term profitability.
- When providing assistance in a country that is frequently hit by natural disasters (typically cyclones) it may be useful to develop step-by-step manuals on how to build typical (local) small fishing vessels. Such manuals will become useful for governments, NGOs, boatbuilders and others should the country’s fishing vessels be affected by a future disaster.
- Follow-up and support will be needed with new technology inputs to increase the confidence and understanding of the beneficiaries. Failure to provide these inputs can result in rapid failure of new vessels and equipment.
- The repair as well as replacement of affected vessels should be considered as this may be cost and time effective.
- The efforts of those involved in boatbuilding activities need to be coordinated to ensure appropriate numbers and types of vessels are planned.
- New vessels, unknown technologies (such as GRP), new engines and unknown equipment need to be able to be serviced locally.
- Where an international organisation is involved in the construction of fishing vessels it is liable for their quality and safety and work to an acceptable construction standard. Note: See Appendix 5.



## 3. Review of existing standards and guidelines

### 3.1 INTERNATIONAL AGREEMENTS

There are a number of key international agreements in place regarding fishing vessel safety. However, until recently, when the Safety Recommendations (see below) were developed, there were no safety guidelines or recommendations for small fishing vessels of less than 12 m in length. Such vessels represent the majority of the fleet in many nations.

#### **The FAO/ILO/IMO Safety Recommendations for decked fishing vessels of less than 12 metres in length and undecked fishing vessels**

The purpose of the Safety Recommendations is to provide information on the design, construction, equipment, training and protection of the crew of small fishing vessels with a view to promoting the safety of the vessel and safety and health of the crew. They are not intended as a substitute for national laws and regulations but may serve as a guide to those concerned with framing such national laws and regulations. The provisions of these recommendations are intended to apply to decked fishing vessels of less than 12 m in length and undecked fishing vessels. And thereby to more than 85 percent of the world fishing fleet.

#### **The FAO/ILO/IMO Code of Safety for Fishermen and Fishing Vessels, 2005 Part A – Safety and Health Practice**

The purpose of part A of the Code is to provide information with a view to promoting the safety and health of crew members on board fishing vessels. This part of the Code may also serve as a guide to those concerned with framing measures for the improvement of safety and health on board fishing vessels but is not a substitute for national laws and regulations. The scope of this part of the Code is limited to such basic information as is necessary for the safe conduct of fishing operations and each competent authority should take every possible measure to promote safety and health aboard all fishing vessels.

#### **Part B – Safety and Health Requirements for the Construction and Equipment of Fishing Vessels**

The purpose of part B of the Code is to provide information on the design, construction, and equipment of fishing vessels with a view to promoting the safety of fishing vessels and safety and health of the crew. The Code is not a substitute for national laws and regulations nor is it a substitute for the provisions of international instruments in relation to safety of fishing vessels and crew although it may serve as a guide to those concerned with framing such national laws and regulations. The Code is voluntary. It is wider in scope than the Torremolinos Protocol and only the minimum requirements to ensure the safety of fishing vessels and safety and health of the crew are given in this part of the Code for decked fishing vessels of 24 m in length and above.

### **The FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005**

The purpose of the Voluntary Guidelines is to provide information on the design, construction and equipment of small fishing vessels with a view to promoting the safety of the vessel and safety and health of the crew. They are not intended as a substitute for national laws and regulations but may serve as a guide to those concerned with framing such national laws and regulations. The provisions of the Voluntary Guidelines apply to decked fishing vessels of 12 metres in length and over but less than 24 metres in length.

### **The 1993 Torremolinos Protocol relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977 (Consolidated edition, 1995)**

This publication contains the regulations for the construction and equipment of fishing vessels of 24 metres in length and over. This instrument is not yet in force.

### **IMO International Code on Intact Stability, 2008**

This Code presents mandatory and recommendatory stability criteria and other measures for ensuring the safe operation of ships, to minimize the risk to such ships, to the personnel on board and to the environment.

### **Regulations for Prevention of Collisions at Sea (COLREGs)**

Setting out the “rules of the road” or navigation rules to be followed by ships and other vessels at sea in order to prevent collisions between two or more vessels

### **International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995**

The 1995 STCW-F Convention sets the certification and minimum training requirements for crews of seagoing fishing vessels of 24 metres in length and above. The convention is set to enter into force on 29 September 2012.

### **FAO/ILO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel, 2001**

The Document for Guidance takes account of the conventions and recommendations adopted by ILO and IMO and the wide practical experience of FAO in the field of training of fishing vessel personnel. It covers training and certification of fishing vessel personnel on small and large fishing vessels and fishing on an industrial scale. It is intended to provide guidance for those developing, establishing or reviewing national training schemes for training and certification programmes for fishing vessel personnel.

### **ILO. The Work in Fishing Convention, 2007 (No. 188) and Recommendation, 2007 (No. 199)**

Providing comprehensive set of standards concerning working conditions on board fishing vessels.

These include, among other things, standards on accommodation, occupational safety and health, and medical care at sea.

### **ILO. Guidelines on occupational safety and health management systems (ILO-OSH 2001)**

Guidelines aim to contribute to the protection of workers from hazards and to the elimination of work-related injuries, ill-health, diseases, incidents and deaths. They provide guidance for the national and enterprise level, and can be used to establish the framework for occupational safety and health management systems.

### **ILO Handbook for improving living and working conditions on board fishing vessels**

The Handbook has been developed to assist competent authorities and the representative organizations of employers and workers in the fishing sector gain a better understanding of Convention No. 188 and Recommendation No. 199. The stimulation of national tripartite discussion will encourage States to take concrete steps towards the implementation and ratification of the Convention.

### **ILO Training Manual on the Implementation of the Work in Fishing Convention, 2007 (No. 188)**

The training material is primarily directed at those persons who will carry out flag State inspections for compliance with national laws, regulations and other measures for the implementation of the Work in Fishing Convention, 2007 and for those persons who will carry out port State control inspections of foreign vessels. It is a valuable tool for any persons that seek a better understanding of the requirements of the Work in Fishing Convention, 2007 (No. 188).

### **ILO Guideline to undertake a comparative analysis of the Work in Fishing Convention, 2007 (No. 188) and national laws, regulations or other measures**

These guidelines propose an approach a Government may take to determine the extent to which its laws and regulations would need to be adjusted or complemented to meet the requirements of the Work in Fishing Convention, 2007 (No. 188). Undertaking a comparative or “gap” analysis is the first step towards the ratification of the Convention. The analysis involves a detailed legal analysis of national laws, regulations or other measures which are intended to give effect to the provisions of the Convention, and careful examination to determine where changes are needed to amend or otherwise adjust national laws or regulations.

### **Preliminary version of the FAO/ILO good practice guide for addressing child labour in fisheries and aquaculture: policy and practice**

To increase the knowledge base on child labour in fisheries and aquaculture and to provide assistance for policy makers and government authorities to combat this difficult issue, FAO and ILO have developed a preliminary version of the good practice guide. All stakeholders, including international and national development organizations, government agencies, and social partners are encouraged to use the guidance document and to provide comments and inputs to improve it before it is published and disseminated more widely.

### **FAO Code of Conduct for Responsible Fisheries**

The Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. FAO uses the Code as a vehicle to promote various issues relating to safety at sea. The articles of the Code that are related to the safety at sea issue are the following: 6.17, 7.1.7, 7.1.8, 7.6.5, 8.1.5, 8.1.6, 8.1.7, 8.1.8, 8.2.5, 8.2.8, 8.2.9, 8.2.10, 8.3.2, 8.4.1, 8.11.1, 8.11.4 and 10.1.5.

## **3.2 NATIONAL STANDARDS**

Most countries with highly developed fisheries have published standards regarding fishing vessel construction, equipment and safety. These vary in scope and complexity and have often been refined over many years as the national fishery has developed. Most reflect the nature of the fishery and sea conditions of the national waters.

Some of these relate to the provision and repair of fishing vessels in an emergency response; however, the purpose of the Safety Recommendations (see 3.1.1) has been

to bring together the most useful and relevant of these in a single document of best practice. Nevertheless some of the most useful are listed here.

**The Nordic boat standard, commercial boats less than 15m, 1990.**

Nordic Boat Standard for Commercial Boats was developed in co-operation between the Maritime Administrations in Denmark, Finland, Iceland, Norway, Sweden and Det norske Veritas. These authorities consider that this Standard to contain safety / requirements which are equivalent to valid national provisions for commercial vessels which are subject to survey in the Nordic countries. The standard covers all aspects of construction, safety and equipment. Construction materials include timber, composite, aluminium and steel.

**The Seafish Construction Standards, for 1) new fishing vessels less than 15m length overall and 2) for new fishing vessels 15m length overall to 24m registered length.**

Construction standards developed in the UK for fishing vessels. Materials covered include timber, composite, aluminium and steel.

**Danish regulations for commercial vessels with a length under 15 m.**

Technical Regulation on the Construction, Equipment etc. of Small Commercial Vessels.

**South African department of transport.**

Merchant shipping (small vessel safety) regulations, 2002.

**MSN 1756(F) The Fishing Vessels Code of Practice for the Safety of Small Fishing Vessels under 12 metres in length.**

Read in conjunction with:

**UK. Statutory Instrument 2001 No. 9. The Fishing Vessels (Code of Practice for the Safety of Small Fishing Vessels) Regulations 2001.**

Fishing vessel safety regulations.

**MSN 1813 (F) The Fishing Vessels Code of Practice for the Safety of Small Fishing Vessels.**

Read in conjunction with:

**UK. Statutory Instrument 2002 No. 2201. The Fishing Vessels (Safety of 15 to 24m vessels) Regulations 2002.**

Fishing vessel safety regulations.

**Ministry of land, infrastructure and transport, Japan,  
Ministry of Agriculture, Forestry and Fisheries, Japan.**

Small fishing boat safety regulations.

**ISO12215-5 (2008).**

Standards for - Small craft-hull construction and scantling-Part 5; Design pressures for monohulls, design stresses, scantlings determination.

**ISO12215-6 (2008).**

Standards for - Small craft-hull construction and scantling-Part 6; Structural arrangements and details.

The standards are normally applied to vessels used for pleasure but are also a useful resource for structural design information. Construction materials include (glued non-traditional) timber and composites.

### 3.3 TECHNICAL GUIDANCE

There are numerous published documents regarding the technical aspects of fishing vessel construction, equipment and safety. And a considerable number of these have been published by FAO including very useful documentation on vessel design, boatbuilding, boat repair and safety at sea; some of the most useful are listed here.

**FAO Fishing Technology Service.** 1996. *Fishing operations. FAO Technical Guidelines for Responsible Fisheries.* No. 1. Rome, FAO. 26pp. 6 annexes.

The technical guidelines are given in support of the implementation of the Code of Conduct in relation to fishing operations. They are addressed to States, international organizations, fisheries management bodies, owners, managers and charterers of vessels, and fishermen and their organizations.

**FAO.** 1986. *Standard Specifications for the Marking and Identification of Vessels.* Rome, FAO. 7pp.

This document contains the specifications of a standardized system for the marking and identification of vessels as endorsed by the FAO Committee on Fisheries, Rome.

**Petursdottir, G.; Hannibalsson, O.; Turner, J.M.M.** 2001. *Safety at sea as an integral part of fisheries management.* FAO Fisheries Circular. No. 966. Rome, FAO. 39pp. (Also available at [www.fao.org/DOCREP/003/X9656E/X9656E00.HTM](http://www.fao.org/DOCREP/003/X9656E/X9656E00.HTM))

This paper provides a comprehensive overview of sea safety issues, and concludes that safety at sea should be integrated into fisheries management.

**Haug, A.F.** 1974. *Fishing boat designs: 1. Flat bottom boats.* FAO Fisheries Technical Paper. No. 117. Rev 1. Rome, FAO. 46pp. (Also available at <http://archive.org/stream/fishingboatdesig034778mbp#page/n0/mode/2up>)

The purpose of this publication is to present some basic designs of boats that are simple to construct, for use in small-scale, non-industrial fisheries.

**Gulbrandsen, O.** 2004. *Fishing boat designs: 2. V-bottom boats of planked and plywood construction.* FAO Fisheries Technical Paper. No. 134, Rev. 2. Rome, FAO. 64pp. (Also available at [www.fao.org/docrep/007/y5649e/y5649e00.htm](http://www.fao.org/docrep/007/y5649e/y5649e00.htm)).

This publication includes the designs of four small vessels (from 5.2 to 8.5 metres), with comprehensive material specifications and lists, and provides detailed instructions for their construction, both planked and of plywood.

**Fyson, J.F.** 1980. *Fishing boat designs: 3. Small trawlers.* FAO Fisheries Technical Paper. No. 188, Rev. 1. Rome, FAO. 51pp. (Also available at <ftp://ftp.fao.org/docrep/fao/012/t0445e/t0445e.pdf>)

This publication contains designs of a range of small trawlers suitable for operation in coastal waters and was prepared to provide detailed technical information and guidance on the choice of appropriate vessels to fisheries officers, vessel owners and boatbuilders.

**Fyson, J.F.** 1988. *Fishing boat construction: 1. Building a sawn frame fishing boat.* FAO Fisheries Technical Paper No. 96, Rev. 1. Rome, FAO. 63 pp.

The purpose of this publication is to explain how a designer draws the curved shape of a boat and shows where to look for the details of construction and the dimensions necessary to build a boat.

**Coackley, N.** 1991. *Fishing Boat Construction: 2. Building a fibreglass fishing boat.* FAO Fisheries Technical Paper. No. 321. Rome, FAO.. 84pp. (Also available at [www.fao.org/DOCREP/003/T0530E/T0530E00.HTM](http://www.fao.org/DOCREP/003/T0530E/T0530E00.HTM)).

This publication is intended to give the reader a sound basic knowledge of GRP and its possibilities and limitations in boatbuilding.

**Riley, R.O.N.; Turner, J.M.M.** 1995. *Fishing boat construction: 3. Building a ferrocement fishing boat.* FAO Fisheries Technical Paper. No. 354. FAO, Rome. 149pp. (Also available at [www.fao.org/docrep/003/v9468e/v9468e00.htm](http://www.fao.org/docrep/003/v9468e/v9468e00.htm))

The publication is intended to provide the reader with a sound basic knowledge of ferrocement and its potential and limitations in boatbuilding.

- Anmarkrud, T.** 2009. *Fishing boat construction: 4. Building an undecked fibreglass reinforced plastic boat*. FAO Fisheries and Aquaculture Technical Paper. No. 507. Rome, FAO. 70pp. (Also available at [www.fao.org/docrep/012/i1108e/i1108e.pdf](http://www.fao.org/docrep/012/i1108e/i1108e.pdf))
- Mutton, B.** 1980. *Engineering applications: 1. Installation and maintenance of engines in small vessels*. FAO Fisheries Technical Paper. No. 196. FAO, Rome. 127pp.  
This publication provides a basic handbook covering all details of installation and the necessary maintenance procedures to be adopted for small boatyards, boat owners and fishermen.
- Mutton, B.** 1980. *Engineering applications: 2. Hauling devices for small fishing craft*. FAO Fisheries Technical Paper. No. 229. Rome, FAO. 146pp.  
This publication provides an introduction to the basic principles involved in the planning and building of a simple hauler.
- Czekaj, D.** 1990. *Engineering applications: 3. Hydraulics for small vessels*. FAO Fisheries Technical Paper. No. 296. Rome, FAO. 199pp.  
This publication provides some ideas and basic rules for general design principles, to mounting details, construction, installation and maintenance of various machines, besides all the other elements that compose a hydraulic circuit.
- Gudmundsson, A.** 2009. *Safety practices related to small fishing vessel stability*. FAO Fisheries and Aquaculture Technical Paper; No. 517. Rome, FAO. 54pp. (Also available at [www.fao.org/docrep/011/i0625e/i0625e00.htm](http://www.fao.org/docrep/011/i0625e/i0625e00.htm))  
This document introduces basic principles on the stability of small fishing vessels and provides guidance on what fishing vessel crews can do to maintain adequate stability for their vessels. It is aimed at fishers and their families, vessel owners, boatbuilders, authorities and others who are interested in the safety of fishing vessels.
- Anmarkrud, T; Danielsson, P; Gudmundsson, A.** 2010. *Guide to simple repairs of FRP boats in a tropical climate*. BOBP/MAG/27. Rome, FAO,  
This booklet results from FAO's experience in FRP work in many developing countries, particularly in Asia. This booklet would be useful for fishers and small workshops in the fishing villages to undertake minor repairs on the FRP boats. It may also serve as a guide for officials of the department of fisheries and other concerned agencies with training in matters of simple repairs of FRP boats.
- O. Gulbrandsen, O. & Pajota, G.** 1993. *Safety guide for small offshore fishing boats*. BOBP/MAG/16. BOBP, Madras. 34pp. (Also available at <ftp://ftp.fao.org/docrep/fao/field/006/ad533e/ad533e00.pdf>)  
This publication provides information to boatyards, boat owners and crew on the design and operational aspects related to the safety of decked fishing boats of less than 12 m in length.
- Gulbrandsen, O.** 2009. *Safety Guide for Small Fishing Boats*. FAO/SIDA/IMO/BOBP-IGO REP 112. 52pp. (Also available at [www.fao.org/fi/oldsite/eims\\_search/1\\_dett.asp?lang=en&pub\\_id=261572](http://www.fao.org/fi/oldsite/eims_search/1_dett.asp?lang=en&pub_id=261572))  
The purpose of this safety guide is to present simple measures to ensure that new boats will satisfy internationally accepted safety standards. The target group consists of boat designers, skippers and government officials responsible for drafting new regulations and for safety supervision. The guide mainly deals with small boats of less than 15m length, which, from experience are most prone to accidents.
- McVeagh, J.; Anmarkrud, T.; et al.,** 2010. *Training manual on the construction of FRP beach landing boats*. BOBP/REP/119, Rome, FAO. 148pp. (Also available at [www.fao.org/docrep/012/al360e/al360e.pdf](http://www.fao.org/docrep/012/al360e/al360e.pdf))  
This manual on construction of fibreglass reinforced plastic (FRP) beach landing boats has been prepared primarily to assist small boatyards in Tamil Nadu, India that build beach landing fishing boats, but may also be used as a guide for making good quality FRP boats as well as for FRP training in the region.

**Ben-Yami, M.** *Risks and dangers in small-scale fisheries: An overview.*

The working paper provides a comprehensive overview of the risks and dangers in small-scale and artisanal fisheries including working conditions, safety approaches in developed and developing countries, accidents associated with the marine environment, navigation and fishing operations, problems associated with boat design and construction as well as other risks and dangers.

**FAO. NORAD.** 2005. *Guidelines on Improved Boat Building Practices in Sri Lanka.* (Also available at [ftp://ftp.fao.org/FI/DOCUMENT/Safety\\_for\\_fishermen/guidelines.pdf](ftp://ftp.fao.org/FI/DOCUMENT/Safety_for_fishermen/guidelines.pdf))

Covering worker safety, environmental safety, boatyard conditions, boat building standards and techniques and quality control. The booklet sets out basic concepts in each key area, so that boat designers, boatbuilders, fishers, fishing cooperative societies, NGOs and others interested and involved in boat construction in Sri Lanka may adopt better methods for increasing worker and environment safety, improving boat construction and ensuring the safety of fishers at sea.

**Savins, M. Lee, R.** 2005. *Boatbuilding in the tsunami affected areas of Aceh and Nias - Quality Issues.* FAO/DKP.

A short pictorial for boat builders and donors as to the boat building situation in NAD. The intent of this paper is to demonstrate the concerns arising from poor quality boat building for safety of fishers. Further, it is to provide a few guidelines for better boat building for the future.

**FAO.** 2005. *Notes on Good Practice for the Construction of Traditional Wooden Fishing Vessels.* Aceh. FAO.

This document aims to describe good practice for the construction of traditional wooden, open and decked fishing vessels of up to 12m in length in Aceh. It is an interim measure applicable to boats constructed as part of the rehabilitation and reconstruction work following the Tsunami of December 2004. Compliance with the notes set out below should improve overall standards of vessel construction thereby improving safety at sea, reducing vessel maintenance and increasing vessel longevity.

**Davy, D.; Svensson, K.** 2009. *Building small wooden boats in Myanmar - 12 ft and 18 ft multi-purpose boats.* Project: OSRO/MYA/805/SWE. Rome, FAO. 39pp. (Also available at: [www.fao.org/docrep/012/ak202e/ak202e00.htm](http://www.fao.org/docrep/012/ak202e/ak202e00.htm))

This step-by-step manual contains information on the construction of small multi-purpose boats typical of those found in the Ayeyarwaddy Delta in Myanmar. Its purpose is to give organizations access to detailed information on boatbuilding, which will allow the production of small boats appropriate to the Delta. The manual is also intended to assist organizations in their understanding of the boatbuilding process and to provide guidelines on good practice. It should assist in the review of contracts and quality control in boatbuilding.

The manual provides information on two boat designs: 12 ft and 18 ft boats. It also gives the scantlings and material requirements as well as the guidelines for selecting and using timber for the boat construction. The largest part of the manual describes how to build the boats step-by-step. Finally, the manual contains boatbuilding guidelines for wooden boats of less than 7 m in length and operating at speeds of less than 12 knots.

**Davy, D.; Svensson, K.** 2011. *Building small fishing vessels in Bangladesh - 30ft Fishing Boat.* Projects: GCP/BGD/043/EC – UTF/BGD/040/BGD. Dhaka, FAO. 67pp. (Under development)

**Davy, D.; Svensson, K.** 2011. *Building small fishing vessels in Bangladesh - 20ft Fishing Boat.* Projects: GCP/BGD/043/EC – UTF/BGD/040/BGD. Dhaka, FAO. 48pp. (Under development)

These step-by-step manuals contain information on the construction of small fishing vessels typical of those found operating in the Barisal division of Bangladesh. The purpose of the manual is to give organisations access to detailed information on boatbuilding which will allow the production of small boats appropriate to the Barisal

division. The manual is also intended to assist organisations in their understanding of the boatbuilding process and to provide guidelines on good practice. It should assist in the review of contracts and quality control in boatbuilding.

The manual provides information on the construction of 30ft (9m) and 20ft (6m) fishing boats. It also gives the scantlings and material requirements. The largest part of the manual describes how to build the boat step-by-step. Finally, the manual contains boatbuilding guidelines for wooden boats of less than 12 m in length and operating at speeds of less than 14 knots.

**Danielsson, P. Faye, M. Faye, B. Kuyateh, M. Mbodj, A. Ndiaye, M & Yahya, B. 2008.** *Training Manual on Safety at Sea*. FAO. 108pp.

Training manual on safety at sea for small-scale fisheries was prepared under FAO project GCP/GLO/200/MUL. It was the basic document used in the training of training officers in safety at sea for small-scale fisheries in six countries belonging to the Sub-Regional Fisheries Commission (SRFC): The Gambia, Sierra Leone, Senegal, Guinea Bissau, Guinea and Mauritania. The proposed modules cover topics such as international regulations on safety at sea, maritime navigation, participatory surveillance and vessel safety.

**FAO, 2007. Safety of fishermen. FAO**

This manual provides a list of possible accidents that may occur onboard fishing vessels and useful tips and courses of action that may be taken in order to keep those accidents from happening. It has been compiled primarily for vessels of less than 24 metres in length where the skipper does not hold a certificate of competency or has limited vocational training.

**FAO International Guidelines for Securing Sustainable Small-Scale Fisheries (under development)**

This instrument, when completed, will complement the Code of Conduct for Responsible Fisheries (CCRF) and take the form of guidelines that draw on existing relevant international instruments. The SSF Guidelines should address both inland and marine small-scale fisheries and focus on the needs of developing countries. Recommendations on safety at sea, which were developed by a workshop on the Guidelines in FAO Headquarters, Rome, Italy, from 7 to 10 February 2012, are contained in Annex 5 to this document.

## 4. Recommendations for best practice relating to vessel repair / replacement in emergency response

**Statement of Best Practice 1: A detailed understanding of the technical and social situation in the affected community should be developed using appropriate assessment techniques.**

- Skills and knowledge of the community are recognised and utilised in the planning and implementation of the response;
- Community assessments of losses and replacement needs as well as local technical expertise on vessels and fishing activities;
- Inventories of persons, boats and equipment are established;
- Pre-existing problems in fishery are identified and alternatives discussed;
- Pre-existing data is used for checking where available;
- Patterns of vessel ownership and credit/finance are established.

**Statement of Best Practice 2: The expectations of the community are managed and the realistic assistance likely to be available is made clear.**

- Proposed interventions are openly discussed with the community;
- Parties are informed where unlikely or unreasonable request are not going to be included in interventions;
- The introduction of new materials /designs is done in partnership with the users.

**Statement of Best Practice 3: Plans include a detailed assessment of the technical details of the boats lost, their fishing activities and other activities that the vessels may be used for.**

- Technical experts are used in assessments;
- Activities other than full time fishing are considered in the assessment.
- Factors which contribute to the design and development of vessels are fully considered and documented;
- Local conditions are considered vessel specification, such as wind, sea, landing and port facilities
- Vulnerable and less viable [in community] groups are considered in assessments
- Unregistered or poorly documented vessels are included in vessel numbers.

**Statement of Best Practice 4: Activities involving replacement and repair of vessels should contribute to and be part of the process of achieving better governance in fisheries.**

- Relevant authorities are consulted to establish pre-existing situation and areas for concern;
- Vessel registration data is checked against actual vessels in use;
- Where new vessels are built records are kept in a form appropriate to the government and made available to them;
- Safety at sea regulations or guidance is checked against actual situation on vessels in use;

- New vessel designs /requests are consistent with government policy and strategy for the fishery, where this is absent they are consistent with international codes and standards;
- Discussions are held with fishers and authorities to establish which areas can be re-directed and the changes required in achieving this.

**Statement of Best Practice 5: Sources of boatbuilding materials, such as timber and GRP, are demonstrated to be sustainable and economically viable.**

- Projects liaise with relevant authorities, such as forestry department, and receive advice on materials procurement;
- Agencies request and are supplied with documentation regarding source and legality of timber products;
- Where materials and equipment have to be imported, such as glass and resin (GRP), projects establish understanding of customs requirements and the cost and time implications.

**Statement of Best Practice 6: The structures to support the repair / replacement of fishing vessels are economically viable and are re-established in a timely manner.**

- The site of new boatbuilding operations takes into consideration transport links with suppliers and the availability of supportive infrastructure;
- Plans for new boatbuilding sites, which are intended to become established businesses (rather than project sites for delivery of inputs), include economic feasibility assessments;
- Plans include collaboration with organisations which provide training, technical support, prototype development and a knowledge base;
- Relevant agencies and organisations are consulted before and during boatbuilding activities;
- Suggested guidance and documentation is used in practical field applications.

**Statement of Best Practice 7: Operations to repair / replace vessels build on local strengths.**

- Local [surviving] business able to provide the required vessels and establish their capacity and structure are documented;
- Contractual arrangements for boatbuilding are simple and understandable to small [local] businesses;
- Boatbuilding contracts and conditions are designed to be suitable for the available businesses;
- Support is provided to businesses to understand procedures and improve practices;
- Discuss with technical experts the compromises needed in matching available items to technically desired items;
- Plans are in place to coordinate involvement of specialist suppliers such as GRP technology /repair or engine maintenance and parts.

**Statement of Best Practice 8: Replacement and repair of vessels should be part of the process of achieving a more sustainable fishery and providing long term livelihoods.**

- Vessel redevelopment plans are informed by resource assessments undertaken by fisheries experts.

**Statement of Best Practice 9: The scale of boatbuilding activity planned should reflect the management and supervision capacity available.**

- Management plan established, covering monitoring, supervision and follow-up of vessel construction projects;
- Adequate resources are made available for project management;
- Construction projects are monitored regularly and assistance and quality control provided where necessary;
- Vessels are delivered according to original schedule;
- Vessels delivered are of good quality and meet the desired specifications.

**Statement of Best Practice 10 The improvement of safety at sea is central to the reconstruction efforts.**

- Users are consulted for feedback on safety versus suitability of vessels delivered;
- The improved and safer vessels delivered are used by the fishers - they are visibly acceptable;
- Boatbuilders and fishers adopt better vessel construction and safety at sea practices in their own work;
- Support, training and awareness upgrades are provided to fishers and the wider community, including vessel owners, boatbuilders, service providers and women, children.

Note: See Appendix 5.

**Statement of Best Practice 11: Continuity of staff and management for national and international recruits is central to successful project implementation.**

- Review planned activities to establish ideal staffing and contract durations;
- Staff contracts designed to match planned activities;
- Staff able to remain in post through the various stages of the activities to which they are assigned.

**Statement of Best Practice 12: Good coordination between agencies is established in order to share information and avoid duplicate work.**

- Forums established to meet and share information;
- Strategies and approach agreed between agencies;
- Register of activities maintained including key figures such as boat numbers;
- Responsibilities allocated between key actors according to competence;
- Interventions in various sectors are coordinated effectively.



## 5. Key technical resources

Information Resource	Summary of the information	Relevance to the technical challenge	Source of information
FAO Fisheries and Aquaculture Department	Information, fact sheets and publications relating to fisheries and aquaculture	FAO has large knowledge base on technical aspects of fisheries	<p><a href="http://www.fao.org/fishery/en">www.fao.org/fishery/en</a></p> <p>Search for publications here <a href="http://www.fao.org/fishery/publications/en">www.fao.org/fishery/publications/en</a></p> <p>See technical papers at <a href="http://www.fao.org/fishery/publications/technical-papers/en">www.fao.org/fishery/publications/technical-papers/en</a></p> <p>Regarding responsible fisheries see <a href="http://www.fao.org/fishery/publications/code/en">www.fao.org/fishery/publications/code/en</a> and <a href="http://www.fao.org/fishery/publications/technical-guidelines/en">www.fao.org/fishery/publications/technical-guidelines/en</a></p>
Safety for Fishermen website	Information related to safety for fishermen on website is hosted by FAO. Managed by experts from the fisheries sector		<p><a href="http://www.safety-for-fishermen.org/50769/en/">www.safety-for-fishermen.org/50769/en/</a></p> <p>Section 3 lists many of the relevant publications available here.</p>
SeaFish (UK)	Services and support to seafood industry covering: Information Safety Environment Regulation Standards Consumers	Numerous reports and documents on training, technical and other fisheries subjects	<a href="http://www.seafish.org/">www.seafish.org/</a>
Maritime and Coastguard Agency (UK)	Maritime safety organisation	Guides on training and safety for fishermen	<a href="http://www.dft.gov.uk/mca/mcga07-home/workingatsea/mcga-fishing.htm">www.dft.gov.uk/mca/mcga07-home/workingatsea/mcga-fishing.htm</a>
Icelandic Maritime Administration	Website for the Intersessional Correspondence Group on the Safety of Small Fishing Vessels (FVS ISCG)	Documents related to the safety of fishing vessels	<a href="http://www.sigling.is/fvs-iscg">www.sigling.is/fvs-iscg</a>
The Bay of Bengal Programme (BOBP)	Inter-Governmental Organisation to enhance cooperation among countries and organisations in the region and provide technical and management advisory services for sustainable coastal fisheries development and management	Documents related to technical issues and the safety of fishing vessels	<a href="http://www.bobpigo.org/safetyatsea/">www.bobpigo.org/safetyatsea/</a>
Kyoto University Graduate school of global environmental studies		Fisherman's handbook On typhoons and strong winds in Vietnam	<a href="http://www.iedm.ges.kyoto-u.ac.jp/aboutus_e.htm">www.iedm.ges.kyoto-u.ac.jp/aboutus_e.htm</a>



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## Appendix 1 – Acronyms and abbreviations

ACTED	– Agency for Technical Cooperation and Development
B	– Beam (width of vessel)
CBO	– Community Based Organisation
CUNo	– Cubic Number
D	– Depth (of vessel)
DOF	– Department of Fisheries (Myanmar)
GPS	– Global Positioning System
GRP	– Glass Reinforced Plastic
GRT	– Gross Register Tonnage
GT	– Gross Tonnage
GTZ	– Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
hp	– Horsepower (engine)
IBE	– Inboard Engine (Sri Lanka)
IMO	– International Maritime Organisation
ILO	– International Labour Organisation
ISO	– International Organization for Standardization
L	– Length (of vessel)
LOA	– Length Overall (of vessel)
MDB	– Multi-day Boat (Sri Lanka)
MFAR	– Ministry of Fisheries and Aquatic Resources (Sri Lanka)
MOFAMR	– Ministry of Fisheries, Agriculture, and Marine Resources (Maldives)
MSN	– Merchant Shipping Notice
nm	– Nautical Miles
ODB	– One Day Boat (Sri Lanka)



## Appendix 2 – Tonnage calculations

Until the London Convention (1969) entered into force, vessel tonnage was [often] measured according to the Oslo Convention (1947), expressing data by gross register tonnage (GRT). The London Convention was agreed in 1969 but did not enter into force until 1982 and gave exemptions for existing vessels to use their previously measured GRT until 1994. Vessel tonnage measured according to the London Convention (1969) is expressing data in gross tonnage (GT).

GRT represented the total measured cubic content of the permanently enclosed spaces of a vessel, with some allowances or deductions for exempt spaces such as living quarters (1 gross register tonne = 100 cubic feet = 2.83 cubic metres). GT for ships of 24 metres in length and over refers to the volume of all the ship's enclosed spaces (from keel to funnel) measured to the outside of the hull framing. The two conventions produce different tonnage values. Although GT measurements are higher than GRT, there is no simple correlation between the two units (GT is often double the GRT, but sometimes as much as four times the GRT). For fishing vessels under a certain size, GT is preferred as it is more accurate. It is important to note that historical data are often expressed as GRT and it is therefore possible that fleet capacity may appear to decline when switching to the use of GT.

To calculate GT:

Find V which is the ship's total volume in cubic meters (m<sup>3</sup>);

Calculate K which is a multiplier based on the ship volume and ranges from 0.22 to 0.32;

K is calculated with the formula:

$$K = 0.2 + 0.02 \times \log_{10}(V)$$

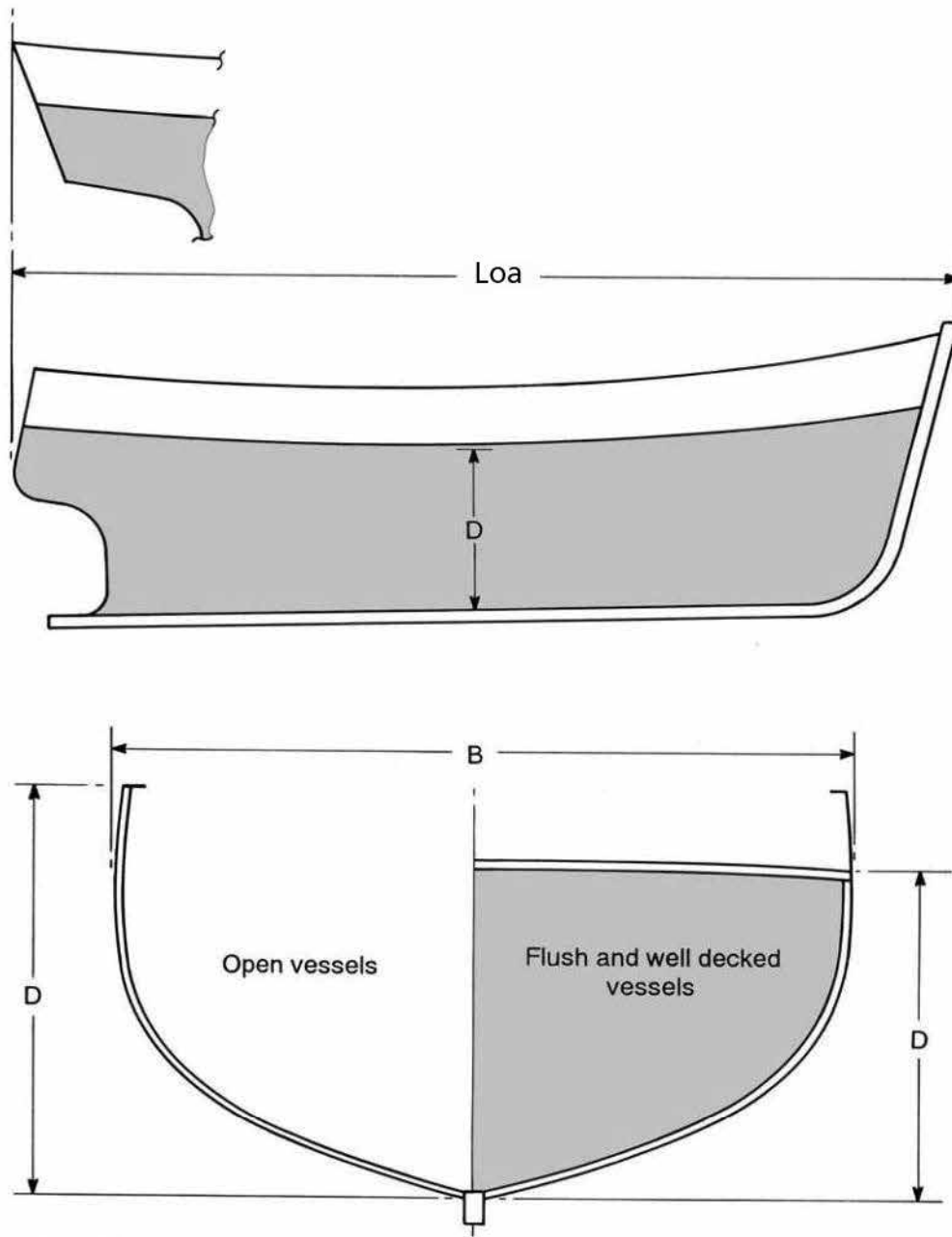
Then GT is a function of V as follows:

$$GT = K \times V$$



## Appendix 3 – CUNO calculation

Cubic number is measured and calculated as follows:



$$LOA \times B \times D = \text{Cubic numeral (CuNo)}$$



---

## Appendix 4 – ISO Design categories

Cubic number is measured and calculated as follows:

### A – Ocean

Category of boats considered suitable to operate in seas with significant wave heights above 4 m and wind speeds in excess of Beaufort Force 8, but excluding abnormal conditions, e.g. hurricanes.

### B – Offshore

Category of boats considered suitable to operate in seas with significant wave heights up to 4 m and winds of Beaufort Force 8 or less.

### C – Inshore

Category of boats considered suitable to operate in seas with significant wave heights up to 2 m and a typical steady wind force of Beaufort Force 6 or less.

### D - Sheltered waters

Category of boats considered suitable to operate in waters with significant wave heights up to and including 0,3 m with occasional waves of 0,5 m height, for example from passing vessels, and a typical steady wind force of Beaufort Force 4 or less.



## Appendix 5 – Recommendations on safety at sea

The workshop on International Guidelines for Securing Sustainable Small-Scale Fisheries took place in FAO Rome, Italy, on 7-10 February 2012. The sub-group on Safety-at-sea recommended that the Guidelines should recognize the complexity that surrounds safety-at-sea issues, the multiple causes behind deficient safety and the link between safety-at-sea and responsible fisheries. The Guidelines should strongly support safety-at-sea measures and the improvements of working conditions such measures entail. Some discussion on what leads to unsafe practices could also be included. The recommendations should, if not specified otherwise, apply to all fishing activities (vessel based or not). The term ‘sea’ is to be understood as oceans, seas, bays, sounds, estuaries, rivers and lakes. It is particularly important to involve women, children, elders in the sea safety awareness issues and emphasis is needed on the distribution channels of sea safety awareness materials.

The group defined the following specific recommendations for inclusion in the Guidelines:

*The Guidelines recommend that improved sea safety in small-scale fisheries will best be achieved through the development and implementation of national strategies, with elements of regional coordination, as appropriate, which should include:*

1. The support (and where necessary establishment) of a consultative national stakeholder framework (e.g. national sea safety coordinating group) for sea safety in small-scale fisheries and the identification of motivated people or ‘drivers’;
2. The generation of political will at a national level to address sea safety in small-scale fisheries;
3. The development and maintenance of national accident reporting and analysis systems for small-scale fisheries;
4. Ongoing sea safety awareness programmes, targeting the fishers, their spouses, children and other relevant stakeholders, with special emphasis on the development of channels for the efficient distribution of appropriate and updated materials, and evaluation of impact;
5. The development, enactment and implementation of appropriate laws and regulations for sea safety in small-scale fisheries, including occupational health and safety, training/certification requirements, onboard safety equipment, and construction standards;
6. The determination of minimum mandatory requirements for each class of small-scale fisheries vessel taking full account of the difficulties associated with cost, remoteness of communities and availability of services and equipment;
7. The establishment of national small-scale fisheries vessel registration and inspection schemes, as practical and appropriate;
8. The implementation of capacity building programmes, including formal and informal training, directed at fishers, fishing communities, government staff, NGOs, the private sector (e.g. gear and boat designers, boat builders, mechanics) and other stakeholders;
9. The full use of existing institutions and community-based structures for increasing compliance, data collection, training and awareness, search and rescue operations, considering time and resource constraints;

10. The inclusion of sea safety as an integral part of fisheries management as well as development initiatives;
11. The development and phased implementation of appropriate enforcement procedures to ensure compliance with sea safety laws and regulations.

# Provision and repair of fishing gear in response to emergencies

by

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# Introduction

The Fisheries and Aquaculture Emergency Response Guidance complements the FAO Code of Conduct for Responsible Fisheries (CCRF). The overall objective is to provide guidance related to emergency response and recovery and support for national and international interventions.

Following any disaster, a well ordered emergency response is required to restore daily fisheries livelihood activities and productivity of the fishing fleet in the shortest time possible. A disordered response will inevitably cause delays and lead to errors that will negatively impact the livelihoods of people and the sustainability of the resources.

In many developing countries, the fishing communities are highly vulnerable since their location along the coasts and water bodies make them directly exposed to natural hazards such as cyclones and tsunamis, and to accidental hazards of human origin such as chemical, heavy metals and oil spills, grounding of tankers, or even nuclear leaks and meltdowns, such as the Fukushima Daiichi disaster in 2011.

This paper provides guidance on the aspects related to fishing gear, materials and fishing equipment within the context of immediate and medium term response after a disaster. It examines what has worked well and what has not.

Following these guidelines will ensure that rehabilitation efforts are timely and appropriate. It should also provide a continuum towards building resilience to future natural disasters, more sustainable exploitation of fish stocks, awareness raising and knowledge sharing amongst all stakeholders so that fishery livelihoods and the fishery itself is in a better condition than before the disaster struck.

This part of the Guidelines addresses the provision and or repairs of fishing gear in response to emergency rehabilitation, recovery and transition to sustainable development.

The document is divided into five sections and four appendixes. Section 1. Describes the complexity of fishing gears and the way it can be impacted on by different types of disasters. There is an analysis of these threats on the gears and included is a part on opportunities presented by the emergency response towards better resource management and transition to sustainable development..

Section 2 looks into some best practices and lessons learnt from past emergency response interventions related to the fishing gears and equipment. In this section there are details of identifying the need for fishing gears and the linkages between provision of fishing gear and other services and infrastructure in the rehabilitation phase.

Section 3 reviews the existing standards and guidelines related to the provision of fishing gears and ancillary equipment in an emergency context.

Section 4 presents best practice guidance with indicators and with notes and recommendations on how to implement good practices.

Section 5 provides technical resources and documentation as well as examples of legislation, policy briefs and case studies.



# 1. Fishing gear and disasters

## 1.1 BACKGROUND ON THE COMPLEXITY AND DIVERSITY OF FISHING GEAR

Fishing gears are very diverse. They are constructed or assembled according to: the species targeted; the ecosystem that they are used in; and season or time of the year that they are used. The quantity that any one fisher may use is determined by: the size of the boat; the amount of investment needed to purchase; and whether the gear is individually owned and or operated by a group of fishers<sup>1</sup>.

The challenge of dealing with the diversity and complexity of fishing gear manifests itself especially when the field officer has to prepare the specifications. If the specifications are incorrect, the fishing gear that is delivered may either be of no use to the beneficiary, or it may cause delays due to misunderstanding of the specifications by the supplier. This is particularly so if the fishing gear is to be procured on the international market. Wrongly specified fishing gear may also fall into the category of being illegal and prohibited by the national authorities.

In some cases, fishing gear used by fishers is illegally imported or available on the national market. In the rehabilitation process it is usually best to ask the fisher exactly what are the specifications of the gear required to be replaced. However, the person responsible for the procurement of such replacement gear should make sure that the gear being provided is not illegal, in its specifications and in its application. In a haste to provide livelihood assistance it is very likely that the legality of a certain gear may be overlooked. The provision of illegal fishing must be avoided at all costs as it reflects badly on the institution that you work for and has negative impacts on the sustainability of the fishing operations and the long-term livelihood rehabilitation of the beneficiaries.

Fishing, especially small scale and subsistence, takes place within a community made up of individuals and family or social groupings. These individuals and groups all have distinct roles to play in the economic life of the community. It is therefore important to understand what these roles are and how the replacement of the fishing gear will either enhance or destabilize the social fabric of the community.

For example, in Myanmar during the rehabilitation of fishing villages after Cyclone Nargis, it was noted that many rice farmers normally practiced subsistence fishing in rice fields using cast nets. In the same villages, fishers with boats fished commercially and their activity provided jobs for processing and marketing of fish and fishery products. It is therefore important to have a holistic view of the rehabilitation process and include both subsistence fishers and commercial fishers.

There may be a zealous rush to distribute the gear without taking into consideration the social structure of the community and or the region where the gear will be distributed. The choice of village, type of gear, number of gear, and priority for distribution, inclusion or exclusion of a certain groups may be influenced by political motives. While it is necessary to avoid political motivation for certain actions, they cannot be completely ignored. Dialogue, transparency, rationale and logic must override. However, negotiated compromise may be necessary to ensure that the most vulnerable are taken care of on an urgent basis.

<sup>1</sup> “The definition of “fisher” includes every person employed or engaged in any capacity on board any fishing vessel, including persons working on board who are paid on the basis of a share of the catch”. FAO 2004 State of the World Fisheries and Aquaculture 2004. Pp 76. ISBN 92-5-105177-1

### Information to Support the Identification of Fishing Gear

Fisheries departments usually have designs of a variety of the most common fishing gears used in the country. However, the completeness of these designs and the pertinence in terms of being updated may be lacking. Fishing gears are very specific to the area where they are used and have been developed and perfected by the fishers over many decades. In fact they are so specific, that what fishes well in one area of a country may not fish as well in another area of the same country.

Some catalogues of fishing gears can be found on different websites but most have to be purchased in hard copy or online. However, The FAO Fisheries Technical Paper No. 222. Revision 1 “Definition and classification of fishing gear categories” is online at [www.fao.org/docrep/008/t0367t/t0367t00.htm](http://www.fao.org/docrep/008/t0367t/t0367t00.htm)

#### BOX 1

The Southeast Asian Fisheries Development Center SEAFDEC, has prepared and published fishing gear categories for Brunei, Cambodia, Myanmar, Philippines, Thailand and Vietnam. For example, The Fishing gear monograph for Myanmar provides 131 different designs for eight different regions of Myanmar. The link to the fishing gear page of SEAFDEC is <http://map.seafdec.org/Monograph/index.php> and for all the countries it is <http://map.seafdec.org/Monograph/index.php>.

The fishing gear specifications present a challenge for many persons as different countries use different methods for specifying a material and there are different measuring methods. For example, the monofilament fishing lines can be measured in Tex, R tex, diameter in millimeters, inches or a number as used by the Japanese.

#### BOX 2

A monofilament line which is 0.90 millimeters in diameter is the same as Japan number 30 and the same as Tex 755

0.90 mm Mono = Mono 30 Japan No. = Tex 755 mono

On the FAO website one can download the full PDF version of the Fisherman’s Workbook which gives many technical details, formulas, calculations, from fishing to storage of ice and bait, light and calculation of fish hold spaces etc. The links to the Workbook in different languages are as follows:

<a href="ftp://ftp.fao.org/docrep/fao/010/ah827e/ah827e.pdf">ftp://ftp.fao.org/docrep/fao/010/ah827e/ah827e.pdf</a>	English
<a href="ftp://ftp.fao.org/docrep/fao/010/ah827f/ah827f.pdf">ftp://ftp.fao.org/docrep/fao/010/ah827f/ah827f.pdf</a>	French
<a href="ftp://ftp.fao.org/docrep/fao/010/ah827s/ah827s.pdf">ftp://ftp.fao.org/docrep/fao/010/ah827s/ah827s.pdf</a>	Spanish
<a href="http://www.fao.org/docrep/010/ah827p/ah827p00.htm">www.fao.org/docrep/010/ah827p/ah827p00.htm</a>	Portuguese
<a href="http://www.fao.org/docrep/010/ah827i/AH827I00.htm">www.fao.org/docrep/010/ah827i/AH827I00.htm</a>	Italian

Some points to remember while identifying fishing gear include:

- a. Fishing gears are specific to the species and ecosystem where they are used.
- b. The quantity of the gear depends on the size of the boat and the financial ability of the fisherman to buy and repair the gear. Local availability of spares is also important
- c. Fishing gear of the same type may be used for subsistence and for commercial fishing. The difference is determined by the quantity of gear and the means to deploy the gear (boat with engine compared to no boat or small canoe using

paddles). While it may have low economic value, subsistence fishing may be a critical element of peoples livelihood strategies and food security. Thus subsistence activities should be recognized and supported. Very often commercial fishing business using many small boats are owned and operated by businessmen while the fishers are operators. This situation needs to be carefully analyzed to make sure that the rehabilitation intervention firstly benefits fishers.

- d. Usually fishing gears are made of different parts and have to be assembled to make the complete gear. For example a gill net is made up of main net panel, the floats, the lead, the float line and the lead line and the twine to assemble the gear together. There will also be a need for marker floats and marker float rope and in some cases anchors to keep the net in position. This means that the entire package with all the necessary parts should be replaced. Providing only parts of the gear may lead to selling of the gear or to become dependent on middle men that will purchase the remaining parts in return for fish at a low price.
- e. Fishing gears may be used seasonally and the delivery time line is important. The delivery of the type of gear should be matched to the season. If the gear is delivered during the wrong season, then the effect of timely fishery livelihood rehabilitation is greatly reduced.
- f. Many women and children take part in constructing and repairing fishing gear as part of their normal life activities. When considering replacement of fishing gears, consideration should be given to the incorporation of the women and children in the overall gear replacement process. Consideration should be given to their skill level, and to the fact that the construction and repair of fishing gear is an important economic activity for the family and will help to re-establish economic activity and reduce dependence on food and other types of aid.
- g. Make use of local fishing gear technologist in identifying and preparing the detailed specification of the most commonly used and lost fishing gears.

## 1.2 ANALYSIS OF THE THREATS TO FISHING GEAR FROM DIFFERENT TYPES OF DISASTER

Storm-related disasters have been increasing in frequency and intensity during the past decades (FAO, 2005-2012). The force of water from floods, tsunamis and raging torrents from heavy rains, cause severe destruction to and losses of fishing gear causing damage and complete loss.

Cyclone Nargis struck Myanmar on the evening of 2 May 2008. It affected 2.4 million people across the Irrawaddy Delta. More than 140 000 people died, and the Irrawaddy Delta, a fertile rice farming region often referred to as Asia's rice bowl, suffered severe damage. The storm surge accompanying cyclone Nargis travelled some 35km inland, flooding 14 400 square kilometers, an area one third the size of Switzerland (World Vision International, 2009).

The high winds that accompany tropical storms and the resulting floods have a particularly devastating impact on food production. Although on average, hurricane intensity has remained essentially steady for the last three decades, there is some evidence to indicate that their frequency may be on the increase. Further, the devastation caused by tropical storm disasters has been rising enormously in the 1990s, owing in part to the increase of population in storm-prone areas (World Vision International, 2009).

Storm-related damages to capital assets, including boats and fishing gear, mean the loss of income and poorer livelihood conditions. As a result, employment and local economics are hit hard. Poor fishing households who depend on fishing for their livelihood, may not have adequate savings to replace their gear and are likely to face food insecurity in the aftermath of hazards unless their working asset is replaced immediately through external or other support mechanisms. These losses are in

addition to personal assets (house, clothes, kitchen wares, stoves, water recipients, transport etc.), which also need to be replaced. In this context, the overall rehabilitation and humanitarian effort to rebuild plays an important role in boosting the local economy.

Additionally, the majority of small scale vessels fishing in marine waters do not have insurance (Van Anrooy *et al.*, 2009). “The machinery, equipment and gears used on modern fishing vessels can have a combined value of hundreds of thousands of United States dollars. Vessel insurers active in Japan, Europe, the United States of America, South America, Oceania, the Russian Federation and Africa commonly insure the above items, [but hardly so for small-scale canoes]. However, gear accessories such as floaters, sinkers and ropes sometimes cannot be included under the coverage (e.g. in Japan and India) and compensations are sometimes paid only for gears in case these are lost together with the vessel (e.g. in Japan, China and India). In India, the equipment and gears of larger vessels can generally be insured; however, engines are not insurable after some years (often three years)” (Van Anrooy *et al.*, 2009).

Insurance for small scale and artisanal fisheries fishing gears is still very uncommon and nonexistent in many countries.

However, the authors noted a few cases in Haiti, and southern Nias island, Indonesia, where replacement fishing gear were provided by the relatives of disaster victims. These private initiatives although hardly documented often make a difference to quick restoration of livelihoods particularly in remote areas.

Natural hazards have a range of impacts on fishing gear and on the livelihoods of fishers. Table 1 below details these impacts by the type of disaster that most commonly affects fishing communities:

TABLE 1  
Analysis Summary: Disaster Impacts on Fishing Gear

Disaster Types	Risks to fishing gear	Implications on the livelihoods of fishing communities
Cyclones	<p>Fishing gear onshore is washed away or tangled up within itself or with other objects<sup>2</sup>.</p> <p>Fish traps are lost at sea<sup>3</sup>, creating marine debris and ghost fishing<sup>4</sup></p> <p>Damage can also occur after traps are lost, becoming DFTs<sup>5</sup>; wave and storm conditions can move them around within a marine habitat or into inland aquatic habitats. In addition to storm events, traps may be lost due to broken or cut buoy lines and unregulated fishing practices, such as the use of unbuoyed traps, a common practice used to reduce theft (NCCOS, 2011). The lost traps then continue to “ghost fish”, affecting the benthic community and increasing the mortality of species caught and retained, until the traps break apart.</p> <p>Gear at sea is entangled in coral reefs.</p>	<p>While some concern may be expressed at the damage caused by “ghost fishing” (where lost fishing gear continues to catch fish), marine life and their habitats are not seriously affected by storms. If boats, fishing gear and associated essential infrastructures have not been lost, fish production can resume immediately following passage of the storm.</p> <p>The most serious impact of storms in the fishery sector is risk faced by fishers in terms of their lives and/or destruction of their capital such as boats and fishing gear. Indeed, storm-related damages to capital assets, including boats and fishing gear, means the loss of income and livelihood, especially for poor fishing households. Poor households who depend on fishing for their livelihood may not have adequate saving to replace their capital, and are likely to face the risk of food insecurity in the aftermath of storms unless their capital is replaced immediately through government, NGOs or family and private support. The disruption of fishing activities by such households could also affect the livelihood and food security of other households, for instance, small traders who buy and sell fish in small local retail markets (FAO, 2005-2012).</p>
Tidal surges / tsunamis	Same as for cyclones	Same as for cyclones

<sup>2</sup> Cyclone Nargis as witnessed by the authors

<sup>3</sup> FAO. 2007. Debriefing Note October 2007. Republic of Nicaragua Misión FAO-TCE Emergencias Debriefing. The estimated quantities of traps lost are similar to the list of those facilitated by INPESCA with the exception of the number of traps the number of traps declared lost amounts to 45 330

<sup>4</sup> TCP/DMI/3203 Assistance to improve disaster risk management capacities in agricultural sectors pp.6

<sup>5</sup> DFT = Derelict Fish Trap

TABLE 1 (cont.)

Disaster Types	Risks to fishing gear	Implications on the livelihoods of fishing communities
Earthquakes	<p>Loss of gear stored in buildings damaged by earthquakes.</p> <p>Unknown amounts of fishing gear, vessels and related equipment were lost throughout Prince William Sound, due to the Great Alaska Earthquake of 1964 (NRC, 1968).</p> <p>Uplifting of undersea areas cause navigation hazards. During the 1964 season in the Prince William Sound uplift areas, three purse seiners hit submerged rocks and were extensively damaged (NRC, 1968).</p>	<p>Loss of income and fishing capacity. For example, in the Great Alaska Earthquake one fisherman submitted a itemized list for losses estimated at \$3,759; and another reported losses of \$ 2,853 (NRC, 1968)</p>
Volcanic eruptions	<p>On land there is limited risk of loss or damage to fishing gear, with the exception of direct exposure of gear storage buildings to lava and pyroclastic flow.</p>	<p>Loss of houses, gear storage, fishing infrastructure, boats and other assets in the case of direct exposure to volcano's lava or pyroclastic flow.</p> <p>Immediate loss of income until gear is replaced. In more developed countries, insurance companies offer insurance protection for vessels and gear including loss due to volcanoes.<sup>6</sup></p>
Floods	<p>Boat taken out to sea or slammed against fixed objects, destroyed or damaged (particularly engines and machinery) by raging torrents of water.</p> <p>Gear, workshops, materials and gear tangled and taken away by flood waters out to sea</p>	<p>Immediate loss of income until gear is replaced</p>
Oil and chemical spills	<p>Oil spills can cause damage to fishing and aquaculture resources by physical contamination, toxic effects and to fishing gear. The nature and extent of the impact of an oil spill on seafood production and fishing gear depends on the characteristics of the spilled oil, the circumstances of the incident and the type of fishing activity or businesses affected.</p> <p>In some cases effective cleanup and protective measures can prevent or minimize damage. Oiled nets can be cleaned provided they are not too heavily fouled and the oil is not highly weathered and persistent.<sup>7</sup></p> <p>Chemical deterioration of the synthetic materials of the fishing gear. Both heavy and light oils and petroleum products have a degrading effect on fishing gear made from synthetic materials such as polyamide, polyethylene, polyester, and polypropylene nets and ropes.</p> <p>Hard plastic floats may be less affected and can be cleaned, however rubber and Styrofoam floats will be damaged and lose their buoyancy.</p> <p>Risk of fire from petroleum and toxic fumes.</p>	<p>Risk of interruption of fishing activity in polluted area, hence loss of income and disrupting business activity.</p> <p>Oil in the vicinity of fishing ports or in fishing grounds can result in interruption of business. Fish are often the main food protein source for coastal communities, and clean produce is vital.</p> <p>Commercially exploited animals and plants may be killed as a result of oil smothering and toxicity. Catches and cultivated stock may become physically contaminated or may acquire an objectionable oil-derived taste known as 'tainting'. Fishing and cultivation gear may be oiled, leading to the risk of catches or stock becoming contaminated or fishing being halted until gear is cleaned or replaced. The interruption of subsistence, recreational and commercial fishing activity and the disruption of seafood cultivation cycles can have important economic and food security consequences. The reluctance of consumers to purchase seafood products from an affected region can also result in a loss of market confidence.<sup>8</sup></p> <p>Expensive compensation may be required for the loss of income to the communities.</p> <p>Illness of humans due to exposure from petroleum and toxic fallout and fumes.</p> <p>Depending on the extent of the hazard, long term ecological impacts on the environment especially if no clean up action is taken.</p> <p>Impacts on bird life, fish and mammals, reproduction of species.</p> <p>Ulcerative diseases and fish kills depending on the type of chemical</p>

<sup>6</sup> Argus Insurance Yacht and Boat Insurance policy . [http://www.argus.gi/documents/marine/POLICY\\_SUMMARY\\_Yacht\\_and\\_Motor\\_Boat.pdf](http://www.argus.gi/documents/marine/POLICY_SUMMARY_Yacht_and_Motor_Boat.pdf)

<sup>7</sup> ITOPE. 2004. The International Tanker Owners Pollution Federation Limited (ITOPF) Technical Information Paper. Oil Spill Effects on Fisheries. [http://www.itopf.com/\\_assets/documents/tip3.pdf](http://www.itopf.com/_assets/documents/tip3.pdf)

<sup>8</sup> Idem xiii

TABLE 1 (cont.)

Disaster Types	Risks to fishing gear	Implications on the livelihoods of fishing communities
Drought <sup>9</sup>	Very limited risk of loss or damages to actual fishing gear and equipment. (The gear should be well protected from sun direct exposure).	<p>For the inland fishing communities, drastic decrease of availability of daily fish proteins</p> <p>Adaptive strategies by moving to other water bodies, which will entail costs, and possible conflicts for access in new water bodies.</p> <p>Relocation will require acceptance of in-migrants by the established communities.</p> <p>Increased vulnerability due to lack of knowledge of the new fishing area</p> <p>Drought = less water. Water bodies will have reduced volume and the fish in lakes and reservoir will become more concentrated making them easier prey for the natural predators and by fishing.</p> <p>Areas used for spawning may be decreased.</p> <p>Drought in one area can affect the productivity of an ecosystem downstream due to reduced or no nutrient transported by the normal rains or flows of water.</p>
Complex Emergencies (Civil unrest)	<p>Past experience has shown that in complex emergencies, gear is pillaged or stolen and boats used to transport armed groups. Fishing may be conducted to produce food for armed groups.</p> <p>Gear may either be destroyed as punishment to be stolen and used, as well as fishers may be forced to fish to supply fish and fish products to armed groups.</p>	In times of conflict most communities being under threat of violence will immigrate to safe havens within or outside of their area of normal residence or outside of their country becoming refugees. This migration is a great source of vulnerability <sup>10</sup> , as often they may have to leave behind their fishing gear which, may be their only income generating activity, preferring to take any food, personal items and family members. Lack of justice, mass migrations and exodus of people fleeing are other major concerns (FAO/UNICEF/UNDP).

### 1.3 THE OPPORTUNITIES PRESENTED BY THE EMERGENCY RESPONSE

Under normal circumstances, fisheries are being conducted at both commercial and subsistence levels. Fisheries managers have the responsibility to put in place and implement laws and regulations to manage resources in a sustainable manner. However, many countries are challenged to manage the fisheries resources due to lack of technical and financial resources, difficult logistics, lack of scientific research and vital statistical information on which to base their decisions.

After a disaster and in countries when there is uncertainty about the status of the fish stocks or when there is lack of scientific information about the fishing effort, fishing gear should be replaced to levels not exceeding pre disaster level. On the other hand the disaster presents an opportunity to review and improve fishing methods and management. There are disadvantages and advantages to just replacing fishing gear that was lost and to use the opportunity presented by the emergency response to what is now called “building back better”, a phrase coined by William Clinton in 2006 when he was UN Secretary-General’s Special Envoy for Tsunami Recovery.

These two approaches are analyzed in Table 2.

<sup>9</sup> 60 years combined experience in fisheries of the authors

<sup>10</sup> Idem xvii

TABLE 2  
**Analysis of Advantages, Disadvantages and Opportunities to replace fishing gear to original levels and considerations for fisheries management**

Parameters	Repair or replace to the pre-disaster levels	Review and Improve Fishing Methods and Management
Advantages	<p>Re-establish fishery and livelihoods to pre disaster levels rather quickly.</p> <p>Less costly than trying to build back better.</p> <p>Use of existing gear specifications already known.</p> <p>Highly efficient with no little need to consider economical or environmental concerns.</p>	<p>Possibility to use the emergency response to introduce environmentally friendly and more economically efficient fishing gears with less negative impact on the resources and juveniles</p> <p>Longer consultative process may lead to fishers being convinced to voluntarily leave the fishery, especially if the fishery was on the verge of economic collapse or to diversify and find alternatives.</p> <p>Improvement of fishing techniques will need to be accompanied by capacity development and training. This can lead to extension of lifespan of fishing gear.</p> <p>Improved resource management and participation of communities in access rights, policy dialogue and ecosystem health.</p>
Disadvantages	<p>Since all the gear will be new, the fishing capacity will increase due to new boats, engines and gears.</p> <p>This is a strong probability that re-establishing pre disaster of numbers of gears without considering their fishing capacity will lead to unsustainable fishing practices and overfishing.</p> <p>Re-establishing the pre disaster status quo, which may have been inefficient, may lead to uneconomical and reduced developmental perspectives.</p>	<p>Longer term and time consuming process in terms of adaptation, experimentation, introduction and scaling up of new more efficient and economical fishing practices</p> <p>Not an immediate livelihood re-establishment process. Requires time and expertise that may not always be available.</p> <p>Requires financial resources and leadership and expertise in the consultative processes for better management and reduced vulnerability and building resilience to future disasters</p>
Opportunities	<p>Provide only a percentage of what was lost and in the meanwhile conduct quantitative and qualitative analyses of the status of the fisheries before and make a decision on the quantity to using a precautionary approach.</p>	<p>Introduction to Low Impact Fuel Efficient fisheries (LIFE) can provide financial and resource sustainability gains (Suuronen, <i>et al.</i>).</p> <p>Integrate a development perspective in the national Disaster Risk Reduction policies and plans.</p> <p>In depth consultative process will be needed with government and fishers creating partnerships for sustainability.</p> <p>Introduce co-management, gender issues and capacity development in disaster risk management plans</p> <p>Elimination fishing practices that have negative impacts.</p> <p>Capacity development to reduce vulnerability to future disasters is a pre requisite to this process.</p> <p>Provide only legal mesh size and development of under exploited resources if existing.</p> <p>Provide incentives for buyout of licenses and reduce fishing capacity particularly.</p> <p>Transition for emergency to rehabilitation and development.</p>
Threats	<p>Unsustainable exploitation of the resources or over fishing of the fish stocks.</p>	<p>If the resources are already overexploited without funding for a transition, the fisheries livelihoods stand a chance of being unsustainable.</p>

In spite of their economic, social and nutritional benefits, as well as their contribution to societal and cultural values, small-scale fishing communities often face precarious and vulnerable living and working conditions. Poverty remains widespread for millions of fishing people, especially in sub-Saharan Africa and South and Southeast Asia (FAO, 2010 c). It is these poor populations that are most affected by disasters. The 2004 Indian Ocean tsunami and more recently Hurricane Katrina in the United States and the earthquake in Pakistan and India demonstrated once again that the poor usually suffer most from disasters occurring from natural disasters, as they often live and work in highly vulnerable locations (ISDR, 2005).

There is a general lack of coherent, reliable and accessible information on the small-scale fisheries sector. This hinders the formulation of relevant policies for the sector. Addressing these knowledge gaps, particularly in developing countries, can help justify additional efforts by policy-makers and planners to maintain and improve the contribution by the sector to food security, poverty alleviation and employment (FAO, 2010c).

Reviews of data gathering for small-scale fisheries indicate that both catches and employment in small-scale fisheries tend to be greatly underreported. The major reasons are: 1). the dispersed characteristics of small-scale fisheries; 2). in many developing countries, a poor institutional capacity; 3). the adoption by developing countries of data collection approaches that originate in developed countries and are difficult to apply in the multi-species, multi-gear environment of small-scale fisheries<sup>11</sup>.

To ensure the long-term sustainability of fishery resources, it is essential that exploited stocks be regularly assessed and that the results of these assessments be incorporated into the fisheries management process (FAO, 2010c). “The severity of the situation has been recognized globally and in particular by the United Nations General Assembly, which in 2003 endorsed a global strategy for improving information on status and trends in capture fisheries”<sup>12</sup>.

When considering the replacement of fishing gear after a disaster it is important to take a precautionary approach. If the consideration is to replace the gear that was lost then it is important to know what was there before the disaster struck. It is apparent that many small-scale fisheries are data poor and therefore the information on which to base replacement of gear in a sustainable manner is usually lacking.

Furthermore the Code of Conduct for Responsible Fisheries (CCRF)(FAO, 2012b) makes recommendations on the marking of fishing gear, prohibiting destructive fishing practices, reduction of discards and bycatch; promotion and adoption of appropriate technology, taking into account economic conditions, for the best use and care of the retained catch; minimizing the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear all of which occur in disasters (FAO, 2012a). The CCRF also highlights the need for research on the environmental and social impacts of fishing gear and, in particular, on the impact of such gear on biodiversity and coastal fishing communities. The Code also encourages research and promotes the use of selective gears so as to minimize waste and recommends that fishers should cooperate in the development of selective fishing gear and methods including the drawing up of laws and regulations (FAO, 1995).

In situations where gear is distributed in an emergency response there is a strong possibility that these gears may increase fishing pressure on stocks that are already under heavy fishing pressure. In 2007, FAO undertook an “Overview of the impact of the tsunami on selected coastal fisheries resources in Sri Lanka and Indonesia”

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<sup>11</sup> Idem xxii

<sup>12</sup> Idem xxiii

illustrated this situation. The report showed that “Many boats were lost to the tsunami, but in 2006 they had been replaced and there was an increase in FRP boats of 49 percent. Catches by all boat types show a declining trend since the 1960s for traditional boats and since the time of introduction of FRP boats. Catches to date in 2006 are still low, despite more boats. In medium pelagic fisheries, 28-foot-inboard day boats have been replaced gradually by FRP boats since the 1970s. Most of the FRP boats were lost during the tsunami, but have now been replaced; there are now many more boats than before the tsunami. Over the same period, in Kalametiya, catch rates declined from around 250 kg/boat/day (28-foot boats) and 100 kg/boat/day (FRP boats) in the 1970s to 20 and 10 kg/boat/day by mid-2006. A similar pattern was seen in Mawella where gillnet catches of 1 500 kg/boat/day in 2000 declined to about 250 kg/boat/day in mid-2006 (FAO, 2007b).

In Sumatra, Participatory Rural Appraisals were carried out during the overview study (FAO, 2007b) and resulted in recommendations on strategies for recovery and management of their fisheries. One of the recommendations made across all of the sites were that “there must be regulation and enforcement (especially of gear and fishing areas), or five years from now, there will be “dangerous” levels of overfishing and/or a decline in incomes from fishing” and that there should be assistance in the form of training for fisherfolk.

Overall, the main recommendations (FAO, 2007b, pp1) of this overview were that:

- there should be a focus on fisheries management and issues that were present before the tsunami, including resource depletion and ecosystem degradation.
- building resilience against future disasters is included in all strategies.
- fisheries in their present condition, namely in Aceh and Sri Lanka are not generally prepared to promote economic recovery. Governments should consider alternatives to fisheries for rebuilding livelihoods and their economies.
- it is important to address the pre-existing problems of weak institutions and enforcement in fisheries that have been exacerbated by the new problems arising post-tsunami.
- finally, replacement of boats and gear in affected communities needs better scrutiny and management. For this purpose, improved fisheries data management mechanisms and improved capacity in analysis is needed (FAO, 2007b).

Given the evidence in the aforementioned, a precautionary approach is recommended in rehabilitation of fisheries concerning gear supply. However, many humanitarian organizations take the approach of going straight to the livelihood rehabilitation and this approach is evident in the donor strategies of short term quick recovery projects of one to two years time frames with much of the project activity centered on distribution of fishing gears and very little resources placed on resource management, coordination and training, and transition to development (FAO Analysis of FAO Field Project Management Information Systems (FPMIS)).

A compromise between the two approaches is needed. The first step is to gather information and rebuild livelihoods with the provision of inputs. Once this is done, there should be a transition to sustainable resource exploitation within a development context. Therefore fishing gear should not be replaced to pre disaster levels unless there is sufficient evidence to show that the fishery resources are stable and there is ongoing data collection.



## 2. A review of best practice and lessons learnt

### 2.1 HING GEAR IN EMERGENCY RESPONSES

This section describes the challenges related to provision of fishing gear within the emergency response to disasters. A set of different practices is given as examples.

#### 2.1.1 Targeting beneficiaries

Immediately after a disaster many of the fishers and their communities are in mourning for the loss of loved ones and in a state of trauma. The FAO RAP publication 2007/19 (FAO, 2007b) reported that PRA assessments were carried in Sri Lanka and Indonesia after the Indian Ocean tsunami out in “post-emergency conditions in both countries and results may be influenced by the trauma experienced by communities and the limited capacity of facilitators”. Although the entire population is affected by disasters, victims are affected in different ways and to different extents.

The ability to properly target the beneficiaries (the real fishers) is important as in many post disaster situations, there have been complaints of non fishers or persons who were not fishers before receiving boats and fishing gear.

The FAO RAP Publication 2007/19 (FAO, 2007b, pp 20) stated that, “Replacement of boats and gear in affected communities needs better scrutiny and management” and “Problems of oversupply, inappropriate beneficiaries, replacing traditional boats with larger, motorized vessels and poor vessel quality urgently need addressing”.

#### Some issues to consider:

- **Wrong target group:** Not all men in coastal villages are fishers, even less so if they live a few miles inland. The eagerness to help quickly sometimes resulted in superficial checks and balances, thus giving out boats to non-fishers, while the real fishers are grounded ashore empty handed. That explains why in Jangka Buaya, Aceh, Indonesia, the 18 boats donated by USAID remain ashore most of the time, as their owners are probably busy cultivating their fields (Janssen, 2005).
- **One source of information doesn't cover the variety of local preferences:** “Before starting the boat project MSF Lamno consulted one of the fishing communities in the affected area. Their preference for a boat with outboard motor became MSF's standard model. That preference is based on the fact that the concerned villages lack a natural harbour, thus they pull the boats ashore and take the engine home. However, in neighboring villages with access to a natural harbour, people prefer inboard motors, according to the Panglima Laot and fishers of Ujung Muloh. They, however were not consulted in this matter and now will have to accept the outboard motor boats. Some fishers have turned to family members for loans to buy a boat with inboard motor, which they argue is cheaper in operation cost (diesel instead of petrol) and easier to maintain. They used to have boats with a ‘house’ [*small wheelhouse*], which would double as a kitchen and bedroom for night fishing. Nowadays [*post-tsunami period*], boat builders reject orders for those models as they are more labour-intensive and the boat builders already have a lot of orders from donor agencies for smaller boats”(Janssen, 2005).

The OSRO MYA 902 SWE (FAO, 2010b) project implemented by FAO in Myanmar in the aftermath of Cyclone Nargis that struck Myanmar in Friday 2, May 2008, reported that “Contrary to what was the case during the first season after Nargis (when FAO issued scant beneficiary selection criteria other than “affected by the cyclone” due to lack of time), the criteria for the second year after Nargis (and hence this project) were quite detailed. There are very comprehensive guidelines, which have been used to guide the implementing partners. Following are the targeting requirements set out in the first round of LOAs with the implementing partners (mid 2009)”. The targeting regarding fishing gear in the second round of Letters of Agreements defined the criteria for beneficiary targeting as:

- Poor vulnerable, landless and women headed households, who are dependent on fishing activities as their major sources of income and who lost their assets during cyclone Nargis.
- or, for the NGO EGG and UNDP
- Landless and work as casual laborer for at least part of the year;
- Not own more than one boat or a boat larger than 12 feet;
- Not own commercial fishing gear such as a trammel net, stow net or net fence;
- Have the skills / experience necessary to use the fishing gears;
- Appear on the Most Vulnerable Households list, as kept by NGOs or Government.

At the Regional Workshop (FAO, 2006b) held in Bangkok between 30 – 31 March 2006, it was stressed that “ensuring that communities are empowered and involved in the planning of rehabilitation has been a fundamental part of the implementation approach of many agencies”.

### 2.1.2 Response coordination

In making an appropriate response to a disaster, it is important that national, regional and international efforts be coordinated in a manner that takes into consideration the technical, socio economic, legal, political and environmental aspects of governance and natural resource management.

Collaboration between different organizations is important for the success of the rehabilitation effort. In Myanmar, FAO fielded two international fisheries officers who supported the fisheries rehabilitation by coordinating the Fisheries Technical Working Group (TWG) under the FAO Cluster. The author<sup>13</sup> was one of the consultants that initiated the TWG. This approach facilitated technical meetings, which brought together most of the NGOs and other organizations working on the rehabilitation effort.

At the TWG, FAO provided technical guidelines, fishing gear specifications and other relevant information to NGOs working on fisheries rehabilitation. An example of one of the technical guidelines is given in Appendix 1.

FAO often works with partners in all aspects of the rehabilitation processes. Implementing partners are contracted to identify beneficiaries, conduct damage and needs assessments and organize and distribute fishing gear inputs.

In Myanmar, a common practice at the TWG was the 4 W’s (Who is doing, What, Where and When). This exercise was coordinated and prepared and a copy was shared with all NGOs and agencies working in the disaster-struck areas. This tended to avoid duplication of effort and double targeting of beneficiaries.

In addition, it was at the TWG meetings<sup>14</sup> that upcoming concerns and technical difficulties could be brought up and openly discussed.

<sup>13</sup> Robert Lee

<sup>14</sup> Technical Working Group on Fisheries and Aquaculture (TWG Fish) - Agriculture Cluster. Summary Minutes Meeting No. 13 - 30 October 2008.

One year after the Indian Ocean tsunami, at the regional workshop, it was reported that, “there has been a lack of general coordination between organizations regarding geographic areas and approaches. Coverage of relief has not been comprehensive with some areas receiving relatively more attention than others.” (FAO, 2006b). This was because during the tsunami rehabilitation, the cluster approach had not been institutionalized. The use of the cluster was born out of the knowledge gained in the tsunami rehabilitation process

### 2.1.3 Impacts on fisheries resources

Fishing gears are often lost, discarded or abandoned during fishing operations. These losses are often not intentional but are caused by different circumstances, such as: the gear becomes hooked on the bottom and cannot be recovered, large fish or sharks attack the gear which have smaller fish in them and thereby destroying the gear, using old or poor quality marker float ropes may cause the marker float to be lost and the fisher cannot recover the gear as the mark is lost. This is not a desired situation as some lost gears have negative impacts on the marine environment and some continue to “ghost fish” (the phenomenon whereby lost fishing gears continue to fish).

In disasters related to floods, tsunamis and cyclones fishing gears may either be lost at sea because there was no time to bring them ashore before the disaster or they may have been washed out to sea by flood waters, or the tidal wave returning to the sea. Not only is fishing gear taken out to sea, but also household effects, garbage and debris also play their part in contaminating the sea bed and in some cases sensitive areas where fish reproduce such as mangroves and coral reefs. This source of debris and derelict fishing gear impact in the environment by destroying or damaging reefs and spawning areas or contribute to ghost fishing. The main sources of derelict fishing gear that contribute to ghost fishing are fish and lobster traps and pots, gillnets and longlines, that were left or lost at sea during the storm or tsunami. Unfortunately, very often clean up of the sea floor or sensitive areas are overlooked in the rehabilitation effort. However, it is recommended to provide cleanup campaigns and projects to reduce debris, which are harmful to the long-term productivity of the resources.

In Nicaragua after Hurricane Felix in 2007, it was reported that an estimated 17 000 lobster traps were lost. Replacing all of these traps without knowing the exact number can exacerbate the possibilities of ghost fishing.

In Dominica, FAO TCP/DMI/3203 “Assistance to improve disaster risk management capacities in agricultural sectors” assisted the Dominican Government to conduct experiments (Norris *et al.*, 2011) with biodegradable escape panels for fish pots. Preliminary studies showed that between Hurricane Lenny in 1999 and Hurricane Omar in 2008, 4 630 pots with a value of USD 1 103 100 were lost. The studies also showed that pots without bio degradable panels caught 3 500 fish over a one year period compared to pots fitted with bio degradable panels which caught 500 fish over the same period. The main recommendations from this intervention were:

- Amend Fisheries Act # 11 of 1987 to include fitting pots with a bio escape panel.
- Increase use of biodegradable panel / time release devices on pots
- Continue research for as long as possible to improve data analysis
- Reduce or remove subsidies on fish pot wire for fishers
- Develop alternative livelihood for pot fishers, to reduce pressure on inshore fishery
- Provide analysis to fishers for information on way forward.

### **An Abstract – Bio-degradable Escape Panel Research on Fish Pots in Dominica: A Fisheries Resources Management tool (Norris, et al., 2011)**

*The serious negative impact of ghost-fishing by abandoned, lost and derelict fish pots on Dominica's limited and fragile marine resources over the last ten years have been documented.*

*This resulted in experiments into the most appropriate type of bio-degradable escape panel and tying materials to reduce the continuous incidence of ghost fishing. For the first part of the study, ten bio-degradable fish pots were used to simulate lost pots. Experiments were conducted using three types of bio-degradable tying materials. After forty-five to fifty days the jute twine bio-degraded. This is the material that was used for the national study. Part two contained forty-five pots with bio-degradable panels and deployed by ten fishers in six communities on the East and West coasts of Dominica.*

*The pots were of straight funnel and gooseneck type entrance. The Jute twine was used as standard bio-degradable material for the escape panel which was constructed to the side of the pot. This part of the study observed the behavior and durability of the twine during hauling operation and response of fishers to the new idea of fitting all pots with a bio-degradable escape panel.*

*The Fisheries Act #11 of 1987 does not require that fish pots in Dominica be fitted with an escape panel as part of a management tool for the sector.*

*Most fishers agreed that the modified fish pot (with the bio-degradable escape panel) was a definite improvement and one that should be made mandatory.*

### **An Abstract of the Thesis of Gabrielle F. Renchen for the degree of Master of Science in Marine and Environmental Sciences presented on April 5, 2011 - Assessing the Ecological and Economic Impact of Derelict Fish Traps in the U.S. Virgin Islands**

*TrapCam recorded fish behavior in and around a derelict trap for fifteen, 24 hour periods. The results revealed that derelict fish traps do have the ability to ghostfish (n=453 fish), causing 5 percent mortality and subsequent economic loss (\$26/trap/year), while damage to habitats was not observed.*

In Myanmar, during the emergency response, FAO supported the implementation of the project OSRO MYA 805 SWE from June 2008 to July 2009. The project's Final Report stated that "Many agencies involved in the recovery of the fisheries sector in the Ayeyarwady Delta are promoting mud crab (*Scylla serrata* spp.) trapping as an income generating activity. It has grown in popularity amongst poor households in saline regions of the Delta due to the relatively high value of the live mud crabs and the relatively inexpensive equipment and modest skills needed to catch them. In an effort to protect the mud crab resources, Department of Fisheries bans the catching and trading of crabs weighing less than 100 g, but it is understood that a black market exists for undersized crabs. Most of the crab traps being distributed by various agencies use a small square mesh of about 25 mm x 25 mm, which does not allow undersized crabs to escape when the trap is lifted. It was therefore considered important to establish a minimum mesh size of the bottom panels retaining crabs larger than 100 g only. Mesh size trials were carried out in laboratory and followed up by verification trials under commercial fishing conditions in a prominent crab trapping area in Bogale Township. All trials were conducted by the Institute of Fisheries Technology of DOF. They resulted in an unequivocal conclusion that meshes smaller than 40 mm x 40 mm should not be used. The trials also produced clear relations between the weight, length and width of crabs, which are little different from those in the existing fishing regulations. As a result of this work, the project was able to help DOF to produce clear guidelines on crab trap specifications for the Delta. The outcome was the development of guidelines for crab traps, with which the DOF is updating its fisheries regulations.

This experience shows that it is therefore possible to introduce experimental fishing technology within the context of emergency response. This should be a norm rather than the exception.

#### 2.1.4 Selecting the right quality of gear

In general, rehabilitation projects should provide good quality gear, which, if not lost, would last longer than poor quality gear, allowing for savings to replace the gear provided by the rehabilitation project.

High quality fishing gears have longer working lives than poor quality gears. It is important to understand that to the untrained eye high quality gears would have the same specifications and appearance as poor quality gears. The difference between high and lesser quality gears are in their price, the manufacturing practices used and the quality of the raw chemical compounds used in the manufacturing process. These are manifested in the difference in their strength, resistance to abrasion and sunlight, which degrades the chemical compounds from which modern fishing gears are made and endurance in water (Klust, 1973).

As high quality gear is usually more expensive, one can purchase more poor quality gear than high quality gear for the same amount of money. Therefore, it is very tempting to purchase larger quantities to have greater livelihood impact. However, it should be remembered that in many rehabilitation projects, the gears will usually only be distributed once to the beneficiaries and therefore longer lasting good quality gears will probably be more effective in the medium term than poor quality gear.

In ordering and preparing the specification of fishing gear it is important to specify the quality of the gear that is required. However, very often, administrative procedures require that the lowest bid be given the highest consideration or priority for purchase.

Instructions on proper use and care would give the fisher more fishing time which would eventually open possibilities to use fish sales to replace the gear. In Nicaragua, FAO implemented the project OSRO/NIC/802/SPA in which fishing gears were distributed. Fishers received training in the fabrication, use and care of the fishing gears (Chapelliquen Tume, 2010).

Finally, as far as possible fishing gear should be purchased locally for three main reasons:

- Acquiring supplies locally or regionally means assistance can be delivered more quickly;
- Purchasing from local markets supports the economic recovery of the local area; and
- Purchasing locally will minimize the risk of lowering local prices of similar goods and ensure easy access to spare parts.

#### 2.1.5 Importance of targeting women as part of the response

Disasters affect different groups of the population differently but the most vulnerable are often the ones that are most impacted. Understanding and assessing vulnerability is a complex process as it includes understanding of the interrelationship between economic, social, cultural and physical factors. Under normal conditions, the full potentials of women are seldom realized as they face several challenges, such as, limited livelihood options, lack of access to financial systems and social services, low education possibilities and their perceived and expected roles in housework and family care. However, in several countries in West Africa, women often own canoes and manage the entire fishing operation from catching and processing to marketing.

Not taking into account the gender dimension (equality, equity, roles and responsibilities) and implementing gender blind rehabilitation projects can have negative impacts especially on women and children by reinforcing, perpetuating or even increasing existing imbalances and exclusion situations. In fishing communities,

often the main producer is the husband while the women do the fish processing. If the husband dies in the disaster, the women and the family are left behind without any income, as the raw material for processing is not forthcoming.

*“As a result, after disasters, compensation schemes and lost asset and livelihood restoration tend to focus solely on men’s needs, leaving women in a more vulnerable position. For instance in the aftermath of the 2004 Indian Ocean tsunami, assistance was available in the form of replacing fishing boats but there was scarce support to help replace women’s fish processing tools and marketing vehicles”* (World Bank, 2005).

In emergency response projects it is therefore important to target women headed households, widows and young girls in order for the project and the recovery processes to benefit from the full potential of what women and girls can bring for food security and societal benefit.

In order to realize their full potential it is important to understand and take actions based on the different needs, risks, responsibilities that women can take on in an emergency response. Accordingly *“By taking into account the different impact of disasters on men and women, policies and interventions for sustainable recovery and reconstruction as well as for risk reduction, preparedness and mitigation programs can become more effective and targeted”*(GFDRR, 2011).

Women and girls play important roles in the repair and fabrication of small scale fishing gears in developing countries and in developed countries they often work in fishing gear manufacturing establishments. In an emergency response, women and girls can be provided with materials to fabricate gears, which can then be sold, leased or used by fishers within the community. This approach will empower women and reinforce livelihoods for their future involvement in the fishery. Women may also become boat or fishing gear owners even though they do not fish. However, in using this approach due recognition must be given to the knowledge and experience of the woman in the fish production aspects as well as to her social network and her capacity to manage the operations. Therefore adapted training and access to credits and opportunities for policy dialogue should be made available to women on an ongoing basis.

In considering the way forward, it is important to understand that:

*“Utilizing both men’s and women’s capabilities has great potential for strengthening reconstruction efforts as well as supporting broader social change and economic development. Post-disaster situations offer a window of opportunity for positive changes in social justice, legal inequalities and reducing vulnerabilities. Build-back-better approaches are based on the principle that recovery and reconstruction policies will improve disaster preparedness and reduce disaster risk. Community based approaches should be designed to include gender appropriate considerations in order to create an enabling environment for sustainable development and to facilitate recovery efforts in the event of a disaster* (GFDRR, 2011).

### **2.1.6 Addressing vulnerability of fishers to potential disasters: preparedness and risk reduction**

It is important to incorporate in all rehabilitation projects the aspects of preparedness and risk reduction to face future disasters. It is not always possible to incorporate precise activities of preparedness and DRM in the context of rehabilitation project unless sufficient funds are available. However, it is important to raise awareness and identify inherent vulnerabilities. When conducting participatory rural appraisals, it is an opportunity to incorporate into interviews aspects related to Disaster Risk Reduction (DRR). The results of such assessments should be shared with the national disaster response agencies. Identifying how early warning systems for storms and tsunami may be addressed at the community level, preparing community disaster preparedness plans

in a participatory manner, rebuilding infrastructure with the appropriate set back from the water's edge and providing adequate and robust protection are examples of actions that can be taken.

The example of the experimentation of reducing ghost fishing by using biodegradable panels in fish pots in the Commonwealth of Dominica was a component of the FAO *TCP/DMI/3203 "Assistance to improve disaster risk management capacities in agricultural sectors"*. (FAO, 2010a).

In Nicaragua after Hurricane Felix which hit the Atlantic Coasts of Nicaragua on September 4, 2007, a state of emergency was declared and all efforts were placed on preparing a response by National, Regional and local authorities. Subsequently the Government requested the World Bank assistance and the project Hurricane Felix Emergency Recovery Project was prepared. This project has integrated into its activities the strengthening of SINAPRED (National System for Disaster Prevention, Mitigation and Response). Through interviews with the regional representative of SINAPRED the authors learnt that activities to reduce vulnerabilities of the fishing communities on the Atlantic coast of Nicaragua include the improvement of radio communications systems, training of community members in first aid and evacuation and protection planning.

### 2.1.7 Financial tools for fishers and fisher households

After disaster, access to financing is important as many people may not benefit from rehabilitation projects. Financial tools such as insurance, micro credits and savings accounts are important and key to rehabilitation in the response phase of any project. Often, assistance from family and donations from organizations come in immediately after the disaster. This can be the important seed money that is used to restart livelihoods. National agricultural and rural banks and micro finance institutions can play an important role in the immediate, medium and long term rehabilitation and development of the disaster-affected area. However, in spite of their great potential, financial instruments are not frequently used in response to emergencies in developing countries.

In the report Regional workshop- One year later – The rehabilitation of fisheries and aquaculture in coastal communities of tsunami affected countries in Asia, it was reported that after one year,

“The review of existing financial mechanisms has yet to be undertaken in a comprehensive manner. The control of loans for large-scale vessels appears to have occurred in some countries and there has been little large vessel construction as a result. There have been difficulties in accessing finance and loans for those who lost assets and lacked collateral to take out loans. The establishment of an enabling environment for the financial/credit sector has yet to be systematically addressed, but is occurring at local level in community strengthening activities. The provision of financial support to harvesting operations has occurred whilst support to other links in the supply and value chains has been limited” (FAO, 2006b).

#### Microfinance

Microfinance to buy gears can be double edge sword. There may be a tendency to provide credits without much consideration for the status of the fish stocks, and therefore leading to over capacity of fishing. Therefore microfinance and other financial institutions should only give loans to fishers that have been authorized to fish through the national or district licensing system.

In Nicaragua, the Hurricane Felix Emergency Recovery Project financed by the World Bank and implemented has integrated into its activities a fund for provision

of credits to women involved in fish and shell fish marketing and for credits all along the production and marketing chain. However, it should be noted that the emergency recovery is a loan from the World Bank and it has to be repaid.

### **Loans**

In Malaysia, after the Indian Ocean tsunami of December 2004, the Malaysian government provided cash compensation for fishing families who lost fishers, partly damaged or completely lost homes, inboard and outboard engine boats and aquaculture assets (Salma, 2005). The Fisheries Development Authority of Malaysia already had a soft loan program which provided interest free loans to fishers to a maximum of 25 000 Malaysian Ringgit (RM) or (USD 6 580.16) with a forty-eight month term. After the Tsunami Disaster, the maximum amount has been raised to RM 70 000.00 (USD 18 484.40). These loans were only for the fishermen. At the time of the report which was in early 2005, 53 percent or 1 952 of the affected fisherman, had used this facilities, taking loans to a total value of 24 619 200 or (USD 6 479 930). Under the Agriculture Bank of Malaysia, in another loan program, called the 3F scheme, applicants can apply for a maximum loan of RM 5 million (USD 1 316 030) with an annual interest rate of 3.5 percent. The repayment period is 7 years however, only a few applicants have shown interest.

### **Insurance**

In Ecuador, on the 30 September 2011, the Minister of Agriculture (Ministerio de Agricultura, 2011) signed the agreement to expedite reforms of the Ministerial Agreement No 154 of the 13 April 2011, to include several articles which established AgroSeguro as a permanent system for productive insurance, financially supported by the State, in benefit of small and medium scale agricultural, livestock, aquaculture, forestry artisanal fishers producers and other productive agents linked to the Ecuadorian Agriculture sector. This is based on co payment schemes and linked to the Agricultural Insurance Unit of the Ministry of Agriculture, Livestock, Aquaculture and Fisheries, Associations or cooperatives of fishermen participating in the insurance system (FENACOPEC), National Development Bank and a private reinsurance company under accords. The insurance covers the fisheries sector, and is subsidized up to 60 percent of the net principal of the boat, engines up to 75 HP and accessories and the remaining 40 percent is paid by the fisher. The policy covers total or partial theft of boats and/or engines, temporarily stranding, sinking, collision, fortuitous collision forced change of route or general travel and all risks met at sea and includes accident insurance to fishermen and others (crew) during a fishing trip and is valid for one year. The maximum grant is \$ 700 insurance premium, i.e. a fisherman can insure with the subsidy goods from around \$ 5 000 to \$ 24 000 USD per boat. The insurance rate is 2.95 percent i.e. to insure a \$ 12 000.00 boat that has a value of \$ 354.00, the State subsidizes \$ 212.4 (60 percent) and the fisherman pays \$ 200.44 per year.

Parametric and catastrophe insurance (CCRIF, 2011) are important tools in transferring risks from governments to the private sector and can be applied right after the disaster has occurred, enabling quick recovery of the sector. However, it is important that the adequate legal framework and banking and insurance laws are in place for this type of risk transfer to work. Insurance for catastrophic events and disasters including climate change is relatively new in developing countries and a lot of work has to be done to make this tool efficient and effective.

### **Vouchers**

The use of vouchers to purchase fishing gear in an emergency response is seldom used, however it may be an effective financial tool to facilitate early recovery of fisheries. In all cases, when using vouchers, it is highly recommended that the numbers of gears

distributed must be monitored through a central coordinating system to ensure that there are not too many gears concentrated in a particular area and the type and quantity of the gear should be specified on the vouchers. The distribution of fishing gear must always be accompanied by a written authorization to fish issued by the government.

### 2.1.8 Delivery and storage of fishing gear

Fishing gears are made up of many different components. These components are assembled together by the fisher according to; the species fished the area of operation and local and individual practices. It may be tempting to purchase prefabricated fishing gears, however, from the authors experience, most fishers have specific preference when assembling their fishing gear. It is therefore necessary to provide all the individual components that are needed to assemble the specific gear.

A fishing gear such as a gill net (FAO, 2012a) is made up of a net panel, float, lead and reinforcing lines, floats, sinkers, marker floats and float line. In addition, net mending needles, twine and anchors (sometimes stone is used) are also needed to assemble and operate the gill net. A good practice is to request the supplier to provide all the components in a “fishing kit format”. Each kit contains all the components to make one particular gear for one fisher. The advantage of this method is that it saves times and reduces confusion when the fishing gear is distributed. The disadvantage of ordering all the individual components in bulk is that when it comes time for distribution, a lot of time is spent dividing up the components between the beneficiaries and there is strong possibility that an individual beneficiary will not receive all the components. All kits delivered should be checked to ensure that they contain all the components before delivery to the final beneficiaries. Once checked the kits can be delivered directly to the beneficiaries. All kits should be packaged in strong and adequate packaging materials to withstand transport by land and by sea and rough handling. In addition, the packages should be clearly marked so as to identify its contents as they relate to the shipping documents and cargo manifest. It is important to deliver fishing gear packages that are complete and therefore, contribute to a rapid fabrication of the gear by the targeted groups for early recovery. A Certificate of Delivery of the fishing kit, stating the name of the beneficiary, the name of the organization distributing it, with the delivery date, should be remitted to each stakeholder upon delivery. Copies should be given to Fisheries Administration for their statistics as the beneficiary has a proof of ownership.

## 2.2 A DESCRIPTION OF HOW TO IDENTIFY NEED FOR FISHING GEAR REPAIR / REPLACEMENT IN AN EMERGENCY CONTEXT

In many countries the quantity of certain types of fishing gears are not exactly known because there are seldom requirements to register the fishing gear which links the fishing gear to a particular owner. In addition fishing gear is routinely lost, abandoned or otherwise discarded during fishing operations. Since gear is assembled from many different parts and are often renovated partially or completely replaced with new parts, the monitoring and registration of fishing gear becomes very difficult for fisheries administrations.

Depending on the extend of the funding available for the emergency response there may be more than sufficient or less than enough funds to replace fishing gear. In any case, more than sufficient funds should not be seen as a green light to spend so much on the provision of fishing gear if these could have negative impacts on the environment and on the fish stocks. There is therefore a need to prioritize on the type and quantity of gear to be distributed in the rehabilitation phase.

The first step is to understand what the most commonly used fishing gears are and whether their use is legal or not. In the emergency context, usually information with regards to fishing gear exists from:

- surveys of fishing gear;
- interviews with fishers, government officials, village leaders, fisher and women post harvest operator associations, and damage and needs assessment conducted by various agencies and NGOs;
- information generated and coordinated by the fisheries cluster or technical working group constituted by the authorities;
- fishing gear catalogues available from gear manufacturers, FAO and other centres of knowledge such as SEAFDEC, national libraries and the National fisheries authorities.
- fisheries legislation and regulations in force.

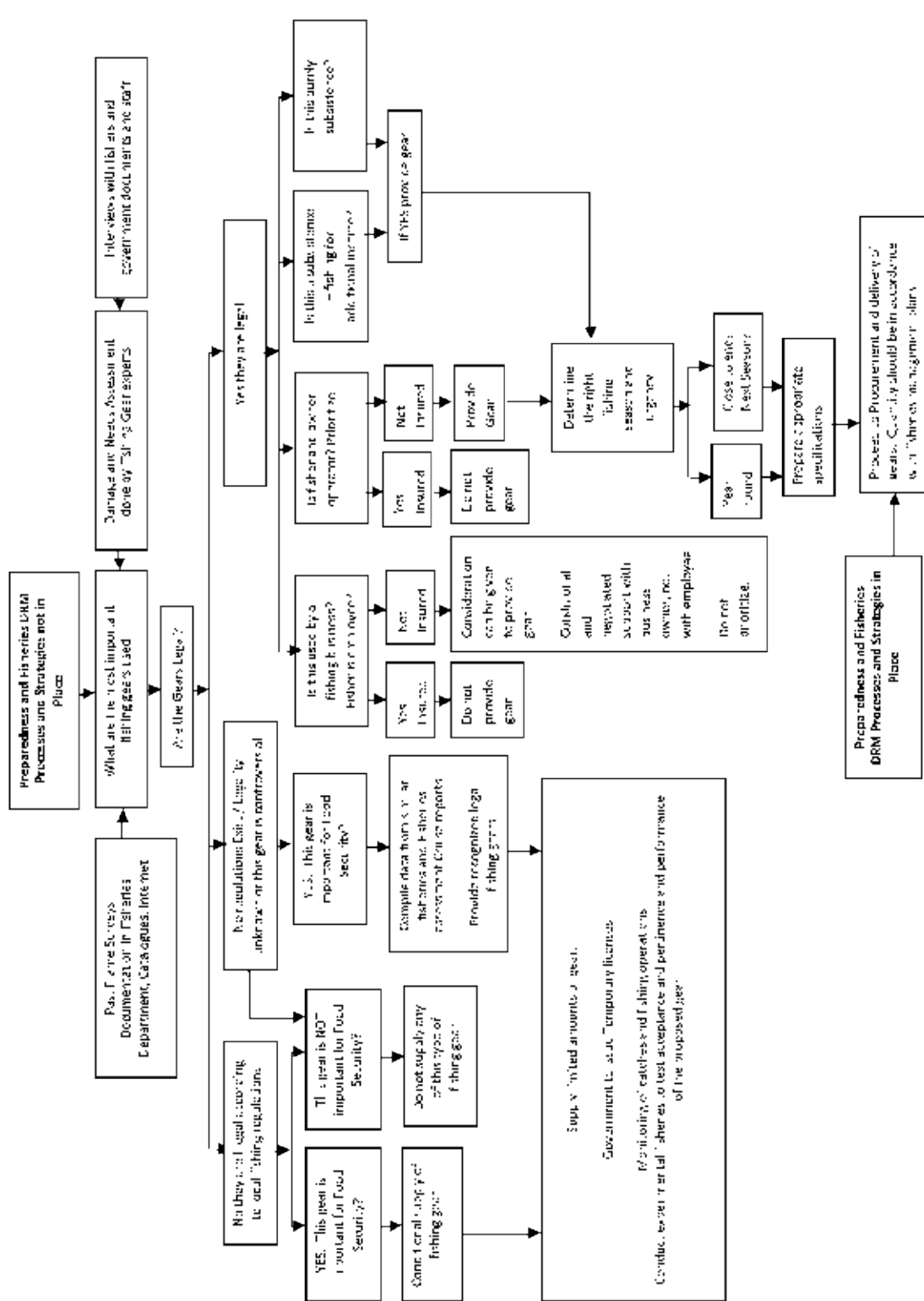
From the experience of the authors, if the national fishing gear suppliers were not severely affected by the disaster, then it would be important to get information on what fishing gear stocks are available as there is usually great demand for the various fishing gears. This is the time when the quality of the fishing gear on offer should be examined. During emergencies, suppliers will tend to get cheaper gear so that they can offer the lowest prices to organizations working on rehabilitation in order to prepare lower bids. As discussed previously, cheaper and low quality is not always the best option for longer- term rehabilitation.

Fishing gear manufacturers often make fishing nets and other components according to orders and to production plans. When a disaster happens very often the production plan is not in sync with the gear needed. Orders for gear from disaster areas will often require the finishing of a production run before re tooling the looms (as in the case of netting materials) to produce the orders from the disaster area. These re tooling and completion of existing orders inevitably cause delays in the supply of nets in particular. It is therefore important to understand the time delay so as to plan for which fishing season the gear will be purchased and the gears supplied. Additionally, the lack of supplies often creates competition between organizations in the rehabilitation efforts.

Fishing gear in small-scale fisheries can usually be considered as an expendable item and it makes little sense in repairing them. On the other hand, large fishing gears like purse seines which can cost hundreds of thousands of dollars for large boats might be worth the while to be repaired depending on the damage done to the gear by the disaster.

FAO usually practices a superintendence of all items received to ensure the quality and completeness of the kits and materials received from the suppliers. Once checked a certificate of good reception with any discrepancies is prepared and the supplier paid based on the certificate.

TABLE 3  
Decision tree on deciding how to identify the need for fishing gear replacement (Ref. R. Lee FAO 2012).



### 2.3 THE LINKAGES BETWEEN PROVISION/REPAIR OF FISHING GEAR AND OTHER SERVICES PROVIDED TO FISHERIES AND AQUACULTURE SECTOR IN EMERGENCY RESPONSE

There are many linkages between the challenge of provisions/repair of fishing gear and the other services that may be provided to the fisheries and aquaculture sector in emergencies. These are described below and summarised in Table 5.

TABLE 4

**Analysis Summary, Understanding the linkages between fishing gear repair and replacement and other services provided to fisheries in the context of emergency responses.**

Areas of Support provided to fisheries sector in emergencies	Linkages between fishing gear repair/replacement and other support provided	What are the implications for planning? (What considerations should be made)
Fishing gear replacement. Fish processing and conservation training. Boat building. Rehabilitation of market and landing site infrastructure. Organizational development to form fisher and women's common interest groups. Transport and conservation and cold storage.	Food Security and Nutrition.	Priority should be given to the distribution of fishing gear such as small-scale drift gill nets which can be used by small vessels to catch relatively inexpensive fish sardines and mackerels that are high in omega 3 fatty acids and important for good nutrition and readily accepted and consumed by the local population. Fish may be supplied or purchased from beneficiaries to supply school feeding programmes, food for work programmes, to reduce the use of imported fish and to boost the local economy (Bundy <i>et al.</i> , 2009). Coordinating and linking with the fisheries cluster and other UN Agencies (FAO, 2011) involved in food security such as WFP (WFP, 2012), IFAD and food and UNDP cash for work. NGOs involved in food distribution should also be involved. Agricultural rehabilitation and food aid to IDP and are refugees.
Provision / repair of fishing vessels/	Assuming that fishing vessels are readily available, fishing gear repairs is not so relevant, but urgent replacement of gear together with technical support for training in order to restart fishing activities "asap" is compulsory	Project Management sending team(s) in disaster area should be able to translate field findings into immediate order for fishing material (Funding should be made available immediately for that purpose) Fast field implementation would enhance the reputation of the project and facilitate future follow-up action in the area by other organization should there be a need.
Provision / repair of infrastructure – e.g. landing sites / market facilities / aquaculture facilities	Landing site infrastructures may have been also damaged or destroyed, and as such should be incorporated into a rehabilitation project in order to facilitate fish landing operations.	
Support for post harvest activities and marketing	Without market chains and post harvest facilities in place – replacing gear will have limited effect.	Transport systems and coordination with government and NGOs that are dealing with transport systems including land, sea and air transport.
Support for fisheries policy and management	Ensuring that the gear is consistent with govt policy and strategy	Need to check government policy, strategy and planning
Rehabilitation Coordination through the Cluster	Technical knowledge and advice and for netter integrated implementation	Involve govt officers in the process of planning the response. Registration with the cluster Communications and information sharing.

### 2.3.1 Linkage between fishing gear and fishing vessels

For the vast majority of fishing operations all around the world, a fishing vessel is needed together with its associated fishing gear. Basically No fishing gear equals No Fish and No fishing vessel equals limited fish (assuming fishing is done from the shore). The both components are inseparable.

Sometimes fishing gear is supplied to fishers that do not have a boat. However, depending on whether the fisher normally fishes from the shore, there is a danger that the gear will be sold to other fishers whose boats were not destroyed in the disaster. However, in Mbandaka in The Democratic Republic of Congo, ex-combatants in a special programme received fishing gear, grouped together to, rent canoes and used the gear to do fishing and processing. They had received at the same time organizational support from an FAO implementing partner (Lee *et al.*, 2009).

Normally, boat building will take time to be re-established due to the fact that the wood used in boat building will need to be seasoned (i.e. partially dried so that the water content in the wood is reduced substantially). Boat builders will have to be trained and proper sheltered areas (boat sheds) will have to be constructed. Boats may have to be built in other areas and transported to the sites where the beneficiaries are. All this takes time and patience will be needed. Building wooden boats rapidly will inevitably end up in low quality boats. This delay in time provides the opportunity to prepare the fishing gear procurement and analyses, to better understand the socio economic dynamics of the fisheries and to verify whether gears need to be improved. Gear can be supplied rapidly to persons that still possess working boats.

### 2.3.2 Linkages between landing sites and fishing gear

Fishing operations require a port or landing site where the fish can be landed in hygienic conditions. These sites in the best of circumstances should also provide ancillary services that are compulsory for the renewal and servicing of a fishing fleet. These may include fuel suppliers, ice plants, marketing and processing facilities, mechanic workshops, equipment sales, canteen and food sale kiosks, water and electricity. Storage and repair sheds for construction and repair of fishing gear is also very important as often the gear cannot be easily transported away from the landing site.

In conclusion, the linkages and dependency between fishing vessels, port and landing site facilities and fishing gears, require taking an integrated approach to the emergency rehabilitation.

## 2.4 SUMMARY OF LESSONS LEARNT AND BEST PRACTICES

The following is a summary of lessons learnt and best practice.

**Time spent in the damage and needs assessment will strengthen the quality of response and improve beneficiary selection and targeting** - It takes time and efforts to study complex livelihoods strategies in post-disaster areas and to find the best ways of providing appropriate fishing gear in terms of beneficiary selection as well recognizing the impact of gear on the environment and fish stocks and to establish suitable quantities of gear. Before introducing new fishing gears, assessments of the possible negative effects have to be studied and recognized.

The beneficiary selection and distribution of gear should be done in a transparent and accountable manner and the gears being replaced should be appropriate, economically viable and environmentally and socially sustainable. Establishing clear selection criteria is important to avoid misunderstanding between beneficiaries and rehabilitation agents. The distribution of fishing gear should contribute to rehabilitation of the local economy through local purchasing where possible.

**Do not distribute illegal fishing gear** – Assessment teams must be well informed about the fisheries laws and regulations. During the assessment phase, one may find

fragments of damaged fishing gear, which reveal illegal fishing gears are being used. Do not promise or distribute illegal fishing gear. There are some gears that are controversial and may have no legal status because that particular gear is evolved from an illegal or legal gear. When in doubt, guidance should be sought from the fisheries administration and or from the fisheries cluster or technical working group.

**Repair or replace fishing gear** - Very seldom is fishing gear repaired in a post-disaster situation. However, there may be exceptions in some very isolated areas, where assistance did not reach a particular community. Moreover, gear repair in itself cannot be regarded as a way to rehabilitate any fishing fleet. Most of the time, the vast majority of fishing gear is so heavily damaged, that the cost and time for repair, makes most efforts not worth the while. Some bits and pieces may be recovered and these can be used as spares in future repairs.

**The need for more holistic responses** – Gear or boats or ice-makers on their own will have little overall effect. What is the point of a boat without gear or a gear without a boat? What is the point of fishing with no means to conserve the fish and it soon rots due to lack of market or transport or suitable drying racks. Rehabilitation should take a holistic and integrated approach to improvement of fishing systems. Activities and livelihoods along the whole production and marketing chain should be addressed. The use and impact of the gear on the socio economic livelihoods and on the resources should be monitored and evaluated and high level of consultation with the beneficiaries should be recognized and undertaken on a continuous basis to ensure transparency, and that appropriate rehabilitation materials and processes reach the correct beneficiaries.

**Institutional coordination and sustainability** - In order to adopt an approach leading to institutional sustainability of fishing activities from emergency responses, good coordination and clear communications between project and different government agencies, are required. More importantly, systematic data collection, monitoring and information systems should be set up to gather information about fisheries where they are lacking and improved where they exist. The rehabilitation should lead into development and to building back better. In line with this, the use and impact of the gear on the socio economic livelihoods and on the resources should be monitored and evaluated. All agents working on emergency recovery should have representatives participating in the fisheries technical working groups or cluster.

**Environmental sustainability of fishing activities from emergency responses** - It is very important for the environmental sustainability of the project(s) that the distribution of harmful fishing gear be avoided. In this respect the role of the cluster and coordination is very important. Technical competence in the delivery of fishing gear is needed and it is recommended that capacity building could be included for fisherfolks/boat operators, as well as Fisheries Officers and national NGOs, in order to raise awareness on fisheries and natural resource management matters. Organizational development, awareness raising and other cross cutting aspects such as gender, climate change, and disaster preparedness should be introduced when and where appropriate.

**Need to incorporate those who don't own fisheries assets in the response** – An important segment of the fisheries population is the crew on mechanized and non-mechanized vessels, coolies etc who seldom own assets and therefore, may not be accounted for in any rehabilitation plans. It is important that these persons, who are essential to the smooth operations of the fisheries sector be given due consideration and be accounted for in the recovery process. Their role and responsibilities should be studied and their integration into the recovery plan established.

**Extending the lifespan of fishing gear** - Fishing gear is a consumable item. In normal fishing operations and with basic maintenance, some type of gear will last a few years, while others will be damaged or lost within months. It is important to note that the quality of maintenance may vary also from one area to another. Organizations

involved in fishing gear distribution should organize training on basic maintenance, operations of fishing gear, as this is also a factor that plays a role on the lifespan of any fishing material.

**Understanding the diversity of the fishing gear in use** - It is important that a rehabilitation project recognize the diversity of the fishing gear as sometimes fishers may operate more than one type of gear. Different gears may be used in the same fishing trip or in different seasons. In any case, it is important to identify the main gear used since it is quite often that projects cannot deliver different fishing gears to many individual beneficiaries.

**Assess the importance of and reduce to effects of ghost fishing and marine debris** - Concrete actions that may be taken to mitigate the effects of ghost fishing are: a) Estimate the amount of gear that was lost at sea to have a better idea of the extent of the possible impact and b) Organize divers and cleanup campaigns on land and at sea. Very often cash for work is given to clean up debris on land, but this is the exception rather than the rule when it comes to cleaning up sensitive coral reefs and spawning areas. More cash for work programs to clean up marine and sensitive areas should be implemented. Fishing traps and pots should be fitted with biodegradable escape panels to reduce the impact of ghost fishing.

**Need to identify and ascertain the role of women in operating fishing gear** – The importance of the role of women, girls and youth in the rehabilitation process should be given due consideration. They play a vital role in the post capture processing and marketing of fish and fishery products. They also play a role in actual fishing and in the repair and fabrication of fishing gear. In order to understand their socio economic role and not to create more inequity between women and men, it is recommended that a gender expert be used in project formulation to ensure integration of gender aspects in projects.

**Training and human capacity building is essential** – Providing fishing gear alone is not enough, particularly in fisheries that are not well managed as this often leads to unsustainable exploitation of the fishery resources. All fisheries interventions and project should have capacity development and training aspects which focuses on responsible use of the resources and organizational development so that the beneficiary group can make the best of the new fishing gear available and become better stewards of the resources on which their livelihoods depend.

**Increasing resilience to future hazards** – As far as possible emergency response project should recognize and incorporate activities that reinforce resilience to future hazards and disasters. These actions can include, studies to identify vulnerabilities, identification of appropriate early warning systems, community emergency evacuation planning, and training in first aid and alternative livelihoods where fishery resources are over-exploited. The possibility of the incorporation of micro insurance and micro-finance to reduce vulnerabilities should be explored. Where possible and available, the feasibility to mainstream these financial and insurance tools (ISDR, 2005) should be studied and promoted. However, financial tools that promote exploitation of the resources should be only promoted where appropriate fisheries policy and management frameworks exist and are being implemented with the supporting monitoring systems.

**The usefulness and importance of financial instruments** – Although not well developed and frequently used in many developing countries, financial instruments such as microfinance, vouchers, soft loans, catastrophe insurance, or regional risk transfer mechanisms can be important in rapid rehabilitation of after disasters. Where existing, organizations working in response to disasters should inform themselves of existing microfinance institutions, banks, insurance schemes that are active in the country. Based on information gathered from the disaster, insurance companies and government fiscal control agencies may come together to prepare catastrophic

risk transfer solutions in the future. In all cases, the use of financial instruments for emergency rehabilitation for fishing gear should be done in close collaboration with the fisheries department and in coordination with the fisheries technical working group and/or cluster.

## 3. A review of the existing standards and guidelines applicable in the context of emergency response

### 3.1 AN OVERVIEW OF THE KEY INTERNATIONAL AGREEMENTS, TECHNICAL GUIDANCE, HUMANITARIAN GUIDANCE AND STANDARDS THAT COULD BE RELATED TO THE CHALLENGE OF PROVIDING / REPAIRING FISHING GEAR IN EMERGENCY SITUATIONS.

#### 3.1.1 FAO Code of Conduct for Responsible Fisheries (CCRF), 1995

The overarching guideline for fisheries activities is the Code of Conduct for Responsible Fisheries. The principles and guidance within the CCRF should be embedded in the national fisheries legislation and regulations. However, the code is voluntary and some States adopt only certain parts of the CCRF. Please make reference to Section 5 for a table of key resources for planners and implementers.

Most countries have fisheries laws and regulations that govern the fisheries and inland waters. Fisheries legislation for many of FAO Member States can be accessed by going to FAOLEX (FAO, 2012c) (An example of a country legislative profile can be found in Appendix II). However, in some cases, national fisheries legislation does not take into consideration disaster risk reduction, climate change, gender equality and other international human rights issues and in some cases there would be a need to update the Fisheries Regulations in a given country.

#### 3.1.2 Technical Guidelines for Responsible Fisheries – Fishing Operation 1

The Code is supplemented by a series of technical guidelines called FAO Technical Guidelines on Responsible Fisheries. This series covers a wide range of topics and provides guidance on how to go about implementing the CCRF. These technical guidelines may be accessed by going to the FAO website (FAO, 2012d). The FAO Technical Guidelines for Responsible Fisheries – Fishing Operations 1 provides guidance on fishing activities as it relates to the implementation of fishing operations and the implementation of the Code of Conduct for Responsible Fisheries. The document also gives guidelines of all States, Flag states and Port States, in addition to fisheries protection, Energy Optimization and protection of the ozone layer, the design, construction and modification of harbors and landing places for fishing vessels and guidelines on the removal of redundant offshore structures, the creation of artificial reefs and deployment of fish aggregating devices. Furthermore, the Appendixes provide detailed guidance on the nine chapters contained in this publication.

Of particular interest to fishing gear is Chapter 6. Guidelines on fishing activities which gives guidance on: the need to respect regulations with regards to fishing gear and fishing methods; the need for prior assessment before the introduction of new fishing practices; allocation of fishing rights to artisanal fishers and control of conflicts between gears and industrial and small scale fisheries. This section also mentions the selectivity of fishing gears and standardization of methodologies for determining selectivity of gears.

### 3.1.3 ICES-FAO Working Group on Fishing Technology and Fish Behavior

The ICES Working Group on Fishing Technology and Fish Behavior (WGFTFB) was created in 1983 (FAO, 2009-2012). In 2002, the Food and Agriculture Organization (FAO) joined with ICES to co-sponsor the WGFTFB, giving the working group a global mandate.

The directive of the WGFTFB is to initiate and review investigations of scientists and technologists concerned with all aspects of the design, planning and testing of fishing gears used in abundance estimation, selective fishing gears used in by catch and discard reduction; and environmentally benign fishing gears and methods used to reduce impact on bottom habitats and other non-target ecosystem components. Areas of focus should also include behavioral, statistical and capture topics.

The Working Group's activities shall focus on all measurements and observations pertaining to both scientific and commercial fishing gears, design and statistical methods and operations including benthic impacts, vessels and behavior of fish in relation to fishing operations. The Working Group shall provide advice on application of these techniques to aquatic ecologists, assessment biologists, fishery managers and industry. A number of reports pertaining to fishing technology and fish behavior can be accessed from this site by going to [www.fao.org/fishery/rebyc/publications/en](http://www.fao.org/fishery/rebyc/publications/en).

### 3.1.4 Coordinating Working Party on Fishery Statistics (CWP)<sup>15</sup>

The Coordinating Working Party on Fishery Statistics (CWP) provides a mechanism to coordinate fishery statistical programmes of regional fishery bodies and other inter-governmental organizations with a remit for fishery statistics. Its main function is to continually review fishery statistics requirements for research, policy-making and management; agree on standard concepts, definitions, classifications and methodologies for the collection and collation of fishery statistics; make proposals for the coordination and streamlining of statistical activities among relevant intergovernmental organizations.

The CWP has produced a Handbook of Fishery Statistical Standards<sup>16</sup> and Chapter M of this handbook is related entirely to Fishing Gear Classification<sup>17</sup>.

The International Standard Statistical Classification of Fishing Gear (ISSCFG) was adopted during the 10th Session of the CWP (Madrid, 22-29 July 1980).

This classification was initially designed to improve the compilation of harmonized catch and effort data in fish stock assessment exercises, it is commonly used in fisheries technology and the training of fishermen. It has been used in particular for reference in works dealing with the theory and construction of gear and for the preparation of specialized catalogues on artisanal and industrial fishing methods.

However, at the 23rd session of CWP it was decided to review and update this classification in accordance with the effort by the ICES/FAO Working Group on Fishing Technology and Fish Behavior (WGFTFB) since 2005 to update the technical contents of the revised edition published in 1990 (FAO Technical Report 222/Rev.1). The draft proposal of revision (Appendix M II) was developed in October 2010 in collaboration with WGFTFB for the adoption at the 24th session of CWP planned in February 2012.

<sup>15</sup> FAO. © 2010-2012. Coordinating Working Party on Fishery Statistics (CWP). In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated 27 September 2010. [Cited 13 April 2012]. <http://www.fao.org/fishery/cwp/en>

<sup>16</sup> FAO. © 2010-2012. Coordinating Working Party on Fishery Statistics (CWP). In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated 27 September 2010. [Cited 13 April 2012]. <http://www.fao.org/fishery/cwp/search/en>

<sup>17</sup> FAO. 2012 Section M Fishing gear Classification. Coordinating Working Party on Fishery Statistics (CWP). In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated 27 September 2010. [Cited 13 April 2012]. <http://www.fao.org/fishery/cwp/handbook/M/en>

## 4. Practical recommendations to promote best practice

### 4.1 BEST PRACTICE FOR SUPPORTING PROVISION AND REPAIR OF FISHING GEAR IN RESPONSE TO EMERGENCIES

The overall appraisal should take an integrated approach which covers, construction of fishing gears, fishing operations, fish landing, handling, processing and conservation and marketing all within the context of the livelihoods and the extent to which the damages have affected them.

When conducting fishing gear needs assessments, it is important to consider the impacts the gears have on the environment and fisheries resources as this has important implications for the long term environmental sustainability and financial viability of fisheries livelihoods and socio economic benefits that accrue to the fishing community.

Very often in the initial stages right after a disaster, carrying out in-depth and technically sound needs assessments is challenging. This is usually due to lack of technical expertise and consistent data on various aspects of fisheries in the damaged area. Inaccessibility of certain areas because of difficult or lack of transport and strong emphasis being placed on providing humanitarian assistance increases these challenges.

Many different relief agencies conduct their own assessments and often the data collected is not harmonised, evidenced by important data gaps such as seasonality of the fisheries, ownership patterns, gender roles, marketing and the actual state of the resources. Without taking into account these information gaps, relief agents may quickly move into replacing boats and fishing gears without a proper understanding of what was the situation of the fisheries before disaster struck.

In order to better coordinate a coherent response that is technically robust, it is desirable for the government, and UN coordination agencies to set up a Technical Fisheries Working Group to share assessments, harmonize reporting, provided technical advice, share policy and legal information and to plan together the fisheries rehabilitation in a manner that the fishery managed better than before the disaster.

In order to assist this process, the following section provides Best Practice Guidance to assist persons and institutions working in fishing gear and fisheries rehabilitation after disasters. These statements of best practices will ensure that the fisheries are Built Back Better. The section is divided into 6 areas as follows:

1. Best practices toward Community;
2. Best practices toward Governance;
3. Best practices toward Ecosystem;
4. Best practices toward Operational Effectiveness;
5. Best practices toward General Statements for Fisheries Development;
6. Best practices toward Determination of the quantity of gear to be allowed per person or family household, as described hereunder.

### 4.2 BEST PRACTICE STATEMENTS

#### Statement of Best Practice 1.1: Community

*Fishing gear is provided in a manner to support the long-term sustainability of fisheries livelihoods and the economic development of the community.*

Fishing communities are made up of many professional groups that exploit, process, transport and market aquatic resources. The production chain is supported by boat builders, mechanics, processors, equipment and gear suppliers, accountants, associations and by interest groups. Government administrations that deal with fisheries resources management are an integral part of the fishing community. Moreover, the fisheries supply high quality protein for food and economic security. It is therefore important and in the interest of the community that illegal and economically inefficient and environmentally unfriendly gears which undermine the long-term sustainability of the fisheries are not supplied.

### *Key indicators*

- Appropriate and legal fishing gears are provided in ad-hoc quantities and in an efficient and timely manner to restart livelihoods after in depth consultation with the communities and professionally led assessments of the resources and gears are undertaken.
- Information on the impacts of gears that have negative impacts on the fisheries resources is gathered and analyzed and their extent of their impacts determined.
- The economic viability of gears that are illegal and / or which have negative impacts (capture of juveniles, destruction of sensitive areas, etc.) are calculated and compared with financial and economic viability of alternative gears.
- Gear replacement or gear conversion programmes are developed and funding sought based on economic and impact assessments carried out in an evidence-based approach.
- Fishing gears are distributed only to experienced bona fide fishers, which have been identified by their community and / or from reliable sources. Due consideration should be given to fact that fishing operations are dangerous and the use of fishing gears by inexperienced persons can lead to death, loss of limb and property.
- Fishing gear is obtained locally and distributed through established channels as a first line, as this will boost economic activity in the area. Where not possible, gear or quality from reliable sources should be sought.
- Capacity development of fisher folk and fisheries administrations is included in rehabilitation projects.

### **Guidance Notes:**

Some small quantities of gears with the least environmental impacts should be first considered as an immediate stopgap measure to maintain livelihoods. With a situation of fishing over capacity, alternative environmentally friendly and economically efficient gears should be introduced. In order to introduce these gears, it would be necessary to undertake fishing trials with alternatives to ascertain their adaptability to local conditions, their catch rates, their acceptability by the fishers and what are the risks. It should be kept in mind that it will not always be necessary to introduce new fishing gears. Modification of existing gears can make some gears more environmentally and resource friendly. For instance, increasing the mesh size or changing the hanging ratio of the webbing material for certain gill nets and traps can reduce the catch of juvenile fish as well as the insertion of bio-degradable panels in fish and lobster pots can reduce ghost fishing if the traps are lost by storm surge and changing the mesh sizes in crab traps in Myanmar allowed undersized crabs/and other crustacean/aquatic species to escape.

The introduction of new fishing techniques and/or modification of existing gears require time and consultation with the fishers. The process should be treated as a joint exercise to find a solution to a technical problem. Fisher participation and engagement is essential for success. In addition, the components of new gears must be available

on the market for newly introduced gear or modifications to be successful. On-the-job-training in the operation of the gear will also be necessary and should be built into the program of work and the budget. Fisheries administration should be made aware of any adaptation of a defined fishing gear. Training and expertise in fishing gear technology is needed for these types of interventions and time and resources are needed to “Build Back Better”. Training for fishers as well as fisheries administration staff should be carried out together as this fosters good dialogue and a way to move towards co-management of the resources in a transition to development phase post disaster.

### Statement of Best Practice 1.2: Governance and information

*The rehabilitation response strengthens the information base for improved fisheries policy and sustainable fisheries management within the country.*

Research and information is key to good decision making and ensuring that supply of fishing gear does not compromise fisheries livelihoods in the medium and long-term. Transition planning and fisheries technical experimentation work and processes, in particular, analysis and planning for the management of natural resources and on the negative impacts of fishing gears on the environment and on the resources require expertise. Organizations wishing to work in these areas should contact experts within the country and government officials before embarking on rehabilitation work and they should make sure that sufficient funding and expertise are available in the long term.

#### *Key indicators*

- Information deficiencies are recognized and systematic data collection, monitoring and information systems are set up.
- Where the information exist, the number and types of existing fishing gears before the disaster and those delivered during the rehabilitation process are known and accounted for and the numbers delivered never exceed the number lost. This inventory is kept and provided to the local and national fisheries management agencies.
- In countries where fisheries science and ecosystem management needs are identified, the possibilities for international cooperation to support and develop fisheries management, reporting and monitoring capacity is sought after.
- The response creates partnerships between local and external experts to bring together available knowledge in order to plan, organize, and to develop capacity in sustainable management of the resources.
- The fishing communities contribute to a better understanding and to the knowledge base on the status of the fisheries resources.

#### **Guidance notes:**

Many fisheries are data poor and present significant challenges to fisheries managers who are often under-resourced in terms of funding and personnel. Before replacing fishing gears it is important to understand the status of the fishery. The first step is to get all available information that existed before the disaster. There are usually frame surveys, which, is a photograph of what the fishery looked like at a particular moment in time. These will usually give the numbers of fishing gears by type, by landing site, the catch per unit effort, the numbers of fishers and number of boats. It is important to find out how old the data is and what changed in the fishery since the last survey. Questions such as whether the catch per unit effort (CPUE) is diminishing over the years and what were the reasons for this are important to be answered. The reduction may have been caused by civil strife, an increase in the number of boats, a natural disaster that damaged and caused losses to boats and gears and infrastructure etc.

However, if it is ascertained that the catch per unit effort is declining because of high fishing capacity (too many boats and gears), then, fishing gears should not be replaced to pre disaster levels. Expertise in fisheries management and governance should be included in the rehabilitation response and training and capacity development made available at the early stages of the rehabilitation process. Where information on the numbers and types of gears is not known, there should be regular reporting to the cluster of the fisheries technical working group of all the gears delivered by type and by location. This will build the knowledge base and improve information on which to take fishery resource management decisions. The data collected should be compatible with the national data collection systems, so it is necessary to be informed on what is essential and what is not.

### Statement of Best Practice 1.3: Governance and policy objectives

#### *The provision of fishing gear contributes to the local and national fisheries policy and strategic objectives.*

Often there are national fisheries regulations, policies and strategies in place, but because of lack of adequate resources, fisheries administrations are unable to monitor and control and therefore ensure in a systematic way that the fisheries sector complies with the laws and regulations. In the rehabilitation of fisheries after a natural disaster, the provision of fishing gears should therefore not undermine the efforts to control the fisheries but rather compliment and support existing regulations and policies.

#### *Key indicators*

- The fishing gear replacement plan demonstrates compliance with the existing national legal and regulatory framework, and aligns with the Articles 6, 7 and 8 of FAO Code of Conduct for Responsible Fisheries.
- The rehabilitation service provider has contact with the national fisheries administration and international support agencies (such as FAO) to ensure that sufficient expertise is available to support the sustainable use of fishing gear within a rehabilitation and eventual transition to development perspective.
- The rehabilitation effort is intrinsically linked and transitions into sustainable fisheries development. Exit strategies based on good governance is part of the response.
- National disaster risk management agencies integrate the fisheries sector in their strategies and plans. Preparedness is integrated into the recovery projects.

#### **Guidance notes:**

At the very beginning, rehabilitation agencies should get a copy of the national regulations, laws, policy papers and fisheries development plans and all relevant information concerning the fisheries. These are the initial bases for making decisions. It is not uncommon to find that laws are out dated or not implemented. In any case, good practice requires that the existing laws be followed and where there is ambiguity or room for misinterpretation, the recommended practice is to follow the Code of Conduct for Responsible Fisheries. It may therefore be necessary for rehabilitation agencies to hire the relevant expertise to assist with fisheries technical, legal and resource management issues. Neglecting to do so can lead to overfishing, destructive practices, mislead investment components, and eventually unsustainable fisheries livelihoods.

Good preparedness planning and risk assessments joined and integrated into policies and strategies will greatly reduce the needs and confusion that occurs once a disaster happens. It is therefore important to integrate into all recovery projects an element of preparedness for the next disaster. For example, activities such as, mapping out escape

routes, contingency plans with the community, learning from what could have been done better (in hindsight), community preparedness plans – who does what and when, what kind of early warning system is needed for future alerts? The important thing is that disaster preparedness should put into actions. The information gathered today and the plans made will save lives and property in the future.

### Statement of Best Practice 1.4: Ecosystem

*The conditions under which fishing gear is provided should contribute to the improved protection of the fisheries resources and the ecosystems within which they live.*

Fishing gears by their very nature are designed to capture and kill fish. Their uncontrolled or illegal use can therefore have negative impacts on the environment, the sustainability of the resources and on the livelihoods of entire communities. Therefore it is important to establish what conditions and criteria are necessary in order to decide when, where, what kind and how much fishing gear should be distributed.

#### *Key indicators*

- Recovery plans demonstrate an understanding of the carrying capacity of the fisheries resource base and the sensitivities and possible impacts of fishing gear on the supporting ecosystems.
- Recovery plans demonstrate an understanding of the national fisheries and coastal policy and management framework that are in place and pre set requirements demonstrate how the fishing gear will contribute positively to these regimes.
- Fishing gear provided does not increase the level of fishing effort above pre-disaster levels.
- The plans take account for the risks of gear replacement impacts on fish nurseries/ reproduction grounds/seasonal fish spawning.

#### **Guidance notes:**

Different fishing gears have different impacts on different ecosystems. It is important to know and understand the types of ecosystems where the fishing gear will be distributed. Sensitive corals, reefs, sea grass meadows, sandy and muddy bottoms, rivers mouths and basins, lakes, rice fields, mangroves, open ocean, costal zones all offer different habitats for different species at different stages in their life cycles. The quantities of gear provided will also have an impact. Many gears concentrated in a relatively finite area will have negative impacts on the resources and the ecosystem especially if the type of gear is prone to be easily lost or abandoned.

Rehabilitation agencies should seek out information and hire expertise to provide guidance on the possible impacts of different gears on the ecosystems that are within reach of the fishing community where fishing gears will be distributed.

Unless it can be ascertained beyond reasonable doubt, through scientific and frame survey data, fishing gear should not be provided in quantities above pre disaster levels. If evidence shows that there is room to increase fishing effort, the amount of a specific gear provided should not exceed what that evidence shows and then a precautionary approach should be taken with specific monitoring of the catches by size and by species and catches per unit effort. This should be done only when a duly monitored licensing system is in place.

### Statement of Best Practice 1.5: Ecosystem

#### *Action is taken to mitigate the effects of ghost fishing*

Fishing gear often gets lost or washed out to sea, entangled, or drifting after a disaster. Other debris such as household articles and other solid materials are also washed out after floods, tsunamis and cyclones. These end up on beaches and on sensitive coral reefs and other areas. They can have a negative impact on the environment and some fishing gear may continue to catch aquatic animals even after they are lost. It is important to reduce the effects of these materials after disaster and indeed under normal conditions.

#### *Key indicators*

- Analysis of the amount of debris and lost fishing gear is done to understand the potential impacts on the fisheries resources and the ecosystem.
- Resources are allocated to organize divers and clean-up campaigns on land and at sea.
- Fishing traps and pots are fitted with biodegradable escape panels to reduce the impact of ghost fishing.

#### **Guidance notes:**

Very often in pot fisheries, because of the lack of marking and registration of fishing gear, many traps are lost. Beach cleanup is also a good way to avoid marine debris and other flotsam from getting back into the marine environment. Cash for work can be used to clean up beaches and marine ecosystems.

### Statement of Best Practice 1.6: Operational Effectiveness

#### *Fishing gear is delivered according to the needs of the community and the planned timeline to ensure that it matches the seasonal requirements.*

Section 1 of this document described the complexity and diversity of fishing gears. It is important that the fishing gears provided meet the needs of each community.

#### *Key indicators*

- The planning of the response accounts for the variability of gear use throughout the annual cycles and different seasons.
- The project has identified the diversity of the fishing gear that is used by different fishers and different ecosystems.
- The fishing gear are constructed or assembled according to the species targeted, the ecosystem that they are used in, and season or time of the year that they are used and the quantity that any one fisher may use is determined by the size of the boat, the amount of investment needed to purchase the gear, whether the gear is individually owned and or operated by a group of fishers.
- When ordering fishing gear kits, the supplier should be requested to supply the fishing gear in individual fishing kits in strong heavy-duty packaging, instead of bulk supplies as this reduces the need for repacking into individual kits. Delays in delivery of the fishing gear are taken into consideration and the gears ordered and distributed should be for the appropriate fishing season.
- Technical competence in preparing the correct specifications for the delivery of fishing gear is important and used.
- Capacity building on good operational practices and care and maintenance of the gear may be included for fisherfolks/boat operators, as well as Fisheries Officers and national NGOs.

- Gears provided should be of good quality, which increases their life span and the ability of the fisher to save enough from the fishing operations to replace the gear.
- Continuous assessment of the technical, socio economic, and environmental impacts of the fishing gears should be monitored during the project life cycle and the information passed over to the national authorities.
- Where feasible and in line with national fisheries policies, financial instruments such as soft loans, vouchers, insurance and micro credits are encouraged and used in the recovery and response process.
- Agencies and organizations working in emergency response should attend the UN Cluster and/or technical working group meetings to avoid duplication of effort and align policies and approaches consistently in all disaster hit areas.

#### Guidance notes:

Continuous assessment of the impacts is important and monitoring systems need to be put in place with the fishers. Beneficiary selection and building trust is important for the recovery process. Engage the fishers, the women, their associations and the fisheries administrations in processes will build trust and direction. Seek technical advice from the technical working group and the cluster and order the right gear and in the right quantities.

#### Statement of Best Practice 1.7: General statements for fisheries development

*The provision of fisheries technical support promotes the contribution of fisheries to food security and food quality, giving key priority to the nutritional needs of local communities.*

#### Key indicators

- Priority is given to the distribution of fishing gear such as small scale gears which can be used by small vessels to catch relatively inexpensive fish such as sardines and mackerels that are high in omega 3 fatty acids and important for good nutrition and readily accepted and consumed by the local population.
- Fishing gear is distributed to the most food insecure and vulnerable populations.
- Fisheries rehabilitation efforts are coordinated with the fisheries cluster and other UN Agencies involved in food security such as WFP, IFAD, UNDP as well as NGOs involved in food distribution.

#### Guidance Notes:

The needs are very great in fisheries immediately following a disaster. Upon gathering the relevant fisheries data as recommended in the best practice statements on governance 1.2, it would be necessary to understand whether small pelagic fish resources are readily available, not over exploited and culturally accepted by the local populations. If these conditions are met and the fishers have the experience and technology to catch these relatively cheap and highly nutritious fish, then the promotion of this technology should be a priority. However, the promotion should be conducted under licensing of the vessels that can fish these resources and the catches monitored and evaluated for long-term sustainability of fishing. Monitoring and evaluation of the fisheries is a good practice for both resource and financial sustainability of the fisheries.

Provided that there is good cold chain and food safety measure, fish caught can be sold to humanitarian agencies involved in food distribution thereby guaranteeing financial stability for the fishing gear and fishers that benefit from this intervention.

Some farmers and households practice subsistence fishing. They usually require very limited quantities of fishing gear and most of the time they do not require boats. Gears may be given to persons that lost theirs in the disaster to immediately restart

their subsistence fishing. All efforts should be made not to convert these subsistence fishers into fulltime fishers. Records of the gears distributed should be kept and passed over to the government.

### Statement of Best Practice 1.8: General statements for fisheries development

*National, regional and international efforts are coordinated in a manner that takes into consideration the technical, socio economic, legal, political and environmental aspects of governance and natural resource management in the rehabilitation process.* A well-ordered and coordinated response will reduce duplication of efforts, and distribution of illegal gear that have negative impacts on the environment and on the fish resources. Making decisions based on expert analysis and in-depth needs assessments, data gathering and understanding of the ecosystems and alignment with the CCRF will contribute to the sustainable livelihoods of the fishing communities.

#### Key indicators

- All agencies working in the fisheries rehabilitation take an active part and or advocate for the fisheries technical working group of the livelihoods and food Clusters set up by the UN Agencies.
- The rehabilitation efforts demonstrate a continuum towards building resilience to future natural disasters, more sustainable exploitation of fish stocks and awareness raising and knowledge sharing amongst all stakeholders so that fishery livelihoods and the fishery itself is in a better condition than before the disaster struck;
- Best practices in governance, [in line with the CCRF] are at the forefront and due consideration is given where there are limited technical and capital resources and gaps in the disaster affected countries;

#### Guidance notes:

It is important to have a balance between short-term rehabilitation gains and long-term sustainability of the fisheries livelihoods. Technical advice and a good knowledge of the fisheries resources and the socio economic situation of the fisheries are important. Technical Guidance should be sought from the competent agencies and coordination between agencies has been recognized as key to successful interventions.

### Statement of Best Practice 1.9: General statements for fisheries development.

*Financial instruments such as microfinance, insurance, cash for work and voucher systems are used to facilitate early recovery of the fisheries sector.*

Micro insurance, microfinance, voucher systems and other similar financial instruments can have an important impact in early recovery of fishing operations and for immediate improvement of food security and reduced dependence on food aid.

#### Key indicators

- Financial instruments are gender-sensitive and are used in a manner that facilitates re-establishment of fisheries livelihoods.
- The use of financial systems and instruments is reported on and monitored
- The most vulnerable persons affected by the disaster are prioritized for assistance and where feasible and within the national policies and practices they receive are assistance through financial instruments.

**Guidance notes:**

While financial instruments can play a role in quick recovery of fisheries livelihoods, they can also play a role in overinvestment in the fishery leading to degradation of the fish resources. It is therefore necessary when providing financial instruments for quick recovery to take the following into consideration:

- Prioritize the most vulnerable who have lost the most and are unable to get alternative assistance.
- Financial instruments should be adapted to the needs and capacities of the beneficiaries. When possible training should be provided in the use and management of financial instruments
- Financial instruments should specify, the type, quantity and area where a fishing gear will be used.
- The administrators of financial instruments should receive guidance on fishing and be familiar with the national regulations and ensure that they do not finance gears that are illegal or that have a negative impact on the environment and the resources.
- Only persons that have licenses authorizing them to fish should get financial assistance to fish.
- Only persons that have experience in fisheries should get financial assistance to fish. However, the process needs to be monitored and implemented within the framework of food fisheries management and governance practices. In general, the use of financial instruments should not lead to over capacity (more boats and gears than can be sustained by the fishery resources) in the fishing sector.

### 4.3 CHECKLIST OF COMMON PLANNING CHALLENGES AND HOW TO OVERCOME THEM

Common planning challenges	Checklist
Initial Assessment	<ol style="list-style-type: none"> <li>1. Ensure that fisheries expertise, with experience in emergency projects conduct the appraisals.</li> <li>2. Review of data and information and legal and regulatory aspects of the fishery.</li> <li>3. Review of seasonality, methods and fishing operation systems.</li> <li>4. Identify beneficiary groupings and their vulnerability</li> <li>5. The overall appraisal should take an integrated approach which covers, construction of fishing gears, fishing operations, fish landing, handling, processing and conservation and marketing all within the context of the livelihoods and the extent to which the damages have affected them.</li> <li>6. Very often the extent of the damage is not fully understood in the initial assessments. Assessments should be coordinated and shared with the fisheries cluster and the minutes of these meetings and the assessments are distributed to all organizations working in the response.</li> <li>7. Updated assessments on a regular basis</li> <li>8. Conduct Impact analysis that feed into priority setting exercises.</li> <li>9. Conduct a capacity implementation exercise to determine local government and key service provider's abilities to respond and partner.</li> </ol>
Linking to long-term development	<ol style="list-style-type: none"> <li>1. Document review and consultation with government official regarding fisheries master plan, fisheries development project in the past, particularly in the context of what worked and what did not.</li> <li>2. Review of fisheries policy and development strategy.</li> <li>3. Align rehabilitation project documents and programmes with stated fisheries development goals and objectives.</li> <li>4. Integrate training and awareness raising into the rehabilitation process</li> <li>5. Review the linkages and create synergies between national disaster response agencies and the fisheries sector.</li> <li>6. Implement train the trainer courses to build national capacity in DRM</li> <li>7. Prepare community disaster preparedness plans and actions with fisheries department and communities.</li> <li>8. To what extent does the response support local industry and services?</li> </ol>

(cont.)

Common planning challenges	Checklist
Linking to long-term development	<ol style="list-style-type: none"> <li>9. Where possible purchase fishing gear locally as it assists the local economy and suppliers will be in a better economic position to replace the fishing gear once the initial amounts are deteriorated and need replacing.</li> <li>10. Facilitate and conduct awareness raising and training with community groups to build organizational capacity to better participate in policy decisions making processes regarding fishing and disaster risk preparedness.</li> <li>11. A clear exit strategy should be formulated and agreed to with the government. This should be based on the level of the governance capacity of the fisheries administration and the communities to continue with the initiatives started related to fisheries and natural resource management and reducing vulnerability to future disasters.</li> <li>12. To assist this process it is necessary to prepare developmental project documents that build on the work done during the emergency rehabilitation phase.</li> </ol>
Participation	<ol style="list-style-type: none"> <li>1. Identify and develop criteria to determine the most vulnerable groups.</li> <li>2. Integrate a gender equality and equity based approach in the selection of beneficiaries. Review and understand the roles and responsibilities of the different sexes and ensure that equal responsibility transforms into equal benefits.</li> <li>3. Conduct SWOT analyses of the various vulnerable groups as a method of prioritizing where and who should be treated and the type of treatment required.</li> <li>4. Use an integrated approach since different vulnerable groups are socially and economically dependent on each other.</li> <li>5. When fisheries data does not exist or community based resource practices are available these should be used and integrated into rehabilitation projects. Cultural norms should also be respected and where they are an impediment to implementation or development, efforts should be made to prompt them to find solutions. Avoid imposing solutions from outside</li> <li>6. Local events and holidays and religious feasts should be taken into consideration when planning meetings, workshops or training sessions so as to have the highest participation rates. In this context, it is also necessary to understand the rhythm of the fishing operations, the processing and marketing aspects so as to cause as little disruption as possible to economic activity.</li> <li>7. Frequently, fishers and groups (beneficiaries) do not attend the fisheries cluster meetings and seldom get the reports and minutes. Standard procedure form development actors should be the sharing of information and receiving feedback. This makes the process more transparent and rich. Decisions that affect the lives of beneficiaries should be discussed with them.</li> </ol>
Technical support and agency competencies	<ol style="list-style-type: none"> <li>1. The project should recruit Technical Officers with sound fisheries and emergency experience. A basic knowledge of the local language (or ability to learn it quickly) in order to be operational in the field as soon as possible. If this is not possible then the fisheries officer should be paired with a national fisheries expert with knowledge technical officer's language.</li> </ol>
Response coordination	<ol style="list-style-type: none"> <li>1. Immediately after a disaster, most of the affected persons are in a state of shock, mourning the dead, rebuilding their basic shelter and trying to find their way. Many live in shelters or are accommodated by host families. Humanitarian organizations working on Health, Water and Sanitation, Psycho Social counselling, Education, Food Distribution are active and usually coordinated by the National Disaster response Agency or by OCHA. It is therefore important to be informed of all situation reports. It is important however, in fisheries rehabilitation not to rush in to assist without the proper fisheries specific damages and needs assessments conducted by fisheries experts.</li> <li>2. The fisheries cluster meetings are a good forum for sharing information, getting guidance on technical aspects and regulations and coordination between humanitarian and response organizations. To what extent are the services provided in this technical area consistent with other services for the sector?</li> <li>3. All agencies working in the rehabilitation efforts should appoint a coordinator as focal point specifically for liaison with other agencies and the UN and national emergency response teams.</li> <li>4. Usually mapping services, OCHA, meetings, Humanitarian sitrep reports are readily available. Sharing information and experience are the best way to make the rehabilitation effort effective.</li> <li>5. Avoid overlap and duplication or triplication of inputs to the same beneficiaries</li> </ol>
Monitoring and Evaluation of impacts	<ol style="list-style-type: none"> <li>1. Every project should install and implement a monitoring and evaluation system.</li> <li>2. A system should be put in place for monitoring the use of the fishing gear and the impact of the intervention. Was more fish caught? How was the fish used? How is the maintenance of the gear? What are the problems being experienced? Was other gear received from other agencies? Did gender equity and equality benefit from the inputs received? Have any conflict arisen from the distribution of gear and how is it being solved?</li> </ol>
Beneficiary selection	<ol style="list-style-type: none"> <li>1. It is not always possible to satisfy all the needs of the beneficiaries. It is therefore necessary to consult with the beneficiary groups the most important fishing gear that they use. It is necessary to verify that the fisher actually has the expertise and experience to use the gear requested.</li> <li>2. The primary mechanism to determine defining target groups occurs in the damage and needs assessment process. Please refer to Table 4.</li> </ol>

*(cont.)*

Common planning challenges	Checklist
Policy	<ol style="list-style-type: none"> <li>1. In general the national laws, policies and standards should be respected and applied in the rehabilitation effort. However, where these are not available or undefined, best practices and internationally accepted norms should be applied.</li> <li>2. The interventions should be aligned with the fisheries master plan, fisheries management plans and stated policies and strategies.</li> <li>3. Interventions and contributions within the field of identification of fishing gear packages to disaster affected areas must be: In compliance with the existing national legal and regulatory framework, and in line with the FAO Code of Conduct for Responsible Fisheries; Technically, economically, socially, and environmentally appropriate to local conditions and the human environment; Technically, economically, socially, and environmentally sustainable; Targeted to strengthening the local economy; Transparent and accountable; Subject to regular monitoring and evaluation; and Community based.</li> <li>4. Programmes should make efforts to reduce any Green House Gasses by using more fuel-saving engines and well designed boat's hulls and fishing gears and operations that are fuel efficient. Low Impact Fuel Efficient Fishing methods.</li> <li>5. Gender equality and equity should be addresses in the project and interventions.</li> </ol>
Use of the Code of Conduct	<ol style="list-style-type: none"> <li>1. Practitioners should make themselves familiar with the FAO 1995 Code of Conduct for Responsible Fisheries and the FAO technical Guidelines for Responsible Fisheries.</li> <li>2. The principles and practices of the Code of Conduct for Responsible Fisheries should be incorporated in the emergency response.</li> </ol>



## 5. Key technical resources that should be available to the planners and implementers

TABLE 5  
Analysis Summary Information Resources

Information Resource	Summary of the information	Relevance to the technical challenge	Source of information (either web link or provide electronic copy)
FAO CODE OF CONDUCT FOR RESPONSIBLE FISHERIES (CCRF) FAO 1995.	General Code of Good Practices for the management and governance of fisheries in general. The CCRF is divided into 12 Articles and 2 Appendixes, covers all main aspects of fisheries and is directed to governments and their obligations. The CCRF is voluntary.	Article 6 relates to conservation of resources; good resource management and conservation, bio diversity and prevention of overfishing. Selectivity environmentally safe fishing gear and practices; monitoring and control of fishing activities and fleets; safe, healthy and fair working and living conditions; protection of the rights of subsistence, small-scale and artisanal fisheries to a secure to just livelihood. Articles 7 and 8 are relevant to fishing operations and fishing practices and concern; The impact on fishing communities; conflicts between gears and fishers; abandoned gears, use of selective, environmentally safe and cost effective gear and techniques. Marking of fishing gears, prevention of damage or loss of fishing gear; loss of fishing gear and ghost fishing; habitat disturbance and introduction of new fishing gear, methods and operations to an area; research on the environmental and social impacts of fishing gear; selective gears that minimize waste.	The CCRF Web Page <a href="http://www.fao.org/fishery/code/en">http://www.fao.org/fishery/code/en</a>
FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES I	Provides technical guidelines on the implementation of the CCRF in matters related to Article 8.	FAO, 1996. Fishing Operations -1 In addition to providing general guidelines to States, Flag States and Port States, it provides guidelines to fishing gears and reinforces what is in the CCRF. It also gives guidance on policies related to removal of redundant offshore structures, creation of artificial reefs and deployment of fish aggregating devices. Appendix I contains examples of international conventions and agreements that have a bearing on fishing operations. It is recommended to obtain further information on the status of these instruments. Annex III gives a proposed system marking of fishing gear, IV gives proposals for standard system of lights and shapes for the identification and location of fishing gears.	FAO Corporate Website <a href="ftp://ftp.fao.org/docrep/fao/003/W3591e/W3591e00.pdf">ftp://ftp.fao.org/docrep/fao/003/W3591e/W3591e00.pdf</a>

TABLE 7 (cont.)

Information Resource	Summary of the information	Relevance to the technical challenge	Source of information (either web link or provide electronic copy)
FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES I. Supp 1	This document summarizes the state of the art of VMS and gives guidance to fisheries administrators considering implementing VMS in their fisheries management systems and to all other personnel involved in fisheries MCS.	FAO, 1988. Fishing Operations Vessel Monitoring Systems. These guidelines are relevant particularly with respect to replacement of larger vessels, which have larger fishing capacity.  Vessel Monitoring Systems (VMS) have greatly increased the potential efficiency of Monitoring Control and Surveillance of fishing vessels (MCS). Indication of the cost of MSC systems are indicated	FAO Corporate Website <a href="ftp://ftp.fao.org/docrep/fao/003/w9633e/w9633e00.pdf">ftp://ftp.fao.org/docrep/fao/003/w9633e/w9633e00.pdf</a>
FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES 1. Suppl. 2	The Guidelines are intended to provide general advice and a framework for the development and implementation of Seabird Plans and Seabird Monitoring and Assessment Reports prepared at national, regional and sub regional levels.	FAO, 2009. Best Practices to Reduce incidental catch of seabirds in capture fisheries - 2 – Some fishing gears are harmful to endangered species of birds and should not be distributed.  In 2008, 18 of the 22 species of albatrosses were threatened with extinction with six species listed by the International Union for Conservation of Nature (IUCN) <sup>18</sup> as endangered and three as critically endangered. Fishing gears have impacted on The guidelines provide additional information on types of fisheries and fishing gear <sup>2</sup> where the incidental mortality of seabirds is a concern, summaries of appropriate mitigation measures, and further elaboration of best practices to assist States and regional fisheries management organizations and arrangements (RFMO/As) in developing effective National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (NPOA–Seabirds) and regional plans. Where a seabird bycatch problem has been identified and where industry has been a partner in a comprehensive bycatch mitigation strategy, dramatic reductions in seabird mortality have been achieved.	FAO Corporate Website <a href="http://www.fao.org/docrep/012/i1145e/i1145e00.pdf">http://www.fao.org/docrep/012/i1145e/i1145e00.pdf</a>
FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES 6	They are intended to provide general advice in support of the implementation of Articles of the Code of Conduct for Responsible Fisheries pertinent to the development and management of inland fisheries	FAO, 1997 Inland Fisheries – Inland fisheries recovery must be looked at differently from marine capture fisheries and it is important to understand the different approaches in inland fisheries There are four strategies that are identified as follows and need to be taken into account in inland fisheries emergency responses.  Food fisheries on wild stocks depending on natural reproduction and fertility continue in most of the larger rivers and lakes of the world. Such fisheries are generally at or exceed the limits of maximum sustainable yield and corresponding shifts in fish community structure are occurring with risks of diminished production and damaged stocks.	FAO Corporate Website <a href="ftp://ftp.fao.org/docrep/fao/003/W6930e/W6930e00.pdf">ftp://ftp.fao.org/docrep/fao/003/W6930e/W6930e00.pdf</a>

<sup>18</sup> The IUCN Red List of threatened species is widely considered an objective and authoritative system for classifying species in terms of the risk of extinction

TABLE 7 (cont.)

Information Resource	Summary of the information	Relevance to the technical challenge	Source of information (either web link or provide electronic copy)
		<p>Food fisheries in smaller water bodies in some countries are increasingly being subject to enhancements to raise productivity of selected species above natural levels. This type of management is spreading and the technologies are being adopted by other countries.</p> <p>Recreational fisheries are becoming more common in many areas of the world and, where they develop, tend to supplant commercial food fisheries. Recreational fisheries may contribute to food supply as in many cases they are of a subsistence or artisanal nature.</p> <p>Locally very intense exploitation of juvenile or small adult forms for stocking into other water bodies and aquaculture ponds or for the ornamental fish trade.</p>	
FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES 4. Suppl. 1	The Guidelines are intended to provide general advice and a framework for development and implementation of Shark Plans and Shark Assessment Reports prepared at national, sub regional and regional levels. They provide general advice and a framework for joint Shark Plans for shared trans boundary species of shark.	<p>FAO, 2000. Fisheries Management – 1 Conservation and Management of Sharks. It is important to understand these guidelines when considering the provision of gears, which may be used to target sharks.</p> <p>There is widespread concern over the increase of shark fishing and the consequences, which this has for the populations of some shark species in several areas of the world's oceans. The prevailing view is that it is necessary to control directed shark fisheries and fisheries in which sharks constitute a significant by catch.</p> <p>International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) is an international plan to reduce and monitor shark fisheries.</p> <p>The guidelines cover species conservation, biodiversity maintenance, habitat protection and management for sustainable use.</p>	FAO Corporate Website <a href="http://www.fao.org/docrep/003/x8692/x8692e00.htm">http://www.fao.org/docrep/003/x8692/x8692e00.htm</a>
FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES 10	These Technical Guidelines provide a focus on small-scale fisheries and their current and potential role in contributing to poverty alleviation and food security by expanding on the guidance on small-scale fisheries offered by the Code. The Guidelines are complementary to existing Technical Guidelines for Responsible Fisheries.	<p>FAO, 2005. Increasing the contribution of small scale fisheries to poverty alleviation and food security- Information about small scale fisheries and their importance, vulnerabilities and resilience.</p> <p>The objectives of these Technical Guidelines are to provide a special focus on small-scale fisheries and their current and potential role in contributing to poverty alleviation and food security by expanding on relevant principles and standards set forth in the Code, and to make practical suggestions about ways to ensure that this role can be enhanced.</p>	<a href="ftp://ftp.fao.org/docrep/fao/008/a0237e/a0237e00.pdf">ftp://ftp.fao.org/docrep/fao/008/a0237e/a0237e00.pdf</a>

TABLE 7 (cont.)

Information Resource	Summary of the information	Relevance to the technical challenge	Source of information (either web link or provide electronic copy)
SEAFDEC (The Southeast Asian Fisheries Development Center - fishing gear categories	Inventory of fishing gear categories for Brunei, Cambodia, Myanmar, Philippines, Thailand and Vietnam	Technical specifications and drawings of 13 different fishing gear categories	SEAFDEC Website <a href="http://map.seafdec.org/Monograph/index.php">http://map.seafdec.org/Monograph/index.php</a>
Disaster response and risk management in the fisheries sector <sup>19</sup>	This document gives an overview of FAO's work with regard to natural and human-induced disasters in the fisheries and aquaculture sectors.	It provides lessons learned and experience gained on how to improve disaster response, preparedness and prevention fisheries.  As a resource guide, the publication assists governments and those working in disaster and emergency situations to formulate plans to reduce or prevent the risks and impacts of disasters, manage disaster relief operations more effectively and steer the recovery process on to the fastest track, "building back better".	FAO Corporate Website <a href="http://www.fao.org/docrep/010/a1217e/a1217e00.htm">http://www.fao.org/docrep/010/a1217e/a1217e00.htm</a>
The Fisherman's Workbook	The Fisherman's Workbook is a tool intended for field use, to carry with you for easy reference on land or sea. It contains essential information about the choice and use of a variety of materials and equipment necessary for commercial fishing. Although the Fisherman's Workbook covers a wide range of subjects, it cannot pretend to cover everything, and in the preparation of the book it was necessary to leave out many subjects. The book is divided into 5 parts	Materials and accessories, contains a review of common materials and components used in commercial fishing, with examples and explanations of their use. This part should help with the choice and use of appropriate materials.  'Fishing gear and operations', will help with the choice of particular types of fishing gear, their characteristics and use  Equipment for deck and wheelhouse', outlines the characteristics of echo-sounders and deck machinery for handling fishing gear and gives examples of such equipment.  'Fishing vessel operation', gives information about the most effective use of fishing vessels. Guidelines for calculating the costs and benefits of fishing operations are presented.  'Formulae and tables', gives tables for converting units and numbers among different systems of measurement.  Ordering equipment' gives recommendations about the specifications to be listed when ordering fishing gear and equipment.	<a href="ftp://ftp.fao.org/docrep/fao/010/ah827e/ah827e.pdf">ftp://ftp.fao.org/docrep/fao/010/ah827e/ah827e.pdf</a> English  <a href="ftp://ftp.fao.org/docrep/fao/010/ah827f/ah827f.pdf">ftp://ftp.fao.org/docrep/fao/010/ah827f/ah827f.pdf</a> French  <a href="ftp://ftp.fao.org/docrep/fao/010/ah827s/ah827s.pdf">ftp://ftp.fao.org/docrep/fao/010/ah827s/ah827s.pdf</a> Spanish  <a href="http://www.fao.org/docrep/010/ah827p/ah827p00.htm">http://www.fao.org/docrep/010/ah827p/ah827p00.htm</a> Portuguese  <a href="http://www.fao.org/docrep/010/ah827i/AH827100.htm">http://www.fao.org/docrep/010/ah827i/AH827100.htm</a> Italian

<sup>19</sup> Westlund, L., Poulain, F., Båge, H., van Annroy, Raymon. 2007. *Disaster response and risk management in the fisheries*. FAO Fisheries Technical Paper No 479. Rome, FAO. 56pp. (also available at <http://www.fao.org/docrep/010/a1217e/a1217e00.htm>)

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# Appendix 1 – Example of Guidelines provided by Rehabilitation Team in Myanmar

## FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

### TECHNICAL GUIDELINES ON FISHERIES

#### CYCLONE NARGIS

#### MYANMAR

#### PURPOSE OF THESE GUIDELINES

The purpose of these guidelines is to provide basic principles and guidance to persons and organizations working in fisheries rehabilitation in the cyclone affected areas of Cyclone Nargis

#### LEGISLATION

The Fisheries Legislation is the legal framework for all fisheries operations in the Union of Myanmar. The fisheries legislation has several sections namely:

The Myanmar Marine Fisheries Law of 1990

The Myanmar Freshwater Fisheries Law of 1991

The Myanmar law relating to Aquaculture of 1989

The Myanmar law relating to fishing rights of foreign vessels 1989

In the interest of good fisheries practices, The Minister may pass any reasonable order at anytime. These orders are separate from the Fisheries Law in that they are promulgated as amendments or as orders. There are laws, amendments and orders related to the size of the fish to be caught, license to fish, penalties, application and definitions.

ALL PERSONS AND ORGANIZATIONS WORKING IN FISHERIES REHABILITATION IN CYCLONE NARGIS REHABILITATION OR IN FISHERIES IN GENERAL ARE ADVISED TO READ THE FISHERIES LAW AND TO REQUEST THE AMENDMENTS AND ORDERS PROMULGATED BY THE MINISTER. OPERATE WITHIN THE LAW. IF THERE IS DOUBT PLEASE GET CLARIFICATION IN WRITING FROM THE DEPARTMENT OF FISHERIES AT TOWNSHIP OR CENTRAL LEVEL OR REQUEST THE CLUSTER.

#### POLICY

Fisheries objectives determine the policy. The stated objectives of the Government are to

- Further develop the fisheries
- To prevent the extinction of the fish
- Safeguard and prevent the destruction of freshwater fisheries waters

- To obtain duties and fees payable to the State
- To manage the Fisheries and to take action in accordance with the law

The rehabilitation policy is to favour small scale poor fishers and to assist them to regain their livelihoods as quickly as possible. The government is doing this by providing boats 18 and 21 feet and related fishing gear. Presently, the stated policy is that boats will be given on credit.

ALL PERSONS AND ORGANIZATIONS WORKING IN FISHERIES REHABILITATION IN CYCLONE NARGIS OR IN FISHERIES IN GENERAL ARE ADVISED TO COORDINATE AND TO CLARIFY WITH THE DEPARTMENT OF FISHERIES AND THE CLUSTER THE POLICY THAT THEY SHOULD FOLLOW IN GIVING/FINANCING BOATS TO BENEFICIARIES.

The guiding principle of persons and organizations working in fisheries is to follow the FAO Code of Conduct for Responsible Fisheries. The document can be found on the FAO website at

[www.fao.org/fishery/ccrf/2/en](http://www.fao.org/fishery/ccrf/2/en)

The objective of Fisheries Management is to put in place systems, research, legislation, and compliance and monitoring mechanisms to ensure that the fisheries resources can be exploited by future generations. Often, market forces, economic interest, lack of capacity, poverty, over investment, lack of or inability to enforce compliance with fisheries legislation leads to over fishing.

This means seeking advice of the Department of Fisheries whose stated objective is the management of the fisheries. If in doubt you can request clarification from the Cluster.

ALL PERSONS AND ORGANIZATIONS WORKING IN FISHERIES REHABILITATION IN CYCLONE NARGIS OR IN FISHERIES IN GENERAL ARE ADVISED TO TAKE THE NECESSARY MEASURES AND DUE DILLIGENCE TO ENSURE THAT THEIR ACTIVITIES OR THE LEVEL OF THEIR ACTIVITIES ARE COMPATIBLE WITH

### **BOAT CONSTRUCTION**

In relation to the construction of boats by persons or organizations working in rehabilitation of Cyclone Nargis it is recommended that:

1. Follow the FAO publication on Fishing Vessel Quality Issues published on the FAO website as document, “Boat building in the Tsunami affected area of Nad. pdf “
2. Seek the advice of professional boat builders. Seek independent advice on the quality of the boat you are giving to the beneficiary
3. Coordinate with the Department of Fisheries and with the FAO Fisheries Officer with regards to the number and type of boats by township in order to avoid building boats in excess of pervious fleet levels.
4. Verify correctly the beneficiary to avoid giving boats to non fishers as this creates conflicts and creates life threatening danger to in experienced operators.
5. Ensure that boats are equipped with safety equipment and that the operators have been trained in the use of that equipment. Equipment should also include anchors, first aid kit.

There are many boat types and classification of boats used in the fisheries Myanmar. A description of the different fisheries and their operations are described on the Myanmar Fisheries Federation Website at

[www.myanmarfisheriesindustry.com/fisheries-in-myanmar.htm](http://www.myanmarfisheriesindustry.com/fisheries-in-myanmar.htm) (site no longer functioning)

There are many boat sizes used in for fishing and transport. The inland waters are where the main bulk of the small fishing boats are used. The main boat sizes are 18 and 21 feet long and the smaller may be mechanized or non-mechanized. The mechanized boats are powered by 5 HP gasoline engines with long tail shafts. The vessel designs are specific to each area. It is important to ensure that the design is acceptable to the small scale fishermen. Designs drawings are available at Department of Fisheries and Myanmar Fisheries Federation

Small canoes of 4.5 to 5 meters are extensively used in the delta for transport and subsistence fishing. There are no records as to how many existed before and therefore no information as to how many were lost. No designs are available for these.

Wood of proper quality will become difficult to procure due to the large demand for boat and housing including windows, doors, furniture etc. The main woods used are

Pyin Ga Doe used in the frames of the boats  
Pyim ma used for the planks

Each 18 foot boat requires 0.5 tons of wood  
Each 30 foot boat requires 7.5 tons of wood

Diesel Engine are usually imported from China (Dong Feng brand) and Indicative costs are:

25 HP = 500 000 kyat  
16 HP = 350 000  
13 HP = 300 000

Boat builders and carpenters have been brought in by the Department of Fisheries from different divisions in Myanmar to build 9000 + eighteen and twenty one foot boats.

ALL BOATS BUILT SHOULD BE INDELLIBLY MARKED WITH A NUMBER SYSTEM AND CLEAR OWNERSHIP ESTABLISHED THAT LINKS THE BOAT TO THE FISHER. THIS SHOULD BE CLEAR IN THE HANDOVER AND REGISTRATION PROCESS. DUE DILLIGENCE SHOULD BE DONE IN MAKING SURE THAT BOATS ARE DISTRIBUTED TO BONA FIDE FISHERS

## FISHING GEAR

In the fisheries of Myanmar, there are different fishing gears used by the different fleet segments.

Offshore fishing vessels used “Active Fishing Gear” these include trawls and purse seine nets and “Static Fishing Gear” which include Stow Nets.

Inshore fishing vessels use Static Fishing Gear which include gillnets, driftnets, fish traps, eel traps, crab traps, shrimp traps, stow nets sometime called Tiger Mouth Nets, hooks and lines and longlines for shrimp and fish, cast nets. Different sizes of boats use different quantities of gear depending on the financial capacity of the owner and the size of the boat. There is maximum amount of gear that any boat can take on board

considering the weight of the wet gear, the working space available to work the gear, the length of time fishing and the size of the boat. The amount of gear also needs to be sufficient for economic viability.

Distribution of large quantities of fishing gears in concentrated areas can contribute to over fishing in that area. In order to avoid over capacity of fishing gear it will be necessary to coordinate with the Department of Fisheries on what type of gear is going to be used in what area and in what quantity.

ALL PERSONS AND ORGANIZATIONS WORKING IN FISHERIES REHABILITATION IN CYCLONE NARGIS OR IN FISHERIES IN GENERAL ARE ADVISED TO TAKE THE NECESSARY MEASURES AND DUE DILLIGENCE TO ENSURE THAT THEIR ACTIVITIES OR THE LEVEL OF THEIR ACTIVITIES ARE COMPATIBLE WITH

SEEK ADVICE FROM LOCAL FISHING GEAR TECHNOLOGISTS

**U KHIN MAUNG AYE 098602485 OR U KYAW WIN 0980 23826**

Fishing gear designs commonly used in Myanmar are available in the publication - **Inland Fishing Gear and Methods in South East Asia: Myanmar by the Department of Fisheries, Myanmar and SEAFDEC Training Department.**

INSULATED FISH BOXES FOR ON SHORE STORAGE OF FISH AND ICE

Insulated fish boxes commonly used are as follows:

Approximate Outside dimensions in centimetres      96 long x 60 wide x 60 high.

Approximate Inside dimensions in centimetres      86 long x 50 wide x 50 high.

Insulation thickness /material 10 cm / polyurethane.

Approximate capacity 0.2 M<sup>3</sup> (200 litres approx) = 200 kgs fish and ice.

Material hard plastic outer cover that can be fixed in place by locking or clasping device.

Handles for lifting and manipulating the box in rope or built into the box.

Drain hole with drain plug.

INSULATED FISH BOXES FOR ON BOARD STORAGE OF FISH AND ICE

Insulated fish boxes commonly used are as follows:

Insulation thickness /material      10 cm / polyurethane

Approximate capacity      0.1 M<sup>3</sup> (100 litres approx) = 50 kgs. fish and ice

Material hard plastic outer cover that can be fixed in place by locking or clasping device

Handles for lifting and manipulating the box in rope or built into the box

Drain hole with drain plug.

## Appendix 2 – Example of search in FAOLEX for (Trinidad Fisheries)

### FAOLEX



**Trinidad and Tobago:** Fisheries Act. **Long title:** An Act to regulate fishing in waters of Trinidad and Tobago.

**Date of original text:** 1916.

**Date of consolidation/reprint:** 1980.

**Source:** *Trinidad and Tobago Gazette, Supplement 1980, pp. 1-6.*

**Type of text:** Legislation

**Full text available (English):** tri2089.pdf

**Implemented by:**

- Fisheries Regulations (Chapt. 67:51). - 1980 [LEX-FAOC002090]
- Fisheries (Control of Demersal (Bottom) Trawling Activities) Regulations, 2000 (L.N. No. 43 of 2000). - 22 February 2000 [LEX-FAOC036360]
- Fisheries (Control of Demersal (Bottom) Trawling Activities) Regulations, 2002 (L.N. No. 161 of 2002). - 29 November 2002 [LEX-FAOC036389]
- Fisheries (Control of Demersal Trawling) Regulations, 2003 (L.N. No. 222 of 2003). - 10 December 2003 [LEX-FAOC042229]
- Fisheries (Control of Demersal Trawling) Regulations, 2004 (L.N. No. 335 of 2004). - 10 December 2003 [LEX-FAOC053279]
- Fisheries (Control of Demersal (Bottom) Trawling Activities) Regulations, 1994 (L.N. No. 217 of 1994). - 23 November 1994 [LEX-FAOC066352]
- Notification of Procedures for Resuscitation of Turtles (L.N. No. 194 of 1999). - 28 September 1999 [LEX-FAOC036381]
- Notification of Type and Specifications of Turtle Excluder Devices (L.N. No. 195 of 1999). - 29 September 1999 [LEX-FAOC036382]
- Consolidated text:  
Fisheries Act (Cap. 67:51). - 31 December 2009 [LEX-FAOC105184]  
**Comments:** Consolidated version of Act No. 39 which has been amended by Act No. 39 of 1966 and Act No. 23 of 1975 and has been authorized by L.R.O. 1/1980 (reprint).

### Abstract:

The Act regulates summarily fishing in inland waters and the territorial sea of Trinidad and Tobago. The Act consists of 10 sections: Short title (1); Interpretation (2); Application of the Act (3); Regulations (4); Duty of Fisheries Officer (5); Penalty for breach of Regulations (6); Use of poison or explosives (7); Taking of fish in prohibited areas (8); Inspection, seizure and forfeiture of nets (9); Offences committed at sea (10). This act shall extend to all rivers, whether tidal or otherwise and the territorial sea of Trinidad and Tobago (sect. 3). Except with a written permission of the Minister, no person shall take any fish in an area declared to be a prohibited area under section 4 (sect. 8). Section 9 provides in detail for powers of inspection and enforcement of the Fisheries Officer and any person authorized by him.

**Descriptors (Fisheries):** basic legislation; marine fisheries; inland fisheries; enforcement/compliance; offences/penalties

**FAOLEX No:** LEX-FAOC002089



## Appendix 3 – Acronyms

AGROSEGURO	AgroSeguro is as a permanent system for productive insurance, financially supported by the State in Ecuador
ARC/WFP	Africa Risk Capacity and World Food Programme
CCRF	FAO Code of Conduct for Responsible Fisheries
CCRIF	Caribbean Catastrophic Risk Insurance Facility [online]
CPUE	Catch Per Unit Effort
CWP	Coordinating Working Party on Fishery Statistics
DFT	Derelict Fish Trap
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organization of the United Nations
FAORAP	FAO Regional Asia Pacific
FAOLEX	The World's Largest Collection of National Laws and Regulations Online
FENACOPEC	Associations or cooperatives of fishermen participating in the insurance system in Ecuador
FAO TCP	FAO Technical Cooperation Programme
FPMIS	FAO Field Project Management Information Systems
HP	Horse Power
IFAD	International Fund for Agricultural Development
INPESCA	Instituto Nacional de Pesca [República de Nicaragua]
IRIN	Editorially independent, non-profit project of the UN Office for the Coordination of Humanitarian Affairs (OCHA)
ISBN	International Standard Book Number
ISDR	International Strategy for Disaster Reduction
ISSCFG	The International Standard Statistical Classification of Fishing Gear
ITOPF	The International Tanker Owners Pollution Federation Limited
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
NCCOS	National Centers for Coastal Ocean Science
NGO	Non Governmental Organization
MCS	Monitoring Control and Surveillance of fishing vessels
MSF	Médecins Sans Frontières
NARA	National Aquatic Resources Research and Development Agency Sri Lanka Fisheries
NPOA–Seabirds	National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries
OCHA	UN Office for the Coordination of Humanitarian Affairs
RM	Malaysian Ringgit
RFMO/As	Regional Fisheries Management Organizations and Arrangements
SEAFDEC	Southeast Asian Fisheries Development Center

SINAPRED	National System for Disaster Prevention, Mitigation and Response
TWG	Technical Working Group
UNDP	United Nations Development Programme
UNICEF	United Nations Children’s Fund
USD	United States Dollar
VMS	Vessel Monitoring Systems
WB	World Bank
WB-GFDRR	Distance Learning: Gender Aspects of Disaster Recovery and Reconstruction
WFP	World Food Programme
WGFTFB	Working Group on Fishing Technology and Fish Behaviour
WVI	WORLD VISION INTERNATIONAL [International NGO]

# Provision and repair of fisheries infrastructure in response to emergencies

by

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# Introduction

Fish landing sites and fishing ports are complex dynamic interface zones involving the mixing of environmental, ecological, economic and social activities and problems. Under normal conditions, this heterogeneous mix of activities demands strong cross-sector interaction at the planning stage to ensure that the resulting infrastructure may be managed in a sustainable manner. Following a disaster, when conditions normally demand quick action, this same cross-sector interaction needs to be implemented with greater caution to ensure that sustainability is maintained .

Over the last few decades, natural hazards and human-induced disasters have become more frequent and increasingly destructive. Populations depending on fisheries for their livelihoods have become more and more vulnerable and have been seriously affected by loss of life and property. These disasters are beyond the control of the victims. Even before natural disaster strikes, the fisheries sector faces a multitude of problems that increases its vulnerability to natural hazards, such as marine and industrial pollution, environmental degradation and overexploitation of the natural resources.

In order to provide adequate disaster response in emergency situations, it is imperative that the particular characteristics of the capture fisheries sector is clearly understood from the technical, social and economic points of view. Disasters cause serious disruption to communities, their governments and society as a whole. In most cases, the rehabilitation and reconstruction process necessitates external assistance to guarantee return to basic livelihoods as quickly as possible. Therefore one of the main purposes of this paper is to highlight the natural hazards and human-induced disasters that impact the coastal zones and the sector's infrastructure components in order to assist the decision-makers and planners involved in disaster response to increase their effectiveness in addressing the needs of fishing communities regarding the provision and/or repair of fisheries infrastructure.

This paper draws on the author's experience in post-conflict Damage and Needs Assessment efforts in East Timor, Albania, Sierra Leone and Liberia and post-tsunami re-construction efforts in Somalia and Sri Lanka.

The paper discusses the lessons learnt from these experiences with a few examples and recommends best practise guidelines, which if implemented, provide the basis for good policy- and decision-making. As a resource guide, it is hoped that the paper will assist external donors and NGOs to formulate plans to manage disaster relief operations more effectively and steer the recovery process on to the fastest track and building back better.



# 1. Introduction to fisheries infrastructure and the way they are impacted in different types of disasters that affect the capture fisheries sector

Fisheries infrastructure broadly covers infrastructure over water, such as vessels, floating cages, and fishing gear and land-based infrastructure, from basic artisanal beach landings to full blown fishing ports and includes breakwaters, quays, jetties, port buildings, processing plants, ice production facilities, transport equipment and general utilities required for the functioning of the facility, like electricity, potable water and sewerage facilities. Road infrastructure, linking the port facility or the fish processing facility to national markets also forms part of this infrastructure.

## 1.1 COMPLEXITY AND DIVERSITY OF FISHING INFRASTRUCTURE

Different types of fishing and aquaculture operations are served by different types of infrastructure. The FAO<sup>1</sup> distinguishes between the two types of interface by grading the infrastructure according to the type of fishery they serve, i.e. artisanal, coastal, offshore, distant-water fishery or inland aquaculture.

- **Artisanal infrastructure** usually serves subsistence or artisanal fishers, operating on a daily trip basis a short distance from their village. Vessels typically consist of canoes (paddle, motorised or sail-powered) or fibre-glass skiffs beached in front of the village. Artisanal landings typically handle high value species but high volume species may also be landed seasonally, Figure 1;
- **Coastal fishing infrastructure** usually involves artisanal fishers, operating on one to two day trips from home. Vessels typically consist of large motorised canoes and decked and un-decked fishing vessels with a maximum length of about 20 metres. These vessels would either be beached or moored in calm spots, such as bays, coves. In some cases, a proper port may be needed if the landings are high-volume. Coastal fishing ports typically handle high value species, Figure 2;
- **Offshore fishing infrastructure** usually serves both fisheries and non-fisheries related business interests who invest in vessel fleets. Fishing trips extend to the limit of the extended economic zone offshore and last anything up to four weeks. The vessel sizes are usually in the 20 to 40 metre range and the vessels generally need proper port facilities. Offshore fishing ports typically handle more high volume species with some high value species, Figure 3;
- **Distant-water fisheries port** involves large modern, factory-type trawlers roaming the oceans on very long trips, 6 to 12 months at a time. Their home port can be located at specially provided facilities in commercial ports but are considered more effective when specifically design for the industry within

<sup>1</sup> Sciortino J.A. 2009 – Fishing harbour planning, construction and management, Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Technical Paper 539, Rome, FAO 13 pp.(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

a properly established fishery port. Distant water ports handle only already processed fish (frozen or canned), Figure 4.

- **Inland aquaculture infrastructure** usually serves both fisheries and non-fisheries related business interests who invest in pond aquaculture. The ponds may be located anywhere where ground conditions permit the excavation of ponds. Species handled include shrimp and other fish species suitable for cultivation.

Obviously, each of the above operations requires a different set of infrastructure components and this is illustrated in Table 1. The infrastructure components for each type of operation, range from the simple artisanal beach landing, where sophistication is at its lowest, to the more sophisticated distant-water port.

A cursory examination of Table 1 shows that a retail fish market is not listed as a fish landing or fishing port component. A clear distinction must be made between a sorting hall and a wholesale (auction) and a retail market hall: The sorting hall is a major component of a landing or port. A wholesale market (auction) hall may be a component of a fishing port if the port infrastructure to handle such an activity has been included in the design, i.e. facilities for the port workers, training of the port workers in hygiene aspects and parking arrangements for the wholesale buyers' trucks .

A retail market, however, attracts a much larger number of people from all walks of life and vehicular traffic which is very difficult to control and even more difficult to design for if the standards of hygiene and quality of the processing are to be maintained throughout. Whereas the port workers inside a sorting or auction hall are trained on hygiene, the traders and buyers that gravitate to a retail market are not and the risk of cross contamination is great.

The environmental impact of retail markets is so great that normally they require an environmental impact assessment of their own and for this reason, best practise dictates that they must never form part of a fish landing or fishing port. Retail fish markets must be located a measured distance away from the landing or port.

Artisanal and coastal fishing, though the least sophisticated technologically, is an important economic activity in many countries. It employs thousands of people, provides food to a large part of the population at relatively affordable prices and may contribute significantly to foreign exchange earnings when the product is handled properly.

At the other end of the spectrum, offshore and distant-water fisheries are now very sophisticated. The technological advancements seen over the last decades in the vessel design as well as the rapidly changing on-board fish storage and processing generally demand large investments from the vessel owners and imply that the financial and investment risks have increased rapidly over the same period.

Modern fishing techniques and equipment tend to decrease the risk of poor catch as well as provide better quality products to the market and a safer working environment but these developments also mean also higher investments and thus increased financial risks.

Following on from the above, the landing infrastructure may be broadly divided into two sectors, the artisanal to semi-industrial sector (artisanal and coastal fisheries) and the industrial sector (offshore to distant-water fisheries). The artisanal to semi-industrial sector is basically low-tech with little or no risk insurance, whereas the industrial sector is very often risk insured. In practise, this means that in the case of a major disaster, the losses in the artisanal to semi-industrial sector are not quantifiable unless the local authorities have kept local inventories up to date (Figure 3 in Section 3). In the industrial sector, on the other hand, risk insurance generally ensures that the inventories are updated every year.

### The four types of coastal fisheries infrastructure

FIGURE 1  
Artisanal landing

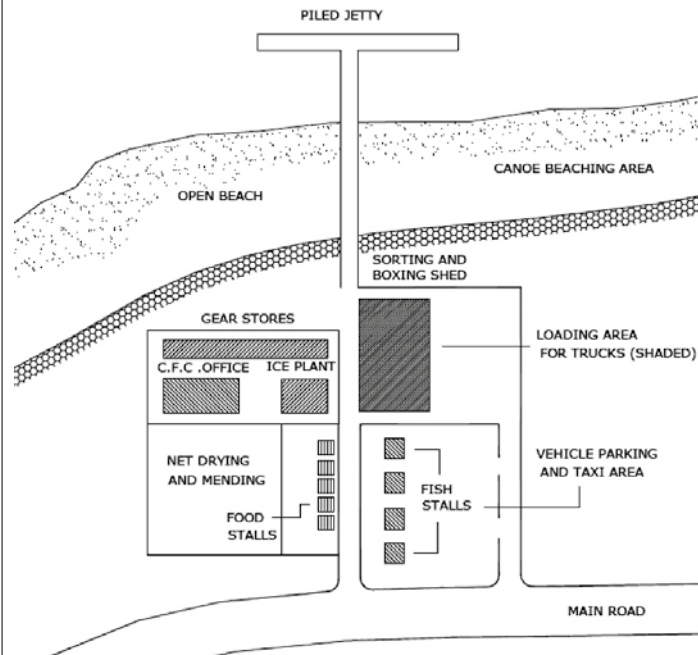
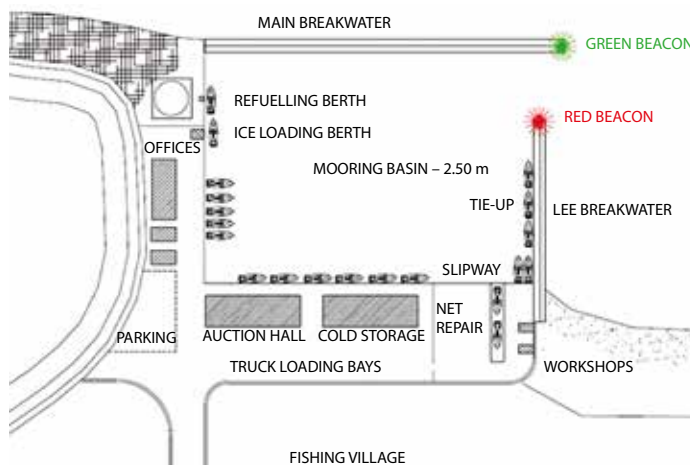


FIGURE 2  
Coastal Fisheries Port



The four types of coastal fisheries infrastructure (cont.)

FIGURE 3  
Offshore Fishing Port

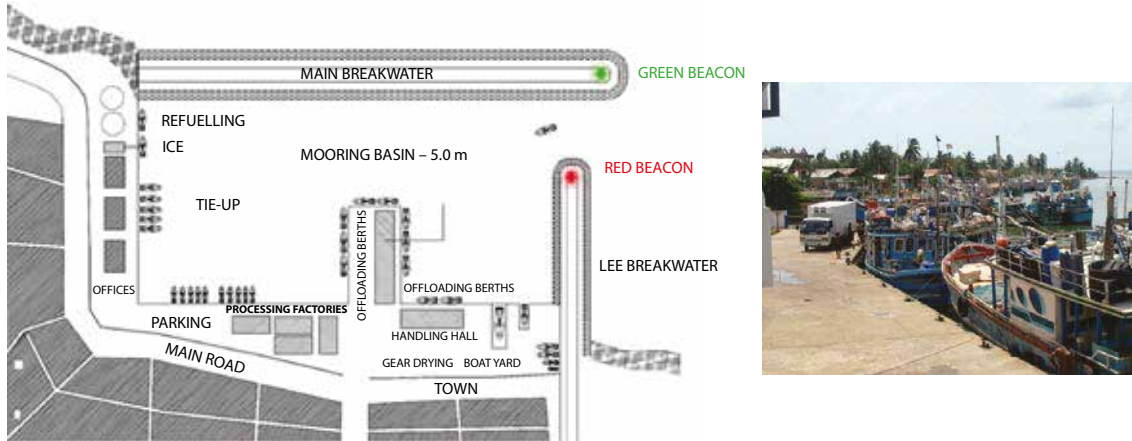


FIGURE 4  
Distant-water Fishing Port



## 1.2 MANAGEMENT ASPECTS OF FISHING INFRASTRUCTURE

The most effective way to run a fishing facility, whether it be a beach landing or a fully-fledged port, is through the establishment of a management body for the facility, representing the interests of all stakeholders<sup>2</sup>. The right to do so, however, is not always resident in national law. Because of the diversity of situations and circumstances in which fishers operate, it is extremely difficult to present ready-made solutions for the size and composition of a port management body. However, there are three areas where management input is required:

- the day-to-day management of operations (unloading, sorting, icing and onward movement plus any other activity that the landing may be used for) and general maintenance; Financial administration of the facility (fees for services rendered, licensing, sale of water and fuel, etc.);
- landing statistics;
- administration of hygiene standards throughout the facility.

It follows that a typical port management body is generally composed of a minimum of four persons; a harbourmaster, an accounting officer or bookkeeper, a fishery statistics officer and a hygiene/pollution controller. A fifth person may assist the harbourmaster with maintenance issues when the need arises. Whereas the harbourmaster's job is a full-time occupation, the other posts may be either full-time or part-time, depending on the throughput of fish at the harbour facility and the availability of trained staff.

At the village level, the management body could consist of the community-based fisheries management organisation or a similar organisation of stakeholders. Aquaculture operations could be run on a community level or by private enterprise. In all cases, however, the infrastructure needs to be managed.

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<sup>2</sup> **Sciortino J.A.** 2009 – Fishing harbour planning, construction and management, Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Technical Paper 539, Rome, FAO 31 pp.(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

TABLE 1  
Comparison of the various types of fishing ports<sup>3</sup>

INFRASTRUCTURE LOCATION OF FISHING GROUNDS	ARTISANAL LANDING	COASTAL FISHING	OFFSHORE FISHING	DISTANT-WATER
TYPICAL FISHING TRIP	Inshore, steaming distance up to 3 hours	Near Coastal, steaming distance up to 6 hours	Offshore, steaming distance up to 1 week	Overseas, steaming distance up to 1 month
TYPE OF VESSELS HANDLED	6 hours to 24 hours Paddle canoes, motorized canoes and small vessels in GRP. Fishing gear usually hand line, pole and line and set nets	1 day to 3 days Large motorized canoes and vessels up to 10 tonnes in weight. Fishing gear usually mini seine, pole and line and trawl nets	2 weeks to 4 weeks Large motorized canoes, purse seiners and trawlers. Vessels up to 100 tonnes in weight. Fishing gear purse seine and trawl nets	Anything from 6 to 12 months Large trawlers (500-1000 Tons GRT) and factory vessels (5000 Tons GRT)
TYPE OF LANDED PRODUCTS	A mixture of low volume high value and high volume low value. Paddle canoes high value only. Motorized canoes both	A mixture of low volume high value and high volume low value	Mainly iced but also frozen pelagics, shrimps and other high value species	Mainly frozen, in bulk, individually packed or ready processed for direct sale through commercial outlets
TYPICAL SHORE PROCESSING	High value – Gutting, icing and boxing for onward sale. Low value – Drying and smoking	High value – Gutting, icing and boxing for onward sale. Low value – Drying and smoking	Canneries, fishmeal, salting, drying and smoking	Packaging, canneries, fishmeal and other value added processing
BREAKWATER PROTECTION	Beach landings do not require breakwaters	Generally required unless port is inside a river estuary	Generally required unless port is inside a river estuary	Generally required unless port is inside a river
SORTING/AUCTION HALL	A sorting hall is required in all cases for icing boxing and onward sale	A sorting hall is required in all cases for icing, boxing and onward sale	A sorting hall is required in all cases for icing, boxing and onward sale	A sorting - auction area is not required in most cases
UTILITIES	Mains power and water preferable Generators only suitable for standby. Boreholes & seawater systems acceptable	Mains power and water preferable Generators only suitable for standby. Boreholes & seawater systems acceptable	Mains power water only. Boreholes & sea water systems acceptable in areas of low rainfall as standby	Mains power and water only
ICE PRODUCTION	Of primary importance. Should only be mains powered otherwise delivered from nearest supplier	Of primary importance. Should only be mains powered otherwise delivered from nearest supplier	Of primary importance. Should only be mains powered otherwise delivered from nearest supplier	Of secondary importance as products are already frozen or canned
COLD STORAGE	Chilled storage on ice (3oC) in ice boxes is acceptable otherwise fish should be moved to a proper cold storage	Cold storage required. Chilled storage on ice (3°C) is acceptable if fish is moved to a proper cold storage quickly	Cold storage required for buffer stocks. Chilled storage on ice (3°C) is acceptable if fish is moved quickly to a cold store	Cold storage required for buffer stocks and local processing needs.
REFUELLING	Small scale installation (up to 10 000 litres) is the most suitable	Medium sized installation (up to 100 tonnes in weight) is the most suitable	Large sized installation (up to 500 tonnes in weight) is the most suitable	Large sized installation (in excess of 1 000 tonnes in weight) is generally required.
DRY DOCKING – SLIPWAYS	Normally carried out on beach	Slipway to handle vessels up to 100 tonnes in weight is desirable	Slipway to handle vessels up to 500 tonnes in weight is desirable	Not important as vessels are serviced worldwide in commercial yards
WORKSHOPS	Small engine and timber hull workshops required. May be located in village	Proper engine and timber hull workshops required in loco. Steel or GRP hulls may need extra workshop area	Proper engine and hull workshops required in loco. Steel or GRP hulls may need extra workshop area	Proper engine and hull workshops required. Steel or GRP hulls may need extra workshop area
NET REPAIR AREAS	Required in all cases. A minimum of 500 m <sup>2</sup> should be set aside. Area should drain surface water away	Required in all cases. A minimum of 1 000 m <sup>2</sup> should be set aside. Area should drain surface water away	Required in all cases. A minimum of 1 000 m <sup>2</sup> required. Area should drain surface water away and be part covered	Generally not required as nets are repaired elsewhere due to their size and complexity

<sup>3</sup> Sciortino J.A. 2009 – Fishing harbour planning, construction and management, Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Technical Paper 539, Rome, FAO 14 pp.(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

TABLE 1

**Comparison of the various types of fishing ports (cont.)**

INFRASTRUCTURE	INLAND FISHERIES
LOCATION OF FISHING GROUNDS	NA
TYPICAL FISHING TRIP	NA
TYPE OF VESSELS HANDLED	NA
TYPE OF LANDED PRODUCTS	NA Species selected beforehand
TYPICAL SHORE PROCESSING	High value – Gutting, icing and boxing for onward sale. Low value – Drying and smoking
BREAKWATER PROTECTION	NA
SORTING/AUCTION HALL	NA
UTILITIES	Mains power and water Generators only suitable for standby.
ICE PRODUCTION	Of primary importance. Should only be mains powered otherwise delivered from nearest supplier
COLD STORAGE	Chilled storage on ice (3oC) in ice boxes is acceptable otherwise fish should be moved to a proper cold storage
REFUELLING	NA
DRY DOCKING – SLIPWAYS	NA
WORKSHOPS	NA
NET REPAIR AREAS	NA

### 1.3 TYPES OF NATURAL HAZARDS AND INDUSTRIAL DISASTERS IMPACTING THE COAST

There are basically 11 types of coastal impacts (storm surge, tsunami, hurricane, earthquake, volcanic eruption, floods, oil or chemical spill, nuclear leak, civil strife, red tide and drought) which, singularly or in group, may strike any part of the coastline instantaneously or over a long period of time, also known as slow-onset disasters. Some are predictable whereas others are not; some are naturally occurring hazards, whereas others are anthropogenic in nature. These may be best illustrated by:

1. **Storm surge** – In 2005, Hurricane Katrina caused an 8.5 m surge above normal tide level;
2. **Tsunami** – In 2004, the Indian Ocean Tsunami generated a 20 m high wave impacting coastlines all around the Indian Ocean;
3. **Hurricane** – In 2005, a Category 5 Hurricane, Katrina, generated 280 km/hour winds;
4. **Earthquake** – In 2010, a Magnitude 9  $M_w$  earthquake in Tokyo generated widespread damage and generated its own tsunami which in turn caused a nuclear leak.
5. **Volcanic Eruption** – In 1979 Mt Soufriere in St Lucia forced the evacuation of 17 000 people when a thick layer of ash smothered the entire island;
6. **Floods** – In 2011, floods in Thailand caused by heavy rains inland and high tide at the river mouth affected 12.8 million people;
7. **Oil or Chemical spill** – In 1999, the shipwreck of the Erika oil tanker contaminated over 400 km of the French coastline, impacting fisheries;
8. **Nuclear Leak** – In 2011, the Fukushima nuclear power plant leaked radioactivity in to the sea during a large earthquake;
9. **Civil strife** – Between 1991 and 2002 in Sierra Leone, civil war badly affected fisheries communities throughout the country, turning entire fisheries communities into IDPs;
10. **Red Tide** – In 2005, a Red Tide phenomenon in Canada affected coastal aquaculture as far south as Maine and Massachusetts;
11. **Drought** – The ongoing drought in the Horn of Africa is putting a large strain on water resources and creating a large number of IDPs.

TABLE 2  
Comparison of the impact of various types of disaster on the coastal area

TYPE-OF-DISASTER	IMPACT-ON-COASTAL-ZONE	POTENTIAL-DAMAGE
<b>Tidal-or-Storm-surge</b>	Gradual: but cyclic flooding of low-lying coastal areas. Excellent prediction characteristics of the phenomenon.	Infrastructure submerged intermittently but not otherwise damaged. Vessels not affected. Interruption of road access sporadic but otherwise intact.
<b>Tsunami</b>	Sudden flooding of coastal area by one large wave which may be up to 6 m in height. Good prediction characteristics developed post 2004 event.	Near total destruction of all vessels and infrastructure in impacted area depending on the characteristics of the foreshore (reefs, vegetation, high ground, etc).
<b>Hurricane-or-Typhoon</b>	High winds that may or may not be accompanied by heavy rains Strong wave action. Excellent prediction characteristics of the phenomenon.	Interruption in road access is total and requires reconstruction. Damage to moored vessels normal. Infrastructure may suffer from flooding or power lines may come down. Road access may be temporarily blocked by debris but otherwise intact.
<b>Earthquake</b>	Seismic movement of ground which may be accompanied by tsunami. No prediction currently available for this phenomenon.	Damage to all shore-based infrastructure is normal. Moored vessels may not be affected but beaches and vessels may suffer damage. Interruption in road access total if access bridges are damaged.
<b>Volcanic-Eruption</b>	Gradual blanketing of coastal area in ash or total smothering by fast flowing lava. Rains worsen an ash blanket by turning it into mud but accelerate the cooling of a lava flow. Good prediction characteristics of the phenomenon.	Beached and moored vessels may suffer damage depending on direction of ash cloud or lava flow. Most infrastructure may be damaged beyond use if ash turns to mud with rain. Road access may be temporarily interrupted if lava flow is mild.
<b>Floods</b>	Flooding of all low-lying areas due to atmospheric downpours may be gradual or sudden. Good prediction characteristics of the phenomenon.	Only beached vessels may be at risk of damage from a flood. Gradual flooding may not cause much physical damage but fast flowing floods eventually destroy most infrastructure. Road access may be interrupted permanently if access bridges are washed away.
<b>Oil-or-Chemical-Spill</b>	The oil or chemical plume may or may not reach the shore line. The occurrence is unpredictable but the spread of the spill may be predicted.	Moored or beached vessels not affected. Most infrastructure is not affected either.
<b>Nuclear-Leak</b>	ditto	ditto
<b>Civil-Strife</b>	Hostilities normally create a climate of uncertainty. Inflow of refugees or outflow of internally displaced persons (IDPs) Shortages of transport means, fuel and water common.	Vessels and equipment commonly looted. Infrastructure may be damaged in case of sustained hostilities. Squatters and Unexploded Ordnance may be a problem during reconstruction.
<b>Red-Tides</b>	The Red Tide plume may or may not reach the shore line. The occurrence is unpredictable but the spread is predictable.	Moored or beached vessels not affected. Most infrastructure is not affected either.
<b>Drought</b>	The occurrence of a drought may not be predictable but the phenomenon normally takes a long time to influence conditions on the ground.	May affect water supplies but vessels and infrastructure are not normally affected.

## 1.4 ANALYSIS OF THE THREATS TO INFRASTRUCTURE COMPONENTS FROM DIFFERENT TYPES OF DISASTER

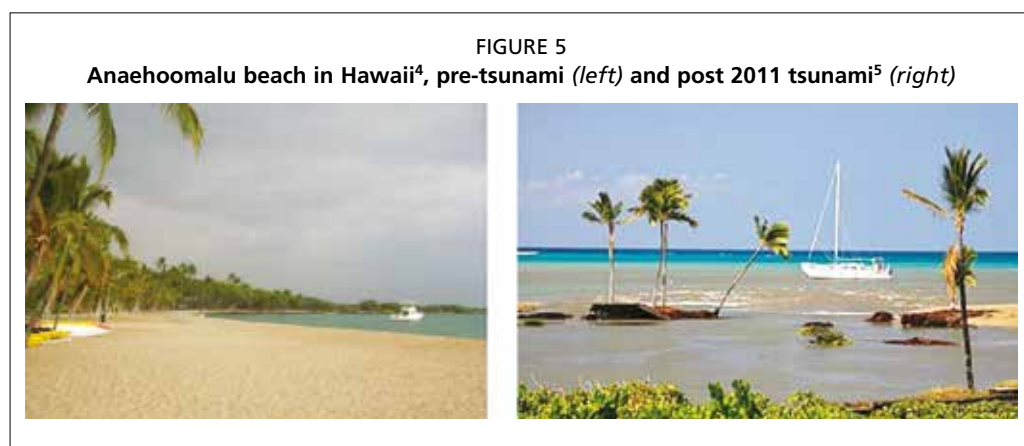
A fishing port, from the simple beach landing to a distant water fishing port, comprises a number of infrastructure components and these may be impacted differently by different types of disaster, Table 4. The key components comprise:

- Open beaches;
- Breakwaters;
- Piled jetties;
- Quay walls;
- Buildings
  - i Port management offices
  - ii Processing – auction halls
  - ii Equipment sheds
  - iv Processing plants;
- Electricity supply;
- Potable water supply and storage
- Hygiene facilities and liquid waste treatment facilities
- Fuel storage;
- Machinery (generators, cold rooms, etc.);
- Roads.

### 1.4.1 Beaches

The beach may be considered as one of the most important components in the infrastructure list as artisanal beach landings comprise by far the largest segment of fishing ports in developing countries.

Shorelines are the margins separating the 29 percent of the earth that is land from the 71 percent that is water. By reworking and often eroding the margins of the land, the seas aid rivers and the wind in wearing down the continents. Sediments derived from the land are often transient along the coasts, temporarily forming beaches, bars or islands before coming to rest on the sea floor. Although winds, waves, water levels, tides, and currents affect all coasts, they vary in intensity and relative significance from one location to another. Variations in sediment supply and geological setting add to this coastal diversity. Tsunamis may adversely affect a beach.



<sup>4</sup> GoogleEarth. 2011 – Panoramio, *Anaeho' omalu Beach* [photo by DisneyKrayzle]

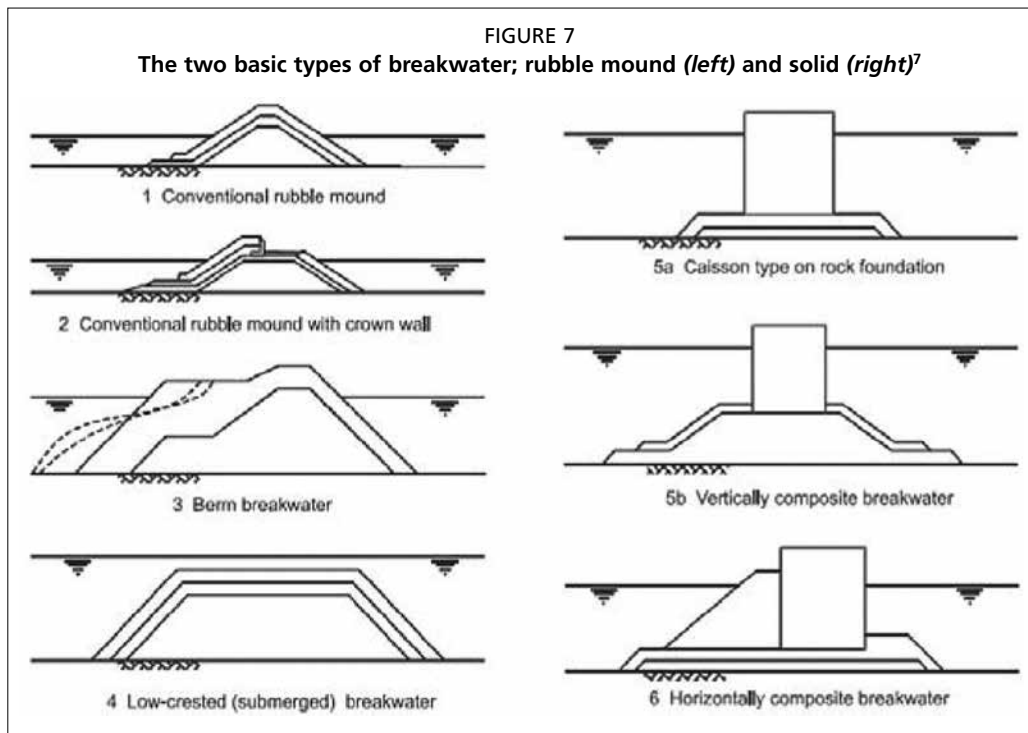
<sup>5</sup> CNN. 2011 – *Tsunami aftermath at A-Bay, Big Island, Hawaii*, [cited 11 march 2011] <http://ireport.cnn.com/docs/DOC-569995>

However, beaches are also at the mercy of oil, chemical or nuclear spills and red tides which may deny access to a beach normally used by fishers for coastal aquaculture and fisheries. These impacts may be immediate, such as when vessels run aground on or near a beach and break up in a storm, or take a much longer time to materialise when the spill is a long distance away and subject to the actions of currents and wind.



#### 1.4.2 Breakwaters

Breakwaters are mainly of two types: rubble mounds with sloping sides or solid vertical-faced structures. The selection of which type is suitable for a particular site depends mainly on the local bathymetry and the availability of rock quarries in the vicinity of the project.



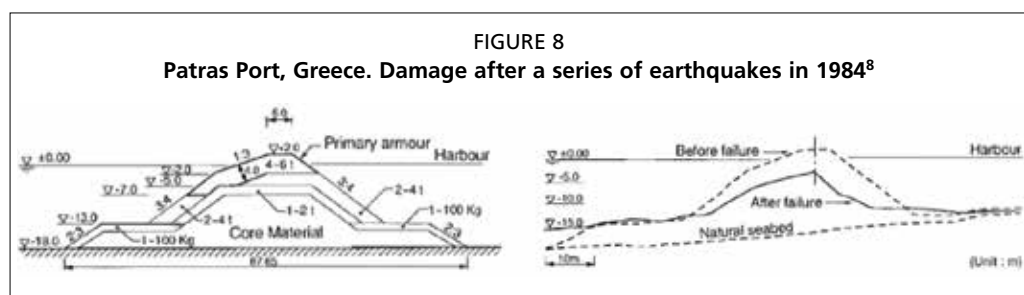
<sup>6</sup> Guardian.co.uk. 2008 – *Erika Oil Spill* [cited Wens 16 January 2008] [www.guardian.co.uk/news/gallery/2008/jan/16/1?INTCMP=SRCH#/?picture=332094871&index=3](http://www.guardian.co.uk/news/gallery/2008/jan/16/1?INTCMP=SRCH#/?picture=332094871&index=3)

<sup>7</sup> CIRIA 2007 *The rock manual*, London.

Rubble mound breakwaters generally consist of at least three main elements, namely a core of small stones, an armour layer of large stones or specifically shaped concrete units and one or more intermediate layers (under layers), which separate the core from the armour, thereby preventing finer material being washed out and ensure stability.

Solid breakwaters, on the other hand, consist of large concrete caissons or blocks sitting on a bed of fine rubble, the thickness of which depends largely on the water depth at the project site.

Only two types of disaster affect breakwaters: earthquakes and tsunamis. In general, earthquake effects fall under national building codes and regulations and are normally mitigated in the overall design of the project through the assessment of the regional seismicity coefficient, geological hazards and soil-structure interaction.



Building codes in seismic-prone countries (regional seismicity coefficients) are continually upgraded as more statistical data becomes available over time and structures designed decades earlier may need to be strengthened to prolong their useful life.

Prior to the Indian Ocean tsunami of 2004, many countries had never witnessed the landfall of a tsunami, small or large, leading to damage (*reference 8 below*). Rubble mound breakwaters are designed to withstand the incident wave climate and extreme weather events without significant damage and movement. As a result, the main (heaviest) armour stones are on the outside and the structure is not designed for strong overtopping. In the case of tsunami waves (very long period waves) the rubble mound structures are subjected to large-scale overtopping and in view of their long periods, the waves also have the ability to penetrate through the porous interior leading to destabilisation and damage of the rear (harbour side) structures. Although porous structures contribute to increase wave energy dissipation, they permit high levels of internal transmission for long waves.

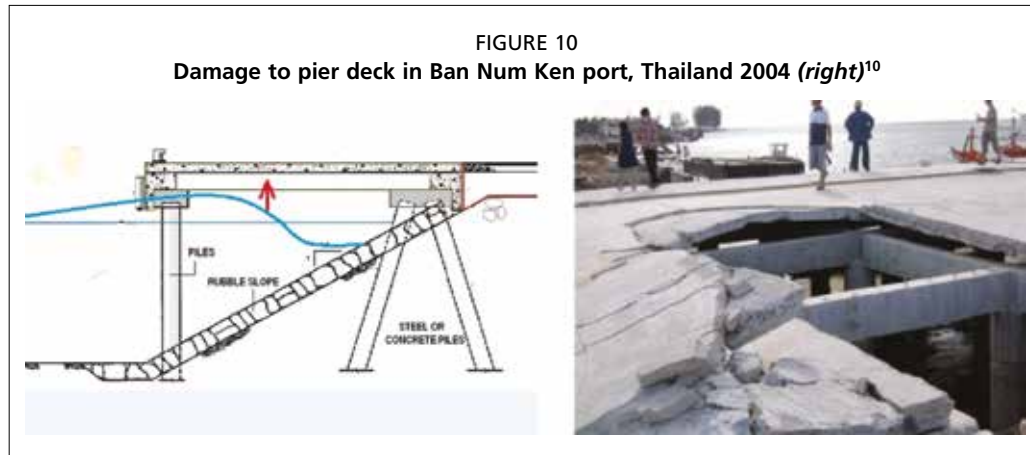


<sup>8</sup> Permanent International Navigation Congresses PIANC 2010 *Mitigation of tsunami disasters in ports* 10pp. Brussels [cited 19 Jan 2012] also available at [www.pianc.org](http://www.pianc.org)

<sup>9</sup> Permanent International Navigation Congresses PIANC 2010 *Mitigation of tsunami disasters in ports*. 34ppBrussels [cited 19 Jan 2012] also available at [www.pianc.org](http://www.pianc.org)

### 1.4.3 Piled Jetties

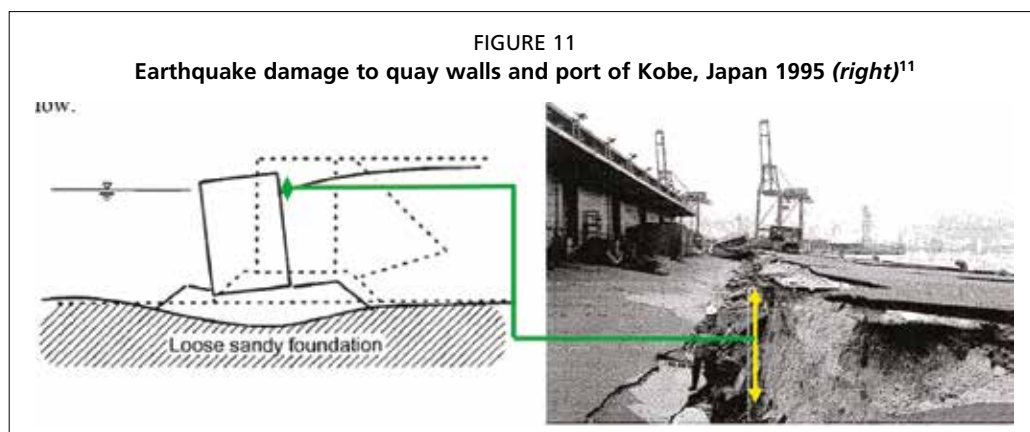
By their very nature, piled jetties offer the least resistance to horizontal water motion but need special attention when large vertical water motions are anticipated. Inside port basins, however, the latter is never considered as a determining factor in the design since berthing requires very calm waters. Whereas a tidal or storm surge raises the water level gradually, a tsunami wave raises the water level rapidly which then impacts all horizontal components of the jetty with such force as to dislodge them from their seating, Figure 6 below.



The supporting piles and cross members of the jetty are not normally affected by this type of impact. However, if large vessels are moored at the jetty during the event, these may cause considerable damage to the piles and superstructure. If the tsunami has been generated by a local earthquake, then the earthquake itself may also damage the piled jetty. Civil strife could also result in damage if the jetty is considered as a strategic asset by the insurgents.

### 1.4.4 Quay Walls

Unlike piled jetties, quay walls are very robust and are only susceptible to strong earthquakes, Figure 7 below.



<sup>10</sup> Permanent International Navigation Congresses PIANC 2010 *Mitigation of tsunami disasters in ports* 41pp. Brussels also available at [www.pianc.org](http://www.pianc.org)

<sup>11</sup> Permanent International Navigation Congresses PIANC 2010 *Mitigation of tsunami disasters in ports* Brussels also available at [www.pianc.org](http://www.pianc.org)

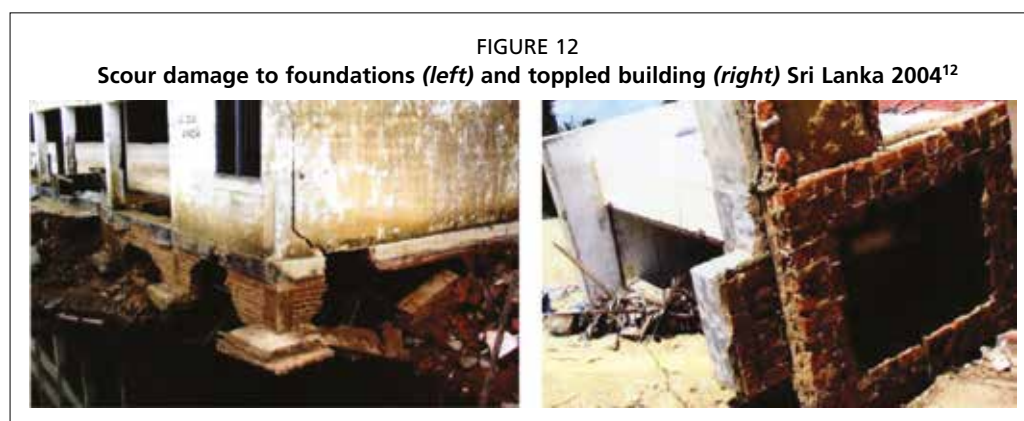
As with other structures in earthquake prone areas, the design of quay walls has to follow the national building codes where earthquake damage is normally mitigated in the overall design of the project through the assessment of the regional seismicity coefficient, geological hazards and soil-structure interaction. Soft soils found in some regions of the world are very prone to earthquake damage when the soil loses consistency during the ground shaking event.

#### 1.4.5 Buildings

Post-disaster damage assessment of buildings is divided into two categories; structural damage to the building structure and the loss of equipment inside the building. Structurally, port office buildings, processing halls and plants and equipment sheds all may suffer structural damage from an earthquake, hurricane or tsunami. A building may also suffer from flooding during hurricanes, tsunamis and floods.

Building structures may also be negatively impacted by volcanic eruptions and to a lesser extent by civil strife. In each case, the relative damage to the building is proportional to the strength or duration of the disaster and the design of the building itself. For a given disaster, buildings that were designed to the appropriate national standards and properly supervised during construction suffer less damage than sub-standard buildings built with inferior materials and left unsupervised during construction.

A building may resist structural damage but high waters associated with hurricanes, tsunamis and floods may cause just as much damage. A flooded building will be none the worse after high waters recede, but all office furnishings, processing and electrical equipment on the ground floor would be a total loss. A building will not be seriously damaged if gradually flooded on plane ground but may be washed away by a sudden strong flood. In general, fast flowing waters erode the foundations which leads to collapse. Impact from a fast running wall of water, as in the case of a tsunami may also literally topple entire buildings whole.



The loss of equipment rendered inoperable by submergence in sea water is unavoidable in single storey buildings. This equipment may range from office equipment to generators and ice plants. Outboard motors and fishing gear on the other hand, if secured inside a sound building, can be returned to operational use even if found underwater.

#### 1.4.6 Electricity Supply

The vulnerability of the electricity supply to a port depends on the method of the supply, i.e. aerial wires on poles or generators.

<sup>12</sup> P.Dias, R.Dissanayake, R.Chandratilake 2006 *Lessons learnt from Sri Lanka tsunami damage* Civil Engineering 159, London, Institution of Civil Engineers.

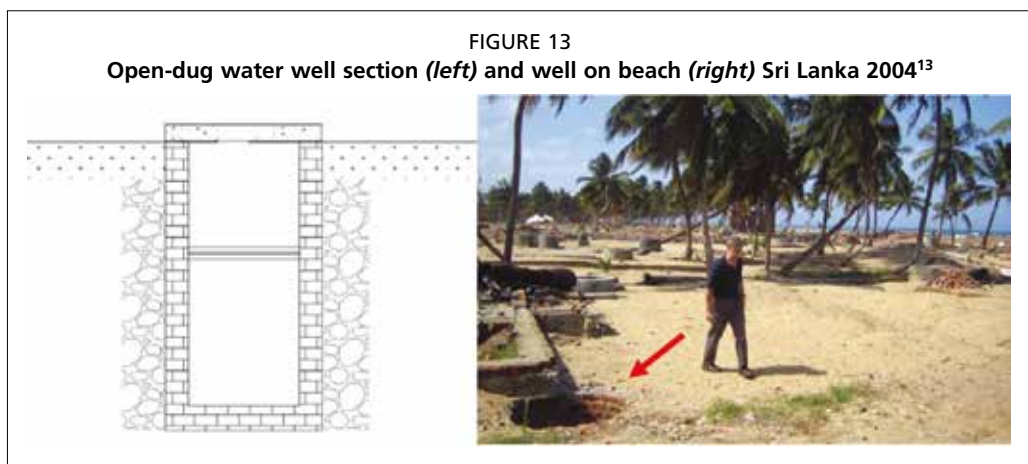
Aerial wires on poles are very susceptible to damage by high winds and hence typhoons are the major concern. Volcanic eruptions may also bring down power lines if too much lava ash settles on the wires. Theoretically, a tsunami should not affect power lines but if the wave front has collected a lot of floating debris (such as vehicles, boats and furniture), then it too will topple poles and pylons.

Local generators, on the other hand, are not influenced by typhoons or volcanic eruptions but will definitely suffer with a rise in water level, no matter how slow or gradual this is. Electrical equipment and sea water do not mix.

#### 1.4.7 Potable Water Supply

The potable water supply to a fishing port may consist of any of the following:

- Shallow open dug or deep water borewells feeding into storage tanks;
- Mains supply, with or without emergency storage tanks;
- Desalination plant;



Shallow open dug wells are typical sources of potable water in many developing countries. They are not more than 5 to 10 metres deep and depend on a thin fresh water lens floating on the sea water table underneath. They are notoriously prone to contamination from sewage if not managed properly.

Shallow water wells are prone to damage from tidal or storm surges and tsunamis, when sea water invades the well from the surface. More often than not, the sea water also carries debris with it into the well, rendering the well inoperable until the sea water has been flushed out by successive rains.

A mains supply to a port may be interrupted if the access road or bridges leading to the port have been washed away by a tsunami or flash floods in the case of typhoons or prolonged heavy rainfall.

#### 1.4.8 Liquid Waste Treatment

In most developing countries, liquid waste is either dumped into the ground directly from toilet blocks via latrine pits or treated in-situ via a 3 stage septic tank. The outflow from the septic tank is most often dumped into a water course. Some landing sites and villages treat this further through a constructed percolation field.

These systems all rely on the uninterrupted flow of the waste water from the water closet to some point below ground level. In general, all types of liquid waste treatment

<sup>13</sup> T. Illangasekare, S. W. Tyler, T. P. Clement, K. G. Villholth, A. P. G. R. L. Perera, J. Obeysekera, A. Gunatilaka, C. R. Panabokke, D. W. Hyndman, K. J. Cunningham, J. J. Kaluarachchi, W.W.-G. Yeh, M. T. van Genuchten, K. Jensen. 2006, Impacts of the 2004 tsunami on groundwater resources in Sri Lanka, Water Resources Research Vol 42 - American Geophysical Union.

facilities cease to function when inflow volumes exceed the design flow, such as during heavy rainfall and when the hydraulic head is reduced to zero or the treatment tanks or fields are water-logged. Hence, storm surges, tsunamis and typhoons are all liable to damage a waste treatment facility. An earthquake may likewise damage or crack the septic tank.

FIGURE 14  
Toilet pits in close proximity to wells<sup>14</sup>



It is not uncommon to come across primitive systems, like latrine pits, built very close to open-dug water wells, Figure 10 above. In such cases, an uncontrolled inflow of water, such as during a typhoon or a tidal or storm surge, also risks contaminating the water wells with sewage.

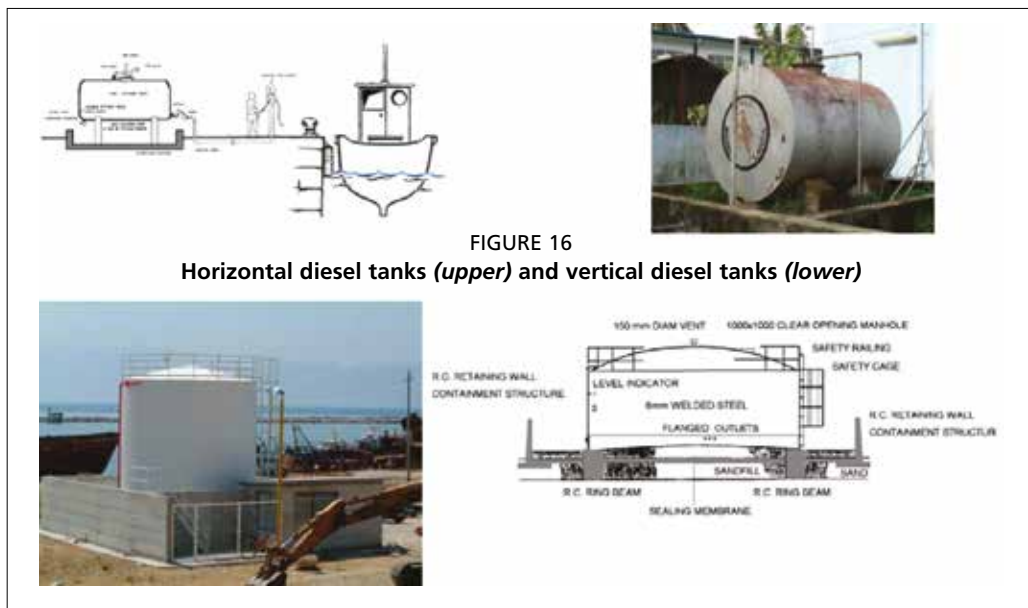
#### 1.4.9 Fuel Storage

Practically all beach landings use outboard engines for propulsion and petrol on site is normally stored either in 25-50 litre plastic jerry cans from which the portable fuel tanks are refuelled, Figure 11. Larger ports need larger amounts of fuel for inboard powered boats and this fuel is normally stored in horizontal or vertical steel tanks like the ones illustrated in Figure 12.

FIGURE 15  
Petrol storage for outboard engines – artisanal beach landing



<sup>14</sup> L. Lyttone 2008 *Deep impact: Why post-tsunami wells need a measured approach* Civil Engineering 161, London, Institution of Civil Engineers.



All storage tanks are vulnerable to tsunami and storm surge when empty or only partially full as the tank will tend to float off its foundations if the water level is high enough. Horizontal tanks are also vulnerable to earthquake damage as they may roll off the foundations and crack in the process. Vertical tanks built to the latest recommended anti-pollution standards are inherently more resistant to disasters. Previous designs that do not conform to these standards are vulnerable to tsunamis, storm surge and high winds, especially if left empty, Figure 23 below.



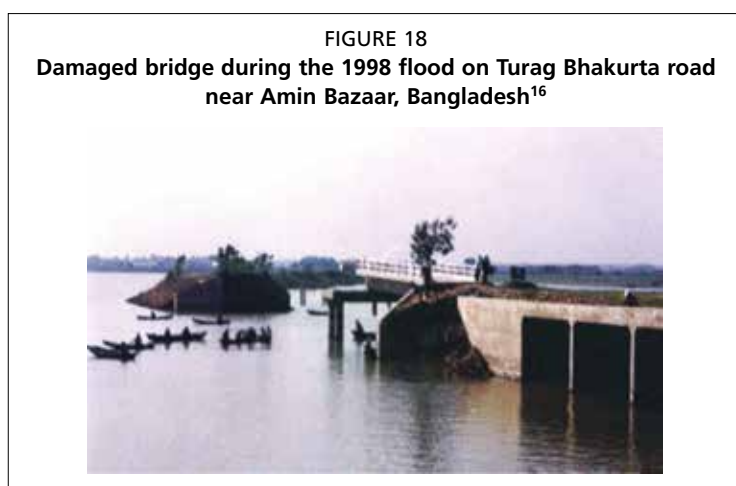
#### 1.4.10 Machinery

Machinery is susceptible to a number of disasters but mainly those that involve submergence in water. Machinery is also prone to theft during civil strife.

#### 1.4.11 Roads

Roads and road network infrastructure such as bridges and tunnels are susceptible to earthquakes, tsunamis and flooding. Roads may be washed away entirely and bridges may be partially or totally damaged, thus cutting off entire areas.

<sup>15</sup> Permanent International Navigation Congresses PIANC 2010 *Mitigation of tsunami disasters in ports* 90pp. Brussels also available at [www.pianc.org](http://www.pianc.org)



## 1.5 ANALYSIS OF THE THREATS TO INFRASTRUCTURE FROM EMERGENCY RESPONSE EFFORTS

Emergency response efforts are normally grouped under two phases for sudden on-set emergencies:

- Phase 1 - Emergency response and relief effort;
- Phase 2 - Rehabilitation and re-construction.

Phase 1 is normally defined as covering the first seven days in the wake of a sudden disaster. This phase is characterised by the inability of the affected population to sustain itself independently. At this time populations require immediate assistance and establishment of minimum conditions for survival. The primary focus is to provide immediate relief, minimise vulnerability to further catastrophes and ensure access to basic needs of health care, water, food shelter and sanitation.

Phase 2 covers the period after the immediate relief efforts and focuses more widely on supporting the affected populations in returning, as far as possible, to the conditions that they lived in prior to the disaster. The exact timing of this phase clearly depends on the nature and scale of the disaster in question.

Whereas Phase 1 normally covers the first seven days into the disaster, certain conditions like problems with access (collapsed bridges, flooded areas or remote site accessibility) may delay the start of Phase 2.

Phase 2 typically consists of:

- A damage needs assessment (DNA) report;
- A strategic coordination plan with wider development plans and/or policy changes;
- A re-construction management plan.

### 1.5.1 Damage and Needs Assessment report or DNA

The damage and needs assessment report, or DNA needs to start during the first phase of the relief effort as the lead-in time for the re-construction effort is a long process and in many cases must follow local procurement procedures which may take 4 to 6 months for a contract to materialise.

For a sustainable industry, the size of the shore facilities, whether a beach landing or port proper, should be based on the sustainable yield of the resources and the major threat to the industry during this part of the relief effort is the over-estimation of

<sup>16</sup> S.K. Bala, M.M. Hoque, S.M.U. Ahmed 2005 *Failure of a bridge due to flood in Bangladesh, a case study*. Journal of Civil and Environmental Engineering, Volume 1, No 1, UAP.

TABLE 3  
Summary of the vulnerability of infrastructure components to type of disaster

TYPE OF PORT	STRUCTURAL COMPONENTS	VULNERABILITY TO DISASTER (PHYSICAL DAMAGE)													
		TSS	TSU	TYP	EOK	VOL	FLD	OCS	NLK	WAR	RTD	DRT			
ARTISANAL BEACH LANDING	a-Beach area	NO	Y/N	NO	NO	NO	NO	Y/N	NO	NO	NO	NO	NO	NO	NO
	b-Piled Jetty or quay wall	NO	YES	NO	Y/N	NO	NO	NO	NO	NO	NO	NO	Y/N	NO	NO
	c-Buildings - Gear Stores & Engines, Nets	Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	d-Buildings - Workshops & Equipment	Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	e-Buildings - Fish Hall and Offices	Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	f-Water supply system	NO	YES	NO	Y/N	Y/N	Y/N	NO	Y/N	YES	NO	NO	Y/N	YES	NO
	g-Electricity supply system	NO	YES	YES	YES	Y/N	Y/N	NO	NO	NO	NO	NO	NO	NO	NO
	h-Waste water treatment	NO	YES	Y/N	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	i-Equipment – Generator, fuel, boxes, other	Y/N	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO
	j-Access road/bridge	NO	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	COASTAL FISHING PORT	a-Breakwaters	NO	Y/N	NO	Y/N	NO	NO	NO	NO	NO	NO	NO	NO	NO
b-Piled Jetty or quay wall		NO	YES	NO	Y/N	NO	NO	NO	NO	NO	NO	NO	Y/N	NO	NO
c-Buildings - Gear Stores & Engines, Nets		Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
d-Buildings - Workshops & Equipment		Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
e-Buildings - Fish Hall and Offices		Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
f-Water supply system		NO	YES	NO	Y/N	Y/N	Y/N	NO	Y/N	YES	NO	NO	Y/N	YES	NO
g-Electricity supply system		NO	YES	YES	YES	Y/N	Y/N	NO	NO	NO	NO	NO	NO	NO	NO
h-Waste water treatment		YES	YES	YES	Y/N	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
i-Equipment – Generator, fuel, boxes, other		Y/N	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO
j-Access road/bridge		NO	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
OFFSHORE FISHING PORT		a-Breakwaters	NO	Y/N	NO	Y/N	NO	NO	NO	NO	NO	NO	NO	NO	NO
	b-Piled Jetty or quay wall	NO	YES	NO	Y/N	NO	NO	NO	NO	NO	NO	NO	Y/N	NO	NO
	c-Buildings - Gear Stores & Engines, Nets	Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	d-Buildings - Workshops & Equipment	Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	e-Buildings - Fish Hall and Offices	Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	f-Water supply system	NO	YES	NO	Y/N	Y/N	Y/N	NO	Y/N	YES	NO	NO	Y/N	YES	NO
	g-Electricity supply system	NO	YES	YES	YES	Y/N	Y/N	NO	NO	NO	NO	NO	NO	NO	NO
	h-Waste water treatment	YES	YES	YES	Y/N	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	i-Equipment – Generator, fuel, boxes, other	Y/N	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO
	j-Access road/bridge	NO	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
	DISTANT WATER FISHING PORT	a-Breakwaters	NO	Y/N	NO	Y/N	NO	NO	NO	NO	NO	NO	NO	NO	NO
b-Piled Jetty or quay wall		NO	YES	NO	Y/N	NO	NO	NO	NO	NO	NO	NO	Y/N	NO	NO
c-Buildings - Gear Stores & Engines, Nets		Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
d-Buildings - Workshops & Equipment		Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
e-Buildings - Fish Hall and Offices		Y/N	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
f-Water supply system		NO	YES	NO	Y/N	Y/N	Y/N	NO	Y/N	YES	NO	NO	Y/N	YES	NO
g-Electricity supply system		NO	YES	YES	YES	Y/N	Y/N	NO	NO	NO	NO	NO	NO	NO	NO
h-Waste water treatment		YES	YES	YES	Y/N	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
i-Equipment – Generator, fuel, boxes, other		Y/N	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO
j-Access road/bridge		NO	YES	NO	Y/N	Y/N	Y/N	NO	NO	NO	NO	NO	Y/N	NO	NO
<b>DISASTER TYPE – TSS (Tidal/Storm Surge)</b>		<b>TSU (Tsunami)</b>	<b>TYP (Typhoon)</b>	<b>EOK (Earthquake)</b>	<b>VOL (Volcanic eruption)</b>	<b>FLD (Floods)</b>	<b>OCS (Oil/Chemical spill)</b>	<b>NLK (Nuclear Leak)</b>	<b>WAR (War)</b>	<b>RTD (Drought)</b>	<b>DRT (Drought)</b>				

the amount and size of infrastructure to be re-constructed, especially if the previous infrastructure was already operating unsustainably.

Generally speaking, the greater the port facilities, the more and the larger the vessels that are attracted to fish in the area. The consequence of this is that the fishing effort is increased locally without follow-up studies on the fish stocks and the sustainable yields. Typical mistakes done in the past are:

- The replacement vessels were larger than the vessels lost in the disaster;
- The re-constructed quays were designed larger and deeper (*to accommodate modern vessels*);
- Beach landings upgraded on an ad-hoc basis into small ports.

These mistakes can all be traced back to:

1. the eagerness of some relief agencies to disburse funds as fast as possible to be seen as *first on the scene* and thus garner more funds through media coverage;
2. the lack of experience in fisheries-related matters of the agencies' assessor in compiling the DNA report.

Governments are also partially at fault for failing to institute base line studies, or, in many cases, for failing to keep such studies updated and readily accessible on IT platforms.

### 1.5.2 Strategic coordination plan with wider development plans and/or policy changes

As the immediate impacts of a disaster are overcome and re-construction efforts proceed, it will become progressively more important to ensure that the re-construction effort is coordinated with wider development plans and policy changes.

In a positive sense, the aftermath of a disaster may present important opportunities in terms of longer term development. This is particularly important when considering such things as:

- Improved road access;
- Improved access to utilities.

Needless to say, improved road access as part of a major relief effort, greatly increases the potential for improved post harvest handling and marketing, as do improved electricity and water supplies.

Hence a lack of coordination at this stage is a real threat to the overall wellbeing of the re-construction effort, especially since the duplication of work often leads to costly and useless infrastructure.

### 1.5.3 Re-construction management plan

A lack of a holistic re-construction management plan, shared and approved amongst the agencies and government departments involved in the re-construction effort leads to an uncoordinated re-construction effort lacking standards and best practise. Given that in the post disaster haste the urge to return to normal is very great, corners in legislation may need to be cut to enable re-construction to start in earnest. The first casualty is typically Environmental Impact Assessments, as they need a long time frame and the outcomes are never always positive. Instances of serious mistakes done at this stage often come back to haunt planners at a later stage. A typical problem of this type is the location of the repository for the rubble to be cleared from a disaster impacted site and solid waste disposal facilities.<sup>17, 18</sup>

<sup>17</sup> UNEP 2009 *Maldives – Post tsunami environment assessment*

<sup>18</sup> UNEP 2005 *Sri Lanka Rapid Environment Assessment*

## 1.6 ANALYSIS OF THE OPPORTUNITIES FOR IMPROVING THE QUALITY OF FISHERIES INFRASTRUCTURE FROM EMERGENCY RESPONSES

The important opportunities that arise in the aftermath of a disaster must be used to improve the quality of the infrastructure in the emergency re-construction effort. Many of the infrastructure components that support fishing operations were designed and built decades ago when design practises and building codes were either unsatisfactory or improperly applied. Building codes, design practises, environmental awareness programmes and risk management practises, together with internationally binding conventions have come a long way and now provide many tools to mitigate the effects of but the most destructive disasters.

Improved road access and access to public utilities like mains water and electricity arising from the relief effort should be worked into the re-construction plans. Solar power is nowadays a viable alternative (except for heavy cooling loads like cold rooms and ice plants) for remote sites and should be encouraged over the use of generators. Shallow, open-dug, water wells should be replaced with deep borewells that are not susceptible to damage from many disasters and are not prone to contamination by sewage waste. Elevated storage should be the norm even in small beach landings as this provides safe water in times of need.<sup>19</sup>

Likewise, sewage treatment facilities should be built in such a way as not to contaminate water tables.

<sup>19</sup> J.Sciortino 2008 *Guide for the Selection of Location and Design of Sanitary Standards for Landing Sites*. ART023GEN, EuropeAid SFP ACP/OCT, also available at <http://sfp.acp.int/en/content/sfp-library-0>

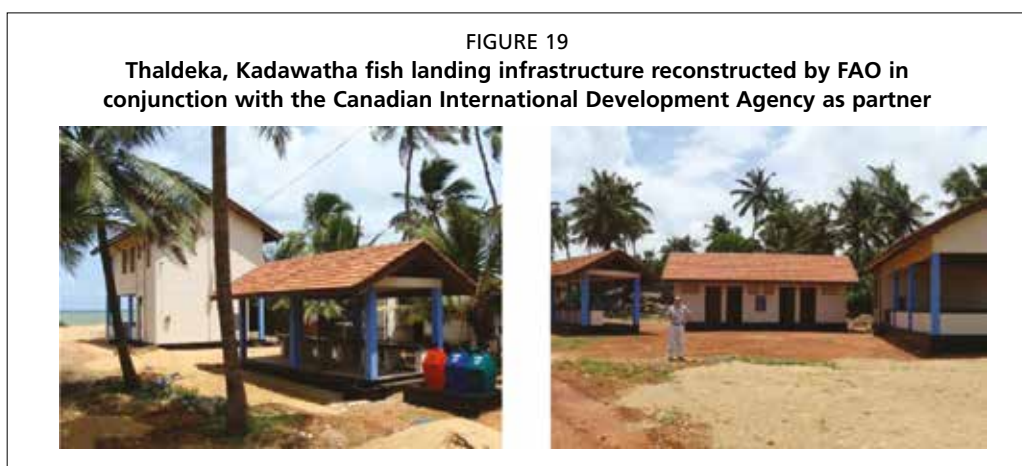
## 2. A review of lessons learnt and best practise from provision/repair of fisheries infrastructure in emergency response

### 2.1 FAO'S AND OTHER INTERNATIONAL PARTNERS EXPERIENCES IN SUPPORTING THE PROVISION/REPAIR OF FISHERIES INFRASTRUCTURE IN RESPONSE TO EMERGENCIES

Over the last decade, FAO has become increasingly involved in disaster response and emergency assistance to coastal communities suffering from the consequences of natural calamities such as hurricanes, floods and tsunamis. FAO has a long experience of working closely with governments and fishing communities on a variety of development activities and is a recognized partner for technical assistance and advice. This, together with the Organization's position as a neutral United Nations agency, puts FAO in a unique position for assisting disaster-stricken governments in coordination and providing technical advice. Although FAO's main area of thrust with emergency efforts relate to needs assessment reports, boat building, fishing gear replacement, guidelines and livelihood support, the organization also has hands-on experience in infrastructure rehabilitation and development in Sri Lanka in conjunction with an international partner.

#### 2.1.1 FAO

Following the Indian Ocean tsunami, in November 2005 the Sri Lankan Government (through the Ministry of Fisheries and Aquatic Resources (MFAR)) with the assistance of FAO finalized the medium and longer-term reconstruction and development programme and strategy for the marine fisheries sector. The objective of this strategy was to create a consistent strategic framework and a single overall programme for coordinating the reconstruction and development of the fisheries sector in all tsunami-affected coastal areas of the country. This strategy serves as the basis for planning and coordination at national, district and local levels. In response to the Sri Lankan government's request, FAO assisted in the planning of infrastructure development and providing technical assistance by preparing a Master Plan for Reconstruction and Development of Fish Landing Centres, including management offices, net repair areas, hygiene facilities, gear stores, retail markets, liquid and solid waste handling and fisheries management organisations. The implementation of the construction projects was done by the FAO in partnership with the Canadian International Development Agency with interventions in the districts of Jaffna, Mullaitivu, Trincomalee, Batticaloa, Ampara, Hambantota, Galle, Kalutara, Gampaha, Puttalam Mannar & Kilinochchi.



### 2.1.2 Japan International Cooperation Agency (JICA)

Japanese experience in post-disaster recovery is very extensive and has matured over the years by continual exposure to earthquakes and tsunamis. Based on lessons learnt from the Kobe Earthquake experience, the Office of the Cabinet of the Government of Japan summarized lessons and checkpoints for rehabilitation, which were then successfully used in post-tsunami Sri Lanka and the Maldives.

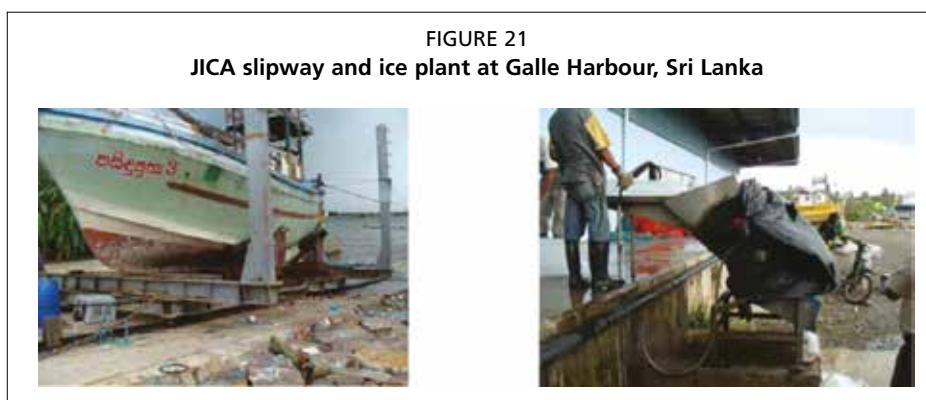
Based on a request by the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to implement a project, “Recovery, Rehabilitation and Development Project for Tsunami-affected Area of Southern Region” in Sri Lanka as part of JICA’s technical cooperation program. The objectives of the Project were:

1. To formulate a plan for a recovery, rehabilitation, and development program for the tsunami-affected area in the southern region of Sri Lanka;
2. To assist and monitor technically the implementation of recovery and rehabilitation projects to be funded under Japanese Non-project Grant Aid and ODA Loan; and 3. To share Japanese experiences in disaster management through implementation of the Project.

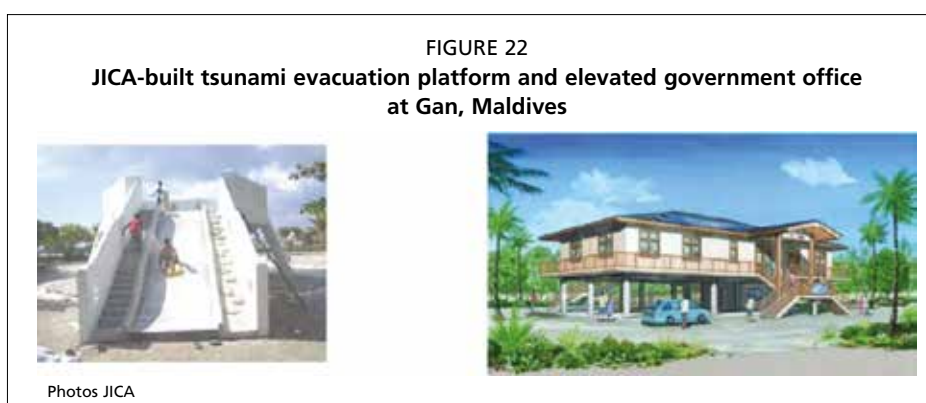
Areas subject to this Project included Galle District, Matara District, and Hambantota District. The Project mainly focused on the Galle Fishery Harbour, Tangalle Fishery Harbour, and Matara District.

Most damage at the Galle and Tangalle Fishery Harbours was concentrated on landside facilities. One of the urgent problems in the Galle Fishery Harbour was ice supply as several facilities and related equipment were damaged. At Galle Fisher

Harbour, construction comprised an ice plant, office building, an auction hall, a canteen, a welfare shop, a quay wall, and slipway.



In the Maldives, the 26<sup>th</sup> December 2004 event wrought considerable damage to the community facilities on many of the islands. The damage to these facilities and the loss of activities therein translated into social and economic distress. However, rapid action to provide assistance to the affected communities through the re-construction of better facilities together with additional emergency infrastructure was undertaken by JICA in cooperation with the Government of the Maldives.



The successful outcome of the interventions was primarily due to the specific experience in fisheries related matters of both agencies.

## **2.2 IDENTIFICATION OF NEEDS FOR FISH LANDING SITE REPAIR/REPLACEMENT IN AN EMERGENCY**

National governments and the international community have reaffirmed the importance of rapid damage and needs assessments, which focus on those reconstruction tasks that are of highest priority to restore social and economic activity to pre-disaster levels. These assessments provide a basic indicator of the scale of the task ahead, in terms of both projects and finance needs.

A simple approach to assessing needs is very much desired as this permits reconstruction to start much sooner than would otherwise be the case. In the Sri Lanka tsunami experience, the reconstruction needs assessments were produced in a matter of months by a combination of national government, UN, and International Financial Institutions personnel often working together, and were notable for their quality. It is important this approach be consolidated in the future, as the sheer number of agencies involved in a large-scale operation increases the potential for duplication of effort. Rapid damage and needs assessments must allow international and local agencies and governments to operate from a shared data set and common overall recovery plan.

One of the lessons learnt from previous emergency work is the need for timely and accurate information on the current or pre-emergency status of the infrastructure<sup>20</sup>. Accurate information runs throughout a relief and recovery process and is the foundation for good analysis when an emergency situation arises.

Accurate information is also critical to financial tracking, progress monitoring, and evaluation efforts. Tracking financial flows in recovery efforts is notoriously difficult, largely because most financial reporting is voluntary and funding comes from many sources. The tsunami experience has not been different in this regard. In Thailand, Maldives, Sri Lanka, and Aceh, governments established aid management platforms to provide an online vehicle for a comprehensive inventory of projects, financial commitments, and disbursements.

During the emergency tsunami response in Sri Lanka, FAO recommended the establishment of a database for all landing sites, from simple beach landings right up to port structures. In general, such databases play a crucial role in filling the longstanding gap on accurate tracking of infrastructure wealth, but to do so, they also need constant and accurate updating. Figure 23 is the format that was recommended at the time. Figure 24 illustrates a typical post-disaster assessment form if the baseline form (Figure 23) had been filled-in and kept updated.

### 2.3 LINKAGE BETWEEN REPAIR OF FISHERIES INFRASTRUCTURE AND OTHER SERVICES

It has already been established that Phase 1 of the relief effort covering the first seven days in the wake of a sudden disaster is characterised by the inability of the affected population to sustain itself independently. At this time populations require immediate assistance and establishment of minimum conditions for survival.

The primary focus as the effort moves from **Phase 1** (conditions for survival) to **Phase 2** (the physical re-construction) is to minimise vulnerability to further catastrophes by ensuring access to basic infrastructural needs of water and sanitation<sup>21</sup> and to ensure the rapid return to productivity of the stakeholders in the fish landing or port<sup>22</sup>. Unless properly managed, this part of the re-construction effort may serve very little purpose other than spending the funds allocated to it by agencies simply eager to use up the funds garnered from the international community of donors. From the social aspect, the reconstruction must also take into account the probability that the makeup of the resident population after a major disaster is different to the one that existed prior to the event.

#### 2.3.1 Access to Water and sanitation

The best example of how this type of re-construction failed a distressed population is the period following the earthquake in Haiti, when Cholera and dysentery outbreaks caused a second round of loss of life. This was due to the uncoordinated efforts in establishing best practise for drinking water standards and waste treatment.

*PORT-AU-PRINCE | Tue Nov 8, 2011 7:22pm EST*

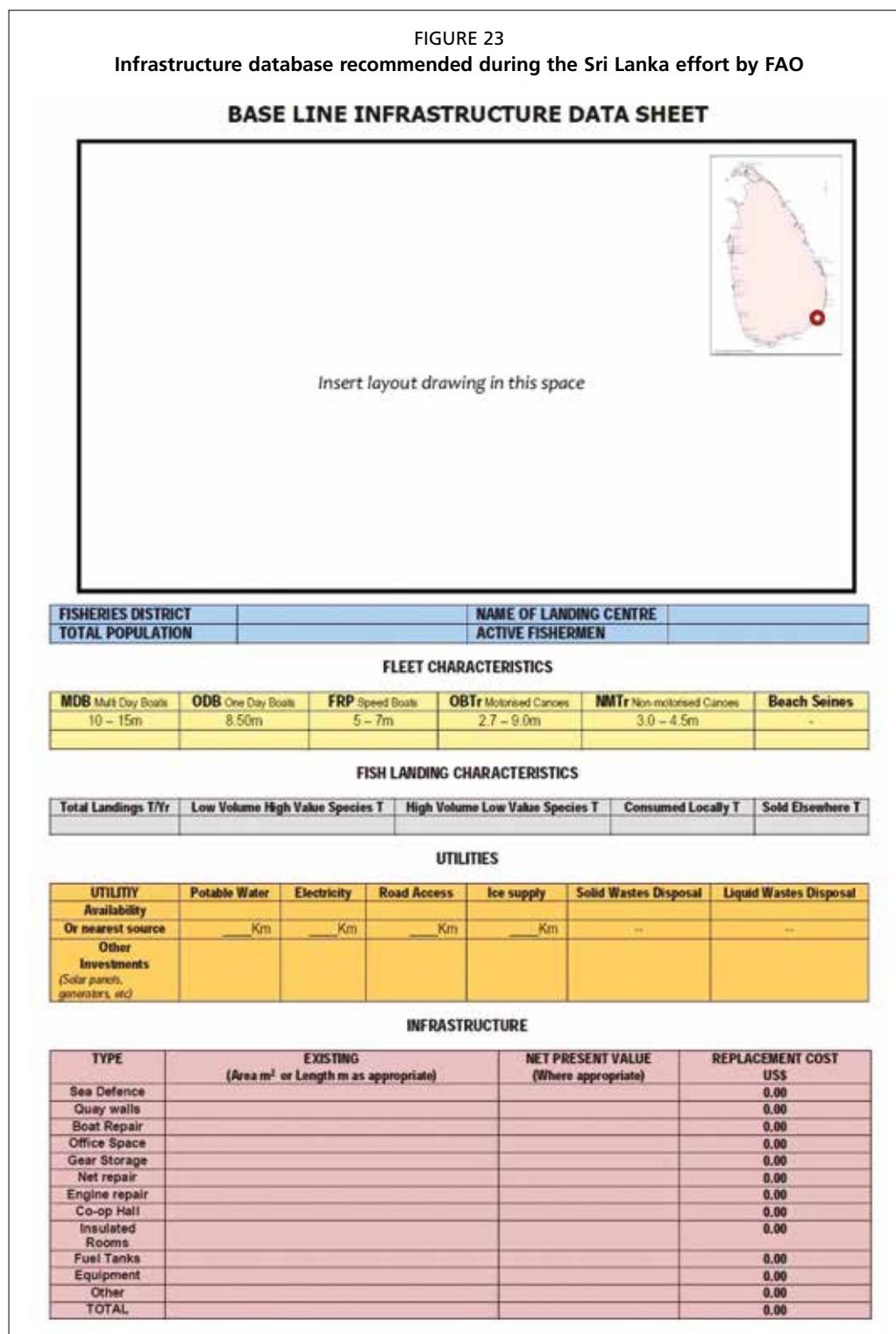
*(Reuters) - The United Nations was hit with a demand for hundreds of millions of dollars in reparations on Tuesday because of a year-old cholera outbreak that has killed more than 6 700 Haitians. The demand was made on behalf of more than 5 000 Haitian cholera victims and their families in a petition filed at U.N. headquarters in New York*

<sup>20</sup> W.J. Clinton 2005. *Key propositions for building back better*. Office of the UN Secretary General, New York.

<sup>21</sup> WHO *Water Sanitation Health – Drinking water quality*. [http://www.who.int/water\\_sanitation\\_health/dwq/en/](http://www.who.int/water_sanitation_health/dwq/en/)

<sup>22</sup> W.J. Clinton 2005. *Key propositions for building back better*. Office of the UN Secretary General, New York.

by the Boston-based Institute for Justice and Democracy in Haiti. The human rights group argues that infected U.N. peacekeeping troops from Nepal, where cholera is endemic, caused the outbreak by *dumping untreated waste from their rural base camp into a tributary of the most important river in the earthquake-ravaged Caribbean nation*<sup>23</sup>.



<sup>23</sup> A. Cravioto, C. Lanata, D. Latagne, G.B. Nair 2011 *Final report of the independent panel of experts on the outbreak of cholera in Haiti*, International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh.

**FIGURE 24**  
**Field damage assessment report sheet**

**POST DISASTER INFRASTRUCTURE DAMAGE ASSESSMENT**

**INFRASTRUCTURE DAMAGE ASSESSMENT**

TYPE	PERCENTAGE DAMAGE (Area m <sup>2</sup> or Length m destroyed as appropriate)	REPAIRABLE ? Y/N *	OUTLINE REPAIR COST OR REPLACEMENT
Sea Defence			0.00
Quay walls			0.00
Boat Repair			0.00
Office Space			0.00
Gear Storage			0.00
Net repair			0.00
Engine repair			0.00
Co-op Hall			0.00
Insulated Rooms			0.00
Fuel Tanks			0.00
Equipment			0.00
Other			0.00
<b>TOTAL</b>			<b>0.00</b>

\* If answer is NO, then apply replacement cost from base line data

**FIELD AND DESIGN STUDIES REQUIRED**

TYPE	EXISTING DATA AVAILABLE (Yes / No) *	PROPOSED / REQUIRED (Yes / No)	ANTICIPATED COST
Topographic Survey	(Yes / No) *	(Yes / No)	0.00
Hydrographic Survey	(Yes / No)	(Yes / No)	0.00
Wave Hindcast Design wave	(Yes / No)	(Yes / No)	0.00
Geotechnical Survey, Stratigraphy	(Yes / No)	(Yes / No)	0.00
Hydrological Flood or surge	(Yes / No)	(Yes / No)	0.00
Sanitation wastes Liquid & solid	(Yes / No)	(Yes / No)	0.00
Water quality Bacteriological tests	(Yes / No)	(Yes / No)	0.00
Engineering Fees			0.00
Supervision Fees			0.00
<b>TOTAL</b>			<b>0.00</b>

\* If answer is NO, Consultants (local or foreign) need to be hired.

*“The cholera outbreak is directly attributable to the negligence, gross negligence, recklessness and deliberate indifference for the health and lives of Haiti’s citizens by the United Nations and its subsidiary, the United Nations Stabilization Mission in Haiti (MINUSTAH),” the petition said.*

*It said numerous studies, including those by the United Nations, traced the virus to U.N. personnel from Nepal. “Until MINUSTAH’s actions incited the cholera outbreak, Haiti had not reported a single case of cholera for over 50 years,” the petition said. The 36-page petition seeks a minimum of \$100,000 to compensate the families or next-of-kin of each of the individuals who lost their lives to the deadly epidemic. It also demands at least \$50,000 to compensate each victim who suffered illness or injury from cholera. U.N. spokesman told reporters he disputed the claim of U.N. responsibility for the cholera in Haiti.*

That a relief agency should dump untreated sewage into a watercourse is bad, but that local people were not informed not to drink raw water from the river simply points to a severe lack of coordination in the planning and execution of the re-construction effort.

If an artisanal landing had been operating under best management principles as recommended by guidelines for potable water supply and liquid waste treatment<sup>24</sup>, then these two items of infrastructure should be repaired immediately as the whole surrounding community stands to benefit. It is also likely that the entire village has been instructed on the importance of personal hygiene and proper sanitation.

If the artisanal landing was still operating precariously under primitive conditions (villages with latrine pits dug in the vicinity of open-dug water wells are still very common in certain developing countries), then the re-construction effort must ensure that best management practise is observed when new water supply and liquid waste treatment are designed to ensure that the local population moves up the scale in the provision of safe drinking water and the treatment of liquid waste. This effort should also be accompanied by a public awareness programme on the dangers of drinking unsafe well water during the emergency crisis.

To ensure better results in the coordination planning, a water and sanitation engineer should accompany the team sent in to assess the damage.

### 2.3.2 The social dimension to reconstruction

The make-up of the resident population of a fish landing or port after a major disaster may or may not be the same as the one that existed prior to the event. In the case of a tsunami or earthquake, entire sectors of the population may go missing from low-lying areas. During slow-onset disasters, the local population may be outnumbered by Internally Displaced Persons (IDPs) with no knowledge or interest in fisheries.

Hence, the planning phase of the fisheries infrastructure re-construction should ensure an accurate assessment of all the stakeholders present at the site in order to ensure that real fishers are identified, none of the vulnerable sectors are negatively impacted and that none of the infrastructure donated is re-directed to other uses.

Vulnerable sectors of the population are not always evident on first examination of a problem. A case in point is the provision of solid landing jetties in villages that use the beach as a landing for canoes. The local canoes, by their very nature, do not have vertical frames that support the planks forming the sides of the hull. This renders them very fragile to side impact and in the presence of swell, owners tend to shy away from solid vertical structures. The fairly large tidal range also makes it impractical to discharge at certain times of day due to the difference in height between the canoe deck and the jetty cope. Canoes store their catch in bulk in wells or compartments, with or without ice, depending on the duration of the fishing effort, Figure 30. Hence, queuing for a berth with a full catch of small pelagics stored without ice is an impractical proposition if the catch needs to be offloaded in the early hours of the day and before the temperature rises to unbearable levels. The current system of beaching the canoe on sand provides as many instantaneous berths as the landing effort requires and should always be maintained.

Unloading the fish from a canoe is also a social event and cannot be compared to the mechanised offloading of an industrial fishing vessel, see Figure 30 below. The crew of a canoe do not take part in the offloading process but generally hand over the process to the fish mummies who then organise the unloading gangs, the destination of the fish, the wholesale at the landing, the logistics to the various processors and onward logistics to the various markets. The casual labour attached to this event is considerable and provides food in-kind to the large number of young off-loaders who throng to the landing site in search of some work. The very large canoes do not come ashore during the peak season and when off-loaded normally drop anchor offshore beyond the surf

<sup>24</sup> Sciortino J.A. 2008 - *Guide for the Selection of Location and Design of Sanitary Standards for Landing Sites*, ART023GEN, EuropeAid OCT-ACP programme, Brussels. (also available at <http://sfp.acp.int/en/guide>)

zone. These canoes employ smaller transport canoes to move the catch to shore, and are themselves operated by family units under the direction of a fish mammy<sup>25</sup>.

The above points clearly indicate that a canoe is designed to be beached and not berthed along a quay and any attempt to change this by the project would definitely result in a social upheaval if forced on the communities.



The Ghana experience illustrates how even a well-meaning development project, consisting of a modern fishing port complete with quays to help local fishing communities can end up impacting large sectors of vulnerable communities at the extreme periphery of the fisheries sector.

## 2.4 SUMMARY OF LESSONS LEARNT

Based on the experience of various agencies, including FAO, a list of *lessons-learnt* has been developed for this report to provide guidance with regard to disaster response. There are lessons to be learnt both from the common planning challenges and the technical issues.

### 2.4.1 Planning challenges

Planning challenges cover a wide range of planning issues, but the author of this paper has identified the following as important to a successful outcome of the emergency effort:

Strategic planning for longer-term rehabilitation and recovery of a fish landing or port should be undertaken at the early stage of emergency interventions, preferably during the transition from Phase 1 to Phase 2 of the emergency effort, to ensure the long-term sustainability of livelihoods and natural resources at all stages of the disaster response. Nation-wide baseline studies should be made available on appropriate platforms and an early analysis of the local stakeholders and communities (before and after the event) is recommended to ensure that all community needs are addressed by the re-construction effort.

Coordination of national and international agencies and organizations involved in disaster response needs to be ensured and appropriate budgets should be allocated by their humanitarian and development partners.

1. Needs assessments should take a holistic approach and the relevant local and international experts (in fisheries, water supply, and sanitation) should form part of assessment teams. Non-technical agencies and NGOs should not go it alone by hiring their own individual experts.

<sup>25</sup> World Bank 2010 *Ghana - Fisheries landing sites. Needs Assessment Report*. Washington DC.

2. National policies and international legally and non-legally-binding conventions, such as the Code of Conduct for Responsible Fisheries, covering resource management and conservation should be strengthened as part of rehabilitation, reconstruction and recovery. Co-management approaches for fisheries management should be promoted at an early stage.

### 2.4.2 Technical challenges

The technical challenges facing the first assessment teams to set foot inside the disaster area may be summarised as follows:

1. The first priority should be the assessment of the drinking water supply situation and the remedial measures required to ensure supplies for an adequate period of time until a proper system is installed. Open-dug wells should be replaced with sealed deep borewells. Public awareness programmes should be initiated on the importance of safe drinking water;
2. The second priority should be the re-instatement of the liquid waste treatment facilities and measures to ensure that water courses are not un-necessarily loaded with untreated waste. Public awareness programmes should be initiated on the importance of personal hygiene;
3. The third priority should be the reinstatement of the local marketing structures to enable basic food security. Effort should be directed into kick-starting the fishing activities;
4. In conjunction with marketing, effort should also be directed into establishing the fishing effort recommended for a sustainable fishery (the landing or port may have already been running at unsustainable levels prior to the disaster event);
5. The design process for the re-construction effort should be supervised by external, specialist, third party consultants or agencies to ensure that the newly-designed structures conform to the latest national building codes, including EIAs, and where necessary, to internationally accepted standards when these supersede inadequate local standards;
6. The construction should be supervised by external third party consultants legally contracted to ensure quality control and quality assurance of the reconstructed structures;
7. The re-construction of artisanal landings and minor ports should follow like-for-like replacement or upgrade. The risk for over capacity in the fishing fleet should be assessed before vessels and fishing gear are replaced;
8. *Go-it-alone* initiatives by non-technical agencies using hired short-term consultants should be discouraged at all costs.

### 2.4.3 Case study – Safe drinking water in Sri Lanka

Most people in rural Sri Lanka rely on wells for their drinking water, yet all open-dug wells in areas where the tsunami intruded, an estimated 62,000 of them, were contaminated by sea water, and often by wastewater and sewage as well. This was an especially serious problem in Trincomalee, Amparai, Batticaloa and Hambantota districts. The pipe-borne water supply system in the coastal areas was also largely out of service. The first “*knee-jerk*” response to this problem was the shipment to the port of Colombo of copious amounts of bottled mineral water from all the countries that answered the call of the various NGOs and aid agencies for relief supplies. This type of response, in turn, triggered downstream impacts on an already strained national infrastructure:

1. The container terminal could not cope with the sudden influx and the containers full of bottled water simply clogged the port;

2. Once offloaded, the containers could not be moved to the affected areas as rail and road communications had been severed in many places, adding to the warehousing costs.

The environmental cost of moving water half way round the world in terms of transport pollution was never considered.

The technically viable solution to the above problem was purification of the water on the spot and nowadays, the advances in water purification processes make it a viable alternative in disaster stricken areas. The equipment is all air portable, including the reservoirs, and has a better chance of arriving on site faster than a container load of bottled water, figure below<sup>26</sup>.



<sup>26</sup> UNEP 2005 *Sri Lanka Rapid Environment Assessment* - Illustration © Prakash Singh/AFP/Getty Images

### 3. A review of existing instruments that relate to provision/repair of fisheries infrastructure which are applicable in an emergency response

As illustrated previously, strategic planning for longer-term rehabilitation and recovery of fisheries infrastructure port should be undertaken at the early stage of emergency interventions to ensure the long-term sustainability of the natural resources at all stages of the disaster response.

*Also, the re-construction of artisanal landings and minor ports should follow like-for-like replacement or upgrade, and should not increase the size of the facilities, including vessels. It should always be accompanied by a proper environmental impact assessment to determine sustainability.*

The above statements make the distinction between:

1. Repairing and/or replacing damaged infrastructure inside a landing or port;
2. Expanding an existing landing or port as part of a strategic development policy.

#### 3.1 REPAIRING AND/OR REPLACING DAMAGED INFRASTRUCTURE INSIDE A LANDING OR PORT

Repairing and/or replacing damaged infrastructure is fairly straightforward if an accurate damage assessment report, Figure 4 in Section 2, has been compiled by the survey team. The damage assessment report would be more meaningful if the survey team had access to accurate baseline data sheets like the one illustrated in Figure 3 in Section 2.

The guidelines for repairing or replacing infrastructural components fall into 2 sections:

- Specific fishing port-related guidelines published by FAO and other agencies;
- Generic national building codes of practise.

##### 3.1.1 Specific fishing port-related guidelines

The three most commonly used guidelines are fully referenced in Section 5. Briefly, they are:

- Construction and maintenance of artisanal fishing harbours and village landings (FAO);
- Fishing harbour planning, construction and management (FAO);
- Design for Sanitary Standards for landing sites (EU).

##### 3.1.2 Generic national codes of practise

The repair or the replacement of infrastructure items should also follow the national codes of practise in matters of building regulations, building materials, seismic norms etc.

### 3.2 EXPANDING AN EXISTING LANDING OR PORT AS PART OF A STRATEGIC DEVELOPMENT POLICY

It is not uncommon for a badly damaged port or fish landing to be expanded or upgraded into a larger facility as part of a national fisheries policy to consolidate handling infrastructure, especially when road networks expand into hitherto undeveloped areas of the coast with access to deep water close inshore.

It must be emphasized that such expansion should not be done to accommodate overcapacity that could have existed pre-disaster. Before considering expansion, a review of fleet capacity pre and post disaster must be undertaken, see section on best practise.

In such cases, the development should follow the path of a full environmental impact assessment, irrespective of the administrative obstacles that may be encountered, especially when confronted by donors with tight timelines for the drawdown of the funds. The full path consists of:

- **International Conventions** - First and foremost, the entire project should be sieved through the list of international conventions that govern the use of the coastal environment and its resources to ensure sustainability. Some of the conventions may not be legally binding and some may be voluntary. It is best to check on the status of the conventions prior to initiating work;
- **Environmental Impact Assessment** - Secondly, the project should then proceed through an EIA exercise compatible with local legislation in matters related to the environment;
- **National Building Codes** - Thirdly, the individual components must comply with the latest revisions or updates of the local building codes.

#### 3.2.1 International instruments/conventions

The list of conventions that may impact positively or negatively on the design of a fish landing or port are:

1. Code of Conduct for Responsible Fisheries, main body text (*size of investment to be compatible with sustainable fisheries*);
2. Code of Conduct for Responsible Fisheries, Technical Guideline No. 1 (*the infrastructure itself to be designed in a sustainable manner*);
3. Code of Conduct for Responsible Fisheries, Appendix VI to Technical Guideline No. 1 (*the detail of the environmental impact studies to be compatible with the size of the investment*);
4. United Nations Convention on the Law of the Sea (UNCLOS III) 1982 (*governs the size of territorial and economic areas and hence size of coastal fisheries*);
5. Ramsar Convention on the protection of wetlands (*exclusion zones affecting the siting of ports and fisheries operations*);
6. International Convention for the Prevention of Pollution from Ships 1973 as modified by the Protocol of 1978 (MARPOL 73/78) (*requirements for the prevention of pollution of the aquatic environment by fishing operations*);
7. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and 1996 Protocol Thereto (London Convention) (*regulates the dumping of excavated or dredged material from ports*);
8. Montreal Protocol to the Vienna Convention on Substances that Deplete the Ozone Layer (*restricts the use of substances that impact the ozone layer in refrigeration equipment*);
9. United Nations Framework Convention on Climate Change (*influences the design of port structures*);
10. International Convention for the Safety of Life at Sea (SOLAS) 1974 (*influences safety safeguards onboard fishing vessels*);

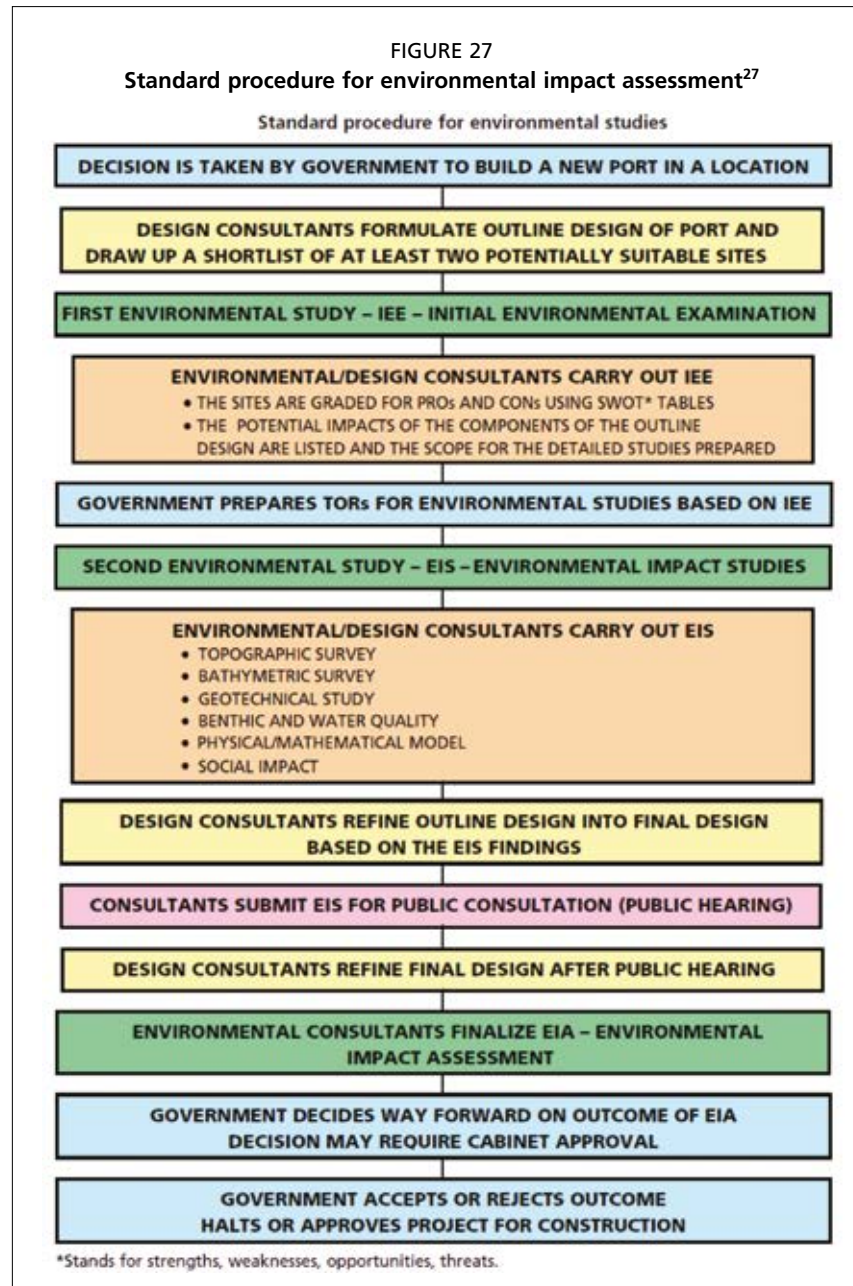
11. International Ship and Port Facility Security Code (ISPS) (*standard of security required at fishing ports with international ship sailings*);
12. Convention on Facilitation of International Maritime Traffic (FAL) 1965 (*port management*);
13. Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IUU) (*port management*);
14. Convention on Environmental Impact Assessment in a Transboundary Context (Espoo 1991) (*for ports built very close to international boundaries*).

If the proposed port upgrade is expected to export fish or fish products to Europe, North America and Japan (the most desired marketing destinations for fish), then the port infrastructure design is also governed by Third Country Directives. The Code of Conduct for Responsible Fisheries also addresses this issue under post-harvest practices and trade within Article 11.

Article 11.1.3 sets out that States should set minimum standards for safety and quality assurance and to make sure that these standards are effectively applied throughout the industry. They should promote the implementation of quality standards agreed within the context of the FAO/World Health Organization Codex Alimentarius Commission and other relevant organizations or arrangements.

Many importing countries impose conditions for the importation of fish and fishery products that translate into conditions to be met by the exporting country and these relate not only to safety in health but also to responsible fishing practices and fish handling infrastructure. An example in this regard are a number of directives issued by the European Commission (EC) that set criteria both for the exporting and importing countries and it maintains an inspection service to monitor and assist exporting countries. Other major importing countries (not members of the European Community) have also set criteria to be met by exporting countries.

### 3.2.2 Environmental Impact Assessment



Environment impact studies form part of the design and permitting process required for coastal development. The figure above illustrates the internationally accepted standard procedure required for coastal projects.

### 3.2.3 Generic national codes of practise

Not all developing countries have building codes covering such things as port or maritime structures. Earthquakes codes may also not be up to date with modern

<sup>27</sup> Sciortino J.A. 2009 – *Fishing harbour planning, construction and management*, Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Technical Paper 539, Rome, FAO. also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en)

research. When these are not readily available, similar European, North American or Japanese codes may be used provided that the local town planning regulations are adhered-to.

### 3.3 MANAGEMENT OF THE REPAIRED INFRASTRUCTURE

The facility may have been operating under a fisheries management organisation prior to the disaster and it would be preferable to locate the same team during the post-disaster assessment in order to reinstate management as quickly as possible.

If the original fisheries management organization is missing or never existed in the first place, then the repaired facility cannot be abandoned in the belief that it would run by itself. Irrespective of the size of landing of the project, whether it is a beach landing or a conventional port, experience has demonstrated that the facility has to be managed to ensure that it is used and maintained correctly over the period of its useful life and for a government to meet its responsibilities under international law.

Because of the diversity of situations and circumstances in which fishermen operate, it is extremely difficult to present ready-made solutions for the size and composition of a port management body. However, there are four major areas where management input is required:

- the day-to-day management of operations (unloading, sorting, icing and onward movement plus any other activity that the landing may be used for) and general maintenance;
- financial administration of the facility (fees for services rendered, licensing, sale of water and fuel, etc.);
- landing statistics; and,
- administration of hygiene standards (water quality and sanitation) throughout the facility.

Guidelines and experiences on the establishment of a management organization are to be found in:

1. **Ben-Yami M. Anderson A.M.** 1985 – *Community Fisheries Centres: Guidelines for establishment and operation*, Food and Agriculture Organization of the United Nations, Fisheries Technical Paper 264, Rome, FAO;
2. **Verstralen K.M., Lenselink N.M., Ramirez R., Wilkie M. and Johnson J.P.** 2004 – *Participatory landing site development for artisanal fisheries livelihoods*, Food and Agriculture Organization of the United Nations, Fisheries Technical Paper 466, Rome, FAO;
3. **Siar, S.V., Venkatesan, V., Krishnamurthy, B.N. and Sciortino, J.A.** 2011. *Experiences and lessons from the cleaner fishing harbours initiative in India*. FAO Fisheries and Aquaculture Circular 1068, Rome,FAO;
4. **Pomeroy R.S. (Ed).** 1994 *Community management and common property of coastal fisheries in Asia and the Pacific: concepts, methods and experiences*. ICLARM, Manila Philippines.
5. **N. Singh, H. Laurie.** 1998. *Community-based resources management and sustainable livelihoods: the grass-roots of sustainable development*. International Institute of Sustainable Development, Winnipeg, Manitoba, Canada.



## 4. Recommendations for best practise and indicators that should relate to the challenge of provision/repair of infrastructure in emergency responses

Best practices are used to maintain quality as an alternative to mandatory legislated standards. However, in the context of complex problems such as post-disaster emergency re-construction efforts, there are significant challenges in defining what is best in any given disaster situation.

In this context, it is more useful to think of best management practice as an adaptive learning process rather than a fixed set of rules or guidelines. Relying on past experiences with re-construction under different disaster scenarios, there are four broad areas where best practice may be applied:

1. Building back better and operational efficiency
2. Ecosystem and resource sustainability;
3. Community development;
4. Governance.

**BP STATEMENT ON THE DAMAGE AND NEEDS ASSESSMENT REPORTING**  
**The Infrastructure that supports fisheries and aquaculture operations is effectively covered in the Damage and Needs Assessment report.**

*Indicators could include:*

- Damage and Needs Assessment missions to landing sites and ports are led by fisheries experts assisted by public utilities engineers and comprise both local and international experts.
- Non-technical humanitarian agencies are to engage specialist agencies to undertake the Damage and Needs Assessment for fisheries infrastructure.
- The decision to provide re-construction aid is based on an objective community-wide problem analysis with clear objectives generated in conjunction with the community.
- The provision of safe drinking water on tap (not only imported bottled water) and liquid waste treatment facilities is included in the list of priorities.

**BP STATEMENT ON THE PLANS FOR RE-CONSTRUCTION**  
**The infrastructure plans are aligned with community aspirations, fisheries and aquaculture development strategies and the long-term development plans for the nation.**

*Indicators could include:*

- A re-construction management plan is set up and agreed on by all stakeholders prior to start of physical work on site.

- Re-construction plans incorporate an impact assessment of the surrounding environment and where appropriate provide for re-planting of mangroves, reinstatement of coastal sand dunes and the setting up of marine protected areas.
- Reconstruction plans incorporate a social-impact assessment.
- Strategic planning for fish landing sites and ports is undertaken in the context of proper governance and management of fisheries
- Opportunities for the provision and/or improvement of public utilities (water, electricity, public lighting, sanitation) in remote areas are explored in the reconstruction plan.
- Opportunities for improvement of road access are explored as part of the planning process.

**BP STATEMENT ON THE DESIGN OF THE REPLACEMENT INFRASTRUCTURE**  
**The design of new or replacement infrastructure is based on robust technical and economic assessments of viability**

*Indicators could include:*

- Plans for reconstruction incorporate the latest revisions of the building codes even if these mean higher overall costs.
- An assessment of the availability and needs for power is undertaken prior to decisions being made on the provision of new equipment and facilities.
- The locations for reconstruction of fish landings and ports are selected based on an objective study of costs and benefits.
- Where possible, legally liable private sector consultants are employed to supervise construction and assure quality control.

**BP STATEMENT ON GOVERNANCE**  
**Reconstruction activities are designed to strengthen community and national management regimes.**

- Where management bodies are not in place a process is set up to establish an appropriate management body with the involvement of all relevant stakeholders.
- Inventories of all inputs are kept and provided to the government in a form that is appropriate and accessible to them.
- Government officers are engaged in the process of design and delivery of the reconstruction inputs – and provided with training to do so where required.
- The exit strategy is based on the successful reinstatement/establishment of the fisheries management organization and the official handing over of the facility.

## 5. Key technical resources

The following is a list of information resources that can be used to support the planning of the emergency response and the follow-up re-construction of the infrastructure.

Articles with an asterisk (\*) indicate the source is a restricted professional journal but the relevant paper may be purchased from the publishers. All other articles are in the public domain and are not password-protected.

### 5.1 MARITIME INFRASTRUCTURE

**Permanent International Navigation Congresses 2010 – *Mitigation of Tsunami Disasters in Fishing Ports***, Report 112, Brussels, Belgium.

**Sciortino J.A.** 2009 – *Fishing harbour planning, construction and management*, Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Technical Paper 539, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

**Sciortino J.A.** 2008 - *Guide for the Selection of Location and Design of Sanitary Standards for Landing Sites*, ART023GEN, EuropeAid OCT-ACP programme, Brussels, Belgium.

(also available at <http://sfp.acp.int/en/guide>)

**Sciortino J.A.** 1995 – Construction and maintenance of artisanal fishing harbours and village landings, Food and Agriculture Organization of the United Nations Training Series 25, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

### 5.2 BUILDING INFRASTRUCTURE

**N.I. Thusyanthan S.D.G. Madabhushi** 2008 – *Tsunami wave loading on coastal houses: A model approach*, Proceedings of the Institution of Civil Engineers, May 2008, London.

(also available at [www.icevirtuallibrary.com/content/issue/cien/161/2](http://www.icevirtuallibrary.com/content/issue/cien/161/2))

**P. Dias; R. Dissanayake; R. Chandratilake** 2006 - *Lessons learned from tsunami damage in Sri Lanka*, Proceedings of the Institution of Civil Engineers, February 2006, London.

(also available at [www.icevirtuallibrary.com/content/article/10.1680/cien.2006.159.2.74](http://www.icevirtuallibrary.com/content/article/10.1680/cien.2006.159.2.74))

**Medina Pizzali A.F.** 1988 – *Small-scale fish landing and marketing facilities*, Food and Agriculture Organization of the United Nations, Fisheries Technical Paper 291, Rome FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

### 5.3 WATER SUPPLY AND INFRASTRUCTURE

**L. Lytton** 2008 – *Deep Impact – Why post-tsunami wells need a measured approach*, Proceedings of the Institution of Civil Engineers, February 2008, London.

(also available at [www.icevirtuallibrary.com/content/issue/cien/161/1](http://www.icevirtuallibrary.com/content/issue/cien/161/1))

**Illangasekare, T., et al., 2006** - *Impacts of the 2004 tsunami on groundwater resources in Sri Lanka*, Water Resources Research, Volume 42, 2006.

**World Health Organisation 1991** – *Guidelines for Drinking Water-Water Quality, Volumes 1, 2 and 3*, Delhi, India, CBS Publishers.

**Metcalf and Eddy. 1991** – *Waste water engineering. Treatment, disposal and re-use*. Third Edition 1991, New Delhi, India, Tata-MacGraw Hill Publishing.

#### 5.4 ICE AND REFRIGERATION IN FISHERIES

**Graham J. , Johnston W.A. , Nicholson F.J. 1993** – *Ice in Fisheries*, Food and Agriculture Organisation of the United Nations, Fisheries Technical Paper 331, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

**Londahl G. 1981** – *Refrigerated Storage in Fisheries*, Food and Agriculture Organisation of the United Nations, Fisheries Technical Paper 214, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

**Johnson W.A. , Nicholson F.J. , Stroud G.D. 1994** – *Freezing and Refrigerated Storage in Fisheries*, Food and Agriculture Organisation of the United Nations, Fisheries Technical Paper 340, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

**Huss.H.H. 1995** – *Quality and Quality Changes in Fresh Fish*, Food and Agriculture Organisation of the United Nations, Fisheries Technical Paper 348, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

**Shawyer, M. and Medina Pizzali, A.F. 2003.** *The use of ice on small fishing vessels*. FAO Fisheries Technical Paper 436, Rome, FAO.

(also available at [www.fao.org/docrep/006/y5013e/y5013e00.htm](http://www.fao.org/docrep/006/y5013e/y5013e00.htm))

#### 5.5 PORT MANAGEMENT IN FISHERIES

**Verstralen K.M., Lenselink N.M., Ramirez R., Wilkie M. and Johnson J.P. 2004** – *Participatory landing site development for artisanal fisheries livelihoods*, Food and Agriculture Organization of the United Nations, Fisheries Technical Paper 466, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en))

**Ben-Yami M. Anderson A.M. 1985** – *Community Fisheries Centres: Guidelines for establishment and operation*, Food and Agriculture Organization of the United Nations, Fisheries Technical Paper 264, Rome, FAO.

(also available at [www.fao.org/fishery/publications/technical-papers/en](http://www.fao.org/fishery/publications/technical-papers/en)).

**Siar, S.V., Venkatesan, V., Krishnamurthy, B.N. and Sciortino, J.A. 2011.** *Experiences and lessons from the cleaner fishing harbours initiative in India*. FAO Fisheries and Aquaculture Circular 1068, Rome, FAO.

(also available at [www.fao.org/docrep/014/am432e/am432e.pdf](http://www.fao.org/docrep/014/am432e/am432e.pdf))

#### 5.6 OTHER REPORTS

Under preparation: Developing fish landing centres: experiences and lessons from Sri Lanka. FAO Fisheries and Aquaculture Technical Paper

UNEP December 2005. *Sri Lanka Rapid Environmental Assessment*

**World Bank** May 2010. *Ghana Fisheries Landing Sites – Needs Assessment Report*. Washington, DC.

# Aquaculture

by

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## Introduction

The increasing severity, prevalence and frequency of risk events abetted by the vulnerability of populations and assets have resulted in increasingly serious threats on the foundations of people's welfare<sup>1</sup>. Response to a disaster is a risk management action. From the same location in the risk management process, disaster response performs a dual function: to mitigate and relieve the impact that a risk event has caused and to mitigate the impact of a future risk event. The first entails providing the means to cope with the immediate impact of the risk and the means to resume the activities that had been interrupted by the event. The second - called "preparedness" in emergency management -- seeks to improve resilience and capacity to adapt to any risk event in the future. These two purposes are not mutually exclusive: disaster prevention and preparedness become part of the disaster response (FEMA, 1996) and assume an increasing importance as the response moves from relief to extended recovery, all the while laying the foundations for sustainable development. The steps are listed in Box 1.

### Box 1 – The Disaster cycle or Emergency Sequence (Westlund, Bage and van Anrooy 2007)

- Prevention of events and processes that could result in disasters.
- Preparedness to respond rapidly and effectively when disasters occur
- Early warning to provide information before potentially disastrous events and immediately afterwards.
- Impact and immediate needs assessment following a disaster.
- Emergency response to meet humanitarian needs and protect livelihoods following a disaster.
- Rehabilitation to initialize the restoration and rebuilding of livelihoods.
- Reconstruction for replacing destroyed infrastructure.
- Sustainable recovery for longer-term re-establishment and enhancement of livelihood support structures.

As part of a risk management strategy applied to an economic sector such as aquaculture emergency response aims to (a) restore livelihoods as soon as possible, (b) enhance livelihood capitals and improve livelihoods sustainability, and (c) increase the resilience and adaptive capacity<sup>2</sup> of the sector to the impacts of risk events. The second and third objectives comprise a large part of the broader goal of building back better.

<sup>1</sup> "Welfare" denotes the existence of the essential conditions for security of life and pursuit of livelihood, access to nutritious and adequate amount of food, state of good physical and mental health, and the ability and freedom to engage in rewarding social relations and economic transactions (IISD 2003).

<sup>2</sup> Resilience is the ability to withstand the impact of shocks and trends, absorbing them and maintaining function while Adaptive Capacity is the ability to respond and adjust to actual or potential impacts of a risk event in ways that moderate harm or take advantage of opportunities that the event may afford; it can be the function of a system's resilience to unpredictable shocks (Tompkins and Adger, 2004).



# 1. Overview of aquaculture and the way that it is impacted in different types of disasters

## 1.1 BACKGROUND: VULNERABILITY OF AQUACULTURE SYSTEMS

The various segments of the aquaculture production and supply chain are invariably vulnerable to most risk events, which make the tasks of protection and rehabilitation complex and demanding. Broodstock farms (brood banks) or wild sources of broodstock, hatchery facilities, nurseries and grow out facilities are highly exposed to natural and biological hazards (with the exception of recirculation aquaculture systems or RAS<sup>3</sup>, sensitive to disruptions in power (especially RAS), and changes in water parameters. The supply of viable seed for the rehabilitation of a vast area of fish farms would depend on distant hatcheries that are not affected by the disaster. This poses difficulties in logistics as well as entails higher cost. For fed aquaculture, commercial feed sources could very well be rendered temporarily out of business or the transport and distribution systems for feed are paralyzed, or the ingredients for farm-made feed become scarce as they could also have been affected by the risk event.

As the product - should there be a harvest --is highly perishable it has to be brought to market quickly or preserved in ice; both technical support services could be absent (ice plants may have also been rendered inoperable by the disaster and market structures damaged) or difficult and expensive to access (source of ice is distant and roads to markets could be damaged and extremely difficult to negotiate or impassable).

Farm structures such as cages and ponds are highly vulnerable to cyclones, tidal surges and flooding and some systems such as cage culture in coastal waters and seaweed culture (using monofilament lines or rafts) are also highly at risk to oil spills and harmful algal blooms such as red tides. A sudden influx of freshwater into estuarine and coastal culture areas from a flood can extensively damage seaweeds and mollusks as well as marine fish in floating cages; the latter happened in Krabi Province in Thailand in the first quarter of 2010. Floating cage culture in enclosed bays even if relatively sheltered, are not safe from cyclones especially a tidal surge generated by a powerful cyclone such as Cyclone Sidr that wrought severe damage on southwest Bangladesh in 2007 and Typhoon Nargis that devastated the Irrawaddy Delta of Myanmar in 2008.

Floating cages in inland water bodies are exposed to flood and highly at risk to chemical leaks and other pollutants. This is illustrated by a massive fish kill of tilapia and other species cultured in floating cages caused by either a barge-load of molasses that accidentally tipped into the Chao Phraya river in Thailand or a discharge of chemicals from a monosodium glutamate plant upstream (the actual cause was never established) in March 2007 (Bueno *et al.*, 2007).

The management of the aquaculture sector, whether in normal times or during recovery from a disaster, is done in the context of the following complex attributes of the sector:

- The wide range of environment in which it is carried out i.e. inland freshwater, coastal brackishwater, and marine

<sup>3</sup> This system rears fish at high densities within an operator controllable rearing environment inside a building using technology to provide greater security and control of the farming process ([www.northernaquafarms.com/aquaculture/page5.html](http://www.northernaquafarms.com/aquaculture/page5.html))

- the numerous types of production systems and containment to produce the product i.e. earthen ponds, floating cages, pens, raceways, tanks, recirculating closed and semi-closed systems, integrated with crop and/or livestock, or open water,
- the range of production scale from small household to industrial vertically or horizontally integrated operation; in a number of areas, the small scale co-exist with the large commercial operations,
- its multiple interactions with most other economic sectors, particularly its having to use and often compete for common resources especially water with the other sectors,
- the high vulnerability of aquaculture production systems, except a closed recirculating system, to biological and natural as well as physical hazards

These attributes, which represent a mix of technical, social, environmental and economic issues, are highlighted because an important consideration for rebuilding is that a poorly restored and therefore poorly managed aquaculture sector can create adverse environmental and social impacts. Any impact on the environment and society rears back as an environmental and social risk on the sector, which impairs its sustainability.

## 1.2 THREATS TO AQUACULTURE OPERATIONS AND POLICY FROM RISK EVENTS

Risk events, depending on their type and severity, have different degrees of seriousness in their impact on operations and on the ability of fish farmers to recover their livelihood. A fundamental policy question is whether the impact of a risk event is such that it would be more feasible to build anew than build back, relocate rather than rehabilitate, and whether to rehabilitate livelihoods or develop new ones and train people for them.

In this discussion paper, seriousness is the function of four variables, three of which are attributes of the risk event and one of the system that is at risk: (i) *severity*, referring to the extent of damage from nil to total, (ii) *prevalence*, from limited and localized to a diffused, widespread and extensive geographical coverage, (iii) *frequency* and duration of occurrence, which can be rare and of short duration when it occurs, rare but prolonged, very frequent but of short duration, or very frequent and of long duration; and (iv) *state of vulnerability* of the system that is at risk<sup>4</sup>. The extreme manifestation of seriousness is a catastrophe, which is characterized by the paralysis of administrative systems, public and social services, and economic functions, widespread destruction of physical and natural assets, and a large toll in human life. The widespread destruction also means that succour from nearby communities cannot be expected so that the only source of relief is external assistance. It invariably takes a very long period for the economic activities and administrative functions to return to normalcy. Other than a war or a genocidal civil strife, catastrophes are invariably wrought by natural hazards such as the Indian Ocean tsunami of 2004, Cyclone Nargis that swamped the delta region of Myanmar in 2008, the earthquake in Haiti in 2009, and of recent vintage, the Fukushima earthquake and tsunami in 2011. The seriousness of impact would depend on the severity of the four variables although the kind of impact also depends on the nature of the hazard. A drought for instance can cause widespread famine and death but it does leave physical infrastructure intact and, as it is a slow onset risk event, it allows time to prepare for mitigation measures. In contrast, an earthquake of the magnitude of the one that struck Haiti in 2011, or the Indian Ocean tsunami of 2004,

<sup>4</sup> Adapted from the definition of risk; see Bondad-Reantaso, M.G.; Arthur, J.R.; Subasinghe, R.P. (eds). Understanding and applying risk analysis in aquaculture. FAO Fisheries and Aquaculture Technical Paper. No. 519. Rome, FAO. 2008. 304p.

leaves no time even to flee. An oil spill will hardly kill directly any human being but it can be costly to mitigate its impact on coastal ecosystems and, as in South Korea in December 2007, on coastal aquaculture industries. In brief, varying seriousness and kind of impact also have varying implications on policy and operation. The threats to aquaculture operations and policy are described below. The threats and their implications on livelihoods are summarised in Appendix 1. The disasters are classified into natural (this list includes earthquake and volcanic eruptions under the natural disasters although sometimes they are classified as geological), technological, biological and complex.

### 1.2.1 Natural Disasters

1. Hurricane/cyclone. Operational impacts include the disruption of power if farms and hatcheries are connected to a grid. It would cause the stoppage of operations in hatcheries the result of which would be the absence or shortage and higher cost of seed for the next crop; lack of seed would freeze operations. If the warning is not early enough harvestable crops could be lost. All standing crops would be damaged and cropping timetable is derailed. Pearl oyster farms have suffered from the destruction of spat collection rigs and onshore structures<sup>5</sup>. Cages and farm structures are usually damaged but especially to marine cages, pens and seaweed crops, as usually happen in the Visayas region in the Philippines when a typhoon blows through the area. A downstream operational impact is that marketing timetable is upset, and transport to market is cut off or disrupted. On the other hand, a cyclone and adverse weather conditions that affect fishing as well as epidemics in the livestock and poultry sector could create a short-term higher demand and prices for cultured fish. A positive result, demonstrated by the changes in shrimp farmers practices in Nicaragua in the aftermath of Hurricane Mitch in November 1998, was the adoption of the closed circulation pond system to reduce the risk of pests and disease vectors entering the ponds with the water, reduce the need for pesticides and drugs, and minimize the discharge of effluent laden with pesticide and drugs into receiving waters (Felder *et al.*, 2003).
2. Tidal surge/tsunami. Mollusc poles and racks, rope, seaweed lines, floating or moored near- or off-shore cages would be very severely damaged, farm structures destroyed and possibly fatalities among workers. Local hatcheries would be unable to provide seed; ponds could be silted up or buried in silt, stones and debris; water intake systems could collapse or also silted up; boundaries of farms could be erased. It would entail huge restoration and rehabilitation costs for the impacted area. Operations could be disrupted for a lengthy period.
3. Flood. A sudden short duration flood can wash away land-based farms, erode topsoil and destroy water intake and outlet systems; influx of a huge volume of freshwater can shock and kill marine cage fish situated on estuaries as in Southern Thailand during the flooding in 2010; floods also affect seaweed and marine mollusc growing sites – the influx of freshwater kills the cultured species and for a while renders the area unsuitable for culture; a long-duration flood in inland areas would submerge farms and affect pond productivity. Rehabilitation from a short term but severe flood can be quick but costly; a long duration flooding will take time, usually disrupting other means of livelihood.
4. Drought. A risk that can be forecast early and with high reliability, it requires water conservation as a strategic measure and the re-cycling and multiple use

<sup>5</sup> As the author had seen during a visit in 2010 to the J. Hunter Pearl Farms in Savu Savu, Vanua Levu, Fiji Islands after it was struck by a hurricane in 2009 (<http://www.pearlsfiji.com>)

of water in an integrated system as technical measures. But the more difficult policy-related challenge is the priority allocation of water to different competing sectors; aquaculture is usually a downstream and last priority user. Another policy implication is the need to look for non-farm livelihood options, which can be in the services, commercial and industrial sectors. This is either a national or a state a policy concern for the entire agricultural sector (World Bank, 2010). A prolonged and very severe drought inevitably leads to massive crop failures, famine and the response is emergency food and medical aid. In extreme and prolonged episodes, populations may have to be relocated. A drought in the eastern region of El Salvador from 1998 to the winter of 2000, exacerbated by an earthquake, red tide and falling prices of the main export crop, coffee, prompted the government to declare a state of emergency in three regions. Affected families were given food aid for three months in cooperation with World Food Programme (International Federation of Red Cross and Red Crescent Societies (undated). While marine aquaculture may continue to operate, the hazards to aquaculture include changed water temperatures to which the culture species may not tolerate and eutrophication of coastal waters particularly the enclosed bays.

5. Earthquake. Its impact can be extensive damage to structures: dwellings but also on land based systems such as hatcheries, ponds, farm buildings, farm roads, and water intake and outlet systems. The water systems could collapse and be rendered unusable so that even if ponds are production-ready, no culture can be carried out. Farm to market roads could be rendered impassable and support services such as ice supply and refrigeration inoperable. Restoration of the functions of public utility infrastructure and dwellings usually takes precedence over restoration of farm production facilities. A more serious environmental impact could be leaks of hazardous chemicals if the quake damaged chemical plants or holding tanks for chemical wastes as in the Wenchuan, China earthquake in May 2008 (Thomas, 2009).
6. Volcanic eruption. Events that smother or bury vast tracks of land, erase boundaries, erode vast swathes of coastal pond systems or shift and liquefy land areas, such as a tsunami with the destructive force of the Indian Ocean Tsunami of 2004, a volcanic eruption such as the Philippines' Mt Pinatubo eruption in 1989, or a powerful earthquake pose hard problems on the ownership of restored pond systems. This is often overlooked because of the urgency of providing relief to a stricken population. In cases when a very thick volcanic ash or lava flow buries farm lands and fish pond areas beyond restoration, lava flow erodes vast swathes of farm lands, and ash and lava clog waterways (irrigation channels and rivers) that make it impossible to restore farm lands, farm families would have to be relocated and livelihoods in a different sector found or developed for them (de Guzman, undated). Most of the people, including fish farmers, would need retraining in new occupations or livelihoods.
7. Severe winter: A severe winter can destroy stocks including brood fish and exacerbate the damage by disrupting power supplies (hydroelectricity generation is reduced and power lines snap or power poles buckle or topple under heavy loads of ice. Heavy snowfalls damage farm structures. All these make recovery more difficult and costly. These happened in Tajikistan in the winter of 2007-8 and China in 2010. Damage to aquaculture in Tajikistan was relatively small because its aquaculture sector is small, but almost total. Damage to farm structures was extensive in Northern China and to cultured species that do not overwinter particularly tilapia and cobia (*Rachythemndron canadum*); the severe winter also affected southern provinces where these species are

extensively farmed (Personal communication with Miao Weimin, Regional Aquaculture Officer, FAO RAP, Bangkok, April 2012).

### 1.2.2 Technological

1. Oil and chemical spills. Culture grounds of molluscs and cage culture areas could be closed for a long time until after a clean up operation is finished. It can take years to clean up an oil spill during which sensitive habitats are damaged, such as coral reefs, mangroves and marine sanctuaries which are also sources of wild seed or broodstock. This happened in Central Philippines in August 2006, when an oil tanker carrying more than two million liters of oil sank in the Guimaras Strait and poured a quarter of its cargo into the sea affecting the Visayan and Sulu Seas. It took three years to clean up. WWF Philippines reckoned that the impact on the fishery of the Visayan Seas, a fairly rich fishing ground, would be felt by two generations. Because wild fishery as well as marine cage culture are greatly diminished, coastal oil spills could create higher demand for freshwater and brackishwater pond raised fish. Similarly, a chemical on a river leak that leads to fish kills in floating cages can create higher demand and prices for fish raised in brackishwater ponds and marine cages.
2. Nuclear leaks. Contamination of water and soils will force cessation of operations; obvious health hazard from radioactive exposure. Demand for any food product from the affected area drastically drops. A clean up will take a long time during which any food production activity, much less resettlement, is restricted by government.

### 1.2.3 Biological

1. Epizootics. Disease outbreaks and epizootics may allow continuing operation while management and control protocols are installed in farms and in the affected area or the entire country. A virus disease especially one that is highly virulent and as yet unidentified may require extreme measures such as killing and disposal of infected stock, closure of farms or the entire industry while epidemiological and diagnostic studies and contingency measures are mounted. If the detection is early however and contingency and containment plans are put in place in time, limited and highly secure operations could proceed. Diseases and fish kills from harmful algal blooms, oil spills and chemical contamination tend to depress demand and prices in both local and export markets.
2. Harmful algal blooms and hypoxia. Closure of farming areas (molluscs and cage culture); fish kills or contamination of stocks. An extensive area of a water body is affected and the causes can be from aquaculture itself (excessive feeding and high density culture), or from another sector such as industries usually upstream, or from agricultural and domestic run-offs. Mollusc farms are highly vulnerable and operations could cease. New areas may need to be opened for cage culture, which has implication on site access by cage farmers that have to relocate. Harmful algal blooms and oil spills may however create higher demand for pond cultured and inland freshwater fish. Serious outbreaks of HABs affect not only aquaculture but fishery and the businesses such as tourism on coastal strips (Hoagland 2008).

### 1.2.4 Complex disaster (catastrophe, civil strife)

1. Security risk would be so serious that the usual impact is complete cessation of farm operations and evacuation. The breakdown of governance mechanisms leads to paralysis of services, and the severance of supply lines and market chain, which in any case would render production impossible or even irrelevant.

Other impacts are possible confiscation or destruction of assets. The impacts of these twelve types of disaster on policy and operations and their implications on livelihood opportunities (in the aquaculture sector) are listed in Appendix 1.

### 1.3 THREATS TO AQUACULTURE POLICY AND OPERATIONS THAT COME FROM EMERGENCY RESPONSES

Responses to disasters, however well planned and carefully considered, carry potential contradictions to the broader objectives of social, economic and environmental policies. The impacts to policy and operations identified in the preceding section can be seen, from the perspective of risk management, as hazards. The potential risks they pose to social, economic and environmental objectives (in aquaculture as well as the greater agriculture sector) are summarized as follows:

#### 1.3.1 Social policy

1. Subsidies, free inputs, relaxed credit could engender dependence and reduce competitiveness; this could jeopardize the objective of attaining food security and, more broadly, a self-sustaining economic growth.
2. Emphasis on a dominant aquaculture subsector or farming system could foster divisions between aid priority groups and the others who may not be recipients or deemed of lower priority. Aid provision itself can unwittingly generate intense rivalry and competition between various sectors that vie for priority attention. This can weaken social cohesion, the foundation of social capital.
3. Organizing aid recipients to facilitate provision and improve the application of material aid and technical assistance presents the pitfall of farmers subsequently joining or forming an association for narrow or the wrong reasons i.e. the overriding motivation is to receive aid or easy credit, which shadows the broader reasons for being associated.
4. Entitlement to damage compensation only to farms that are legally recognized (registered) poses a moral hazard i.e. the motivation for the registration of all sorts of “farms” is being able to claim compensation.
5. Social and economic interventions under an emergency situation are rarely subjected to a social impact assessment because a systematic SIA process can be time consuming and prevent a timely response. Under an intense public and political pressure to do something quickly and show accomplishment, potential and unintended adverse impacts of interventions are not properly identified and anticipated so that when they emerge, they would be more difficult and costly to address.

#### 1.3.2 Economic

1. Market based incentives such as subsidies on inputs, and price support tend to mask the inefficiencies in production systems as well as in the market chain.
2. There is a risk of distortion of the market for input supply particularly seed and feed with the subsidies or provision of free inputs.
3. Price distortions happen in the local market when huge purchases drive up market prices of commodities being provided as aid and the high purchasing power from an influx of aid personnel drives up local prices.

#### 1.3.3 Environmental

1. Biosecurity measures such as the responsible movement of live species tend to be overlooked or ignored with the desire to rapidly procure and distribute seed to get the farmers to resume production. Seed are often obtained from hatcheries

in other regions of the country (as with shrimp procured for distribution in Southern Thailand after the tsunami of 2004).

2. Environmental standards are relaxed in favour of a rapid return to production.
3. Potential impacts of reconstruction and rehabilitation cannot be precisely identified without an EIA, which is usually waived in favour of a quick restoration of the capacity to produce.

#### 1.3.4 Operations

1. Scarcity and high cost of farm labour results from heavy recruitment for cash for work programmes and rebuilding projects in other sectors, which happened in Aceh when the demand for and wages of workers to build houses and other infrastructure -- a higher priority during recovery -- left few workers to rehabilitate or work on the farms.
2. The efficient use of inputs as part of good management practice gets overlooked by the liberal use of free inputs.
3. Setting a logical sequence of particular responses (rehabilitation activities) can be missed by focusing on quick restoration of farms; without restoration of a reliable source and supply line for inputs the farms have nothing to produce. Without restoration of post harvest, transport and markets, production can only be geared for home consumption and neighbourhood distribution.

### 1.4 OPPORTUNITIES FOR IMPROVING THE QUALITY OF AQUACULTURE POLICY AND OPERATIONS FROM EMERGENCY RESPONSES

Disasters should not be wasted, to rephrase what many have said in the aftermath of natural and technological disasters, economic crises and business failures. The phrase suggests using the event as an opportunity to learn lessons: what went wrong so that they may not be repeated and what went right so that they can be improved on and made even more effective, and then to use these as a basis for “building back better”. Overall a disaster response is an opportunity to reduce vulnerability to future risk events by increasing society’s resilience and adaptive capacities to risk impacts.

This discussion paper proposes to place this issue in the context of (i) risk analysis and management and (ii) the sustainable livelihoods approach.

Risk analysis is applied to identify strategic responses and specific actions that can more effectively prevent or reduce the probability of risk occurrence and severity of impacts of future risk events, in other words mitigation and its twin, preparedness.

Meanwhile, focusing the SLA lens on the possible responses can identify mitigation options that contribute to protecting and restoring livelihood capitals, promoting the sustainability of the capitals, and supporting livelihood options that are more sustainable and more resilient to future natural and economic shocks. The following are examples:

#### 1.4.1 Opportunity for better governance and regulatory enforcement

Risk identification and analysis will identify and assess hazards to the community, its vulnerabilities and capacities to manage the risks; identify ways to avoid hazards and reduce vulnerabilities. It can also identify suitable risk sharing and transfer mechanisms to relieve impacts, to enable better recovery and to protect or rebuild assets. The practical outcome of the analysis is a disaster preparedness strategy. This exercise would provide the opportunity to identify the weaknesses and strengths of the sector or community so that the weaknesses can be addressed and the strengths enhanced and brought to bear on the mitigation of risk impacts. For example, the lack of zoning regulation or the haphazard siting and excessive density of culture units in an area, which led to pollution and hypoxia that triggered massive fish kills prompted the Philippine fisheries agency to work with the local government agency to develop and

### Box 2 – Risk management strategies and arrangements (Holzmann, 2001)

There are three ways to address risk: (i) prevention, which includes measures to reduce the probability of the risk occurring; (ii) mitigation, which reduces the impact a risk event will bring or has brought; and, when everything else has failed, (iii) coping, which relieves the impact of a risk event that has occurred. The arrangements to deal with vulnerability fall into three main categories: (a) Informal – households and farms respond to risk by protecting themselves through informal and personal arrangements. Credit from relatives and self-help group arrangements are examples; (ii) Market based – where available and affordable, households take advantage of the financial products offered by insurance companies and banks. Because formal market institutions have difficulty to lend or provide insurance to small farms without secured earnings and improved access to information, micro-credit and insurance are interesting instruments for risk management and (iii) Public – this category takes various forms: the government can provide or mandate social insurance programs for risks such as unemployment, work injury, disability and sickness, and compensation schemes for catastrophes or unusually large damages to assets and crop. Governments can also use such coping instruments to help farms cope after a shock such as social assistance, subsidies on basic goods and services and public works programmes. Through legislation, government is also able to introduce prevention strategies such as zoning, safety standards, property rights and protection of rights to assets. Many government programmes (in health, education and infrastructure) also play an important role in risk prevention.

This matrix table can provide an overview of the risk management options that households or communities have or have no access to.

Strategy/Arrangements	Informal	Market based	Public
Prevention			
Mitigation			
Coping			

agree to cooperate in implementing the provisions of a better management practices manual for local governance of the aquaculture sector. This was supported by training programmes for the local regulatory bodies, extension agencies and farmer groups. The opportunities provided by this disaster (massive fish kills) included reforms in the governance of the sector, capacity building for governance and provision of technical services and, for the farmers, better and science-based farm management practices (see Appendix 4).

#### 1.4.2 Opportunity for strengthening the coastal ecosystem and habitats

This was demonstrated by the Earthquake and Tsunami Emergency Support Programme – Fisheries Component in Indonesia. The project helped mitigate the environmental impact of shrimp ponds by redesigning the pond systems so that they do not intrude into the greenbelt zone identified in government plans, intensive mangrove planting in and around the fish pond areas or tambaks and rebuilding and putting back into operation two previously non-functional marine fish hatcheries (in Nias and Simeulue) and training the staff in spawning and nursing groupers, which reduced pressure on the fish populations of surrounding reefs while laying the foundations of a profitable industry in those economically disadvantaged islands (see Appendix 4).

#### 1.4.3 Opportunity for faster recovery and more sustainable livelihood through microfinance

The impact of disasters is invariably greater and more lasting on the poor. Vulnerability assessments have identified the lack of financial capital as one of the major factors that not only make the poor vulnerable but less able to recover. Lessons from various disaster risk mitigation efforts have shown the potential of microfinance in reducing

the vulnerability of the poor to disasters by, generally, reducing poverty and supporting sustainable development (Chakrabarti, *et al.*, 2005). As part of a greater strategy for risk reduction, microfinance can, among others, provide relief and then support sustainable recovery and rehabilitation, increase coping capacity against risk events, and reduce the cost of post disaster recovery financing while reducing aid dependency. Because it requires a degree of self-management by the beneficiaries and is community based, it fosters recovery, ownership, dignity and community cohesiveness in the face of instability (Chakrabarti, *et al.*, 2005). Microfinance as a strategy could thus facilitate the transition from emergency to mitigation and from extended recovery to sustainable growth. The long term influence is to create a greater role of the private microfinance institutions in providing financial services under market oriented, rather than government or donor subsidized, credit policies.

Another opportunity is to encourage the establishment of community based mutual savings funds by organized groups of farmers that include the women and training the members on its management. The tsunami rehabilitation programme of NACA in an island community in Southern Thailand did not create this opportunity; the community organization of tourist service providers cum fishers and fish farmers already had a community savings and revolving fund, which was well-managed. The fund - a collective financial asset - provided emergency loans to members for subsistence or recovery of production assets such rebuilding of fish cages or both (Bueno *et al.*, 2008).

A broader effect of microfinance is the restoration of the functions of the local market, which are usually impaired by a disaster or totally stopped by a catastrophe, as in Aceh. Demand becomes nonexistent and in any case supply of goods and services are curtailed. A market based microfinance programme for farms and aquaculture-based local enterprises such as processing and trading also promotes a market based and community driven recovery. Such a market and demand-driven credit provision for community enterprises does not distort the market. Credit is provided and repaid under market terms and as the businesses recover and expand, they are able to borrow more, thus fostering a self sustaining growth. The sector, rather than remaining dependent for a very long time in subsidized or free financial assistance, goes back into a market economy, which in economic development terms can better allocate resources for a more sustainable economic growth (Chakrabarti, *et al.*, 2005).

#### **1.4.4 Opportunity for building community assets through cash for work**

Cash for work scheme is meant to provide income to people whose earning capacity has been wiped out by a disaster. It is a livelihood relief programme which remunerates people for repairing and re-building physical assets in a community such as a cut off village road to re-establish market access or temporary shelters. Beyond restoration, cash for work programme can be used to build a structure or system that has an important function in the livelihood and welfare of the community, but due to bureaucratic inertia or lack of government resources or other reasons, has remained a plan. An example was a new drainage system built by the youth in a slum community in Gujarat in the aftermath of the severe floods in July 2005 (Chakrabarti, *et al.*, 2005). The first of its kind in the region, the system was seen to make dramatic improvements in public health, sanitation, and disaster mitigation in the community. Estimated to cost 60 000 Indian Rupees it would have remained un-built without the flood recovery related cash for work programme. The drainage system, a physical asset, improved the health and thus the human capital of the community.

#### **1.4.5 Opportunity for resolving conflicts between common resource users**

A drought, or the prospect of climate-change induced water scarcity, may be the last risk event expected to provide an opportunity to resolve conflicts over the use of

freshwater. Yet, it could spur the development of water use regimes that provide a fair allocation of water for crop irrigation and aquaculture. On a technical level, it could also be used to promote better aquaculture practices that conserve water, re-use or recycle water, add value to water such as integrated farming as well as switch to crops or farming systems that are less water intensive (World Bank, 2010).

#### **1.4.6 Opportunity for creating synergy and preventing a potential conflict between aquaculture and another sector**

Tourism and aquaculture can be incompatible or in conflict if they are conducted in the same water area. But the case of Koh Yao Noi, a NACA post tsunami rehabilitation community in Southern Thailand, has shown that fishfarming (cage culture of finfish, lobster and, lately, sharks) can be merged with the tourism activities to earn for the farmers more income and, critically, make farmers more conscious of cage culture practices that are non-polluting. The reason is that the cage farms have been promoted as a stop in an eco-tourism itinerary. The cages are sited in culture areas that are far from beach fronts and away from swimming and snorkelling spots. Some of the fish farmers are also tourist boat operators and have rustic guesthouses for inexpensive tourist accommodations (Bueno *et al.*, 2008).

#### **1.4.7 Opportunity for introducing better management practices that promotes social and environmental responsibility**

The recovery phase should not be confined to interventions that aim to restore production capacity. This stage is an opportunity to improve the sustainability of fish farming with better management practices, as in the case of FAO's developing and promoting Better Management Practice guides in shrimp farming in Aceh (Padiyar *et al.*, undated). If farmers were not organized into clusters or associations before the disaster, the recovery phase is an opportunity to organize them, at least into clusters, for better adoption of the better management practices. If they have an association, the extended recovery phase should include strengthening and professionalizing the association.

## 2. A review of best practice and lessons learned from support to aquaculture in emergency response

### 2.1 SELECTED EXPERIENCES IN SUPPORTING AQUACULTURE POLICY AND OPERATIONS IN RESPONSE TO EMERGENCIES

The emergency responses selected for this review include (1) the assessment of post tsunami damages and needs for the recovery of the aquaculture sector in Aceh, Nias and Northern Sumatra organized by FAO; (2) the Fishery component of the Asian Development Bank (ADB)-funded Earthquake and Tsunami Emergency Support Project in Aceh, Nias and North Sumatra, managed by the Network of Aquaculture Centres in Asia-Pacific or NACA; (3) a rehabilitation action and study in an island community in southern Thailand after the Indian Ocean tsunami, by NACA and partners; (4) the restoration of production of pond-based aquaculture after the Mekong River flooding in 2008 in three provinces of Laos, by FAO; (5) a response to the Harmful Algal Bloom (HAB)- and hypoxia-associated massive fish kills in marine cages, coastal pens and brackishwater ponds in the Philippines, assisted by the EU; and (6) the rehabilitation of Southern Sudan and Uganda from severe and recurrent droughts.

#### 2.1.1 Support to Policy

##### 1) *Policy alignment*

The Aceh assistance, in fact all the projects that were implemented in Aceh, were infused with a great deal of sensitivity to the government policies and regulations on agriculture, habitation, industry, fishery and aquaculture. This was achieved at the project development phase aided by an extensive consultation with government and other sectors. The assessment of impact and needs ensured that the response would be aligned with the national policy and strategy on aquaculture development through a series of consultations in Aceh and North Sumatra and a national workshop in Jakarta.

##### 2) *Policy advice*

The KHV (koi herpes virus) epizootic assistance team realized that the disease containment measures were going to disrupt fish supplies and affect traders, but it had to advise government to put a ban on interprovincial trade because the impact of an uncontained spread of the disease would have been enormous, more costly to control, and more seriously affect the more numerous poor farmers raising common carps for food than the better off ornamental carp growers and fish traders. The response to the HAB and hypoxia related massive fish kills in the Philippines included a number of policy outcomes: a better management practice guide for local governments in managing the milkfish aquaculture sector, an agreement among three government departments (=ministries) – Agriculture, Local Government, and Environment and Natural Resources to coordinate the management of the aquaculture sector, zoning, and others.

### 3) *Relevance to climate change*

The post tsunami assistance in Aceh included all or most of these elements: coastal management, coastal bio-shields, natural hazards planning, resilient coastal ecosystems, sustainable communities and livelihoods, preparedness and resilience to future shocks. Whether these were deliberately made with climate change impacts in mind or not, the building of institutional and community capacities for these elements are in themselves measures to reduce vulnerabilities to climate change related risks. The more important step however was to have these taken up in national climate change strategies and policies.

### 4) *Guidance from CCRF*

Article 9 Aquaculture has specific provisions on responsible use of genetic resources to protect biodiversity, which is elaborated in the technical guideline on the introduction and movement of live aquatic animals and its impact on biodiversity and animal health. The interventions in Aceh and Koh Yao Noi (Southern Thailand) strongly adhered to this provision. Responsible production, another CCRF Aquaculture provision, was promoted through the better management practice guidelines

## 2.1.2 Project design and management

### 1) *Assessment*

The Indian Ocean tsunami and KHV virus assessments were carried out by teams of external and local experts all technically equipped (i.e. fish health, aquaculture and environment specialists). The local experts also had some administrative and technical supervision with the government aquaculture personnel in the impacted areas, which facilitated cooperation and information gathering. While the tsunami impacts were very serious, their implications on rehabilitation were fairly well defined and clearly understood.

The KHV epizootic was more demanding of scientific approach for proper identification of causal agent, determining its pathways for spreading, assessing its potential damage, and deciding on the least disruptive way to effectively contain it. Thus the assessment team included three external experts with complementing expertise and joined by equally highly trained local experts in fish diseases. The assessment included the required technical and policy measures, a diagnosis protocol to ascertain the pathogen, an epidemiology to find out the origin and mode of spread of the disease, and a scenario of what could happen in the country and the region if the disease was not contained.

For biological risk events such as epizootics and harmful algal blooms as well as hypoxia, the identified interventions were more clear cut because of the very specific and technical nature of the risk. It was more difficult with the rehabilitation of agricultural and fishfarming areas from the impacts of a severe flood in Laos and a catastrophic typhoon in the Philippines. The analysis in Laos missed out on the farming system that would have yielded the most benefit for the poorer segment, which was integrated rice fish farming. (The analysis also identified the culture of frog as an option which did not find much interest among the clients for lack of experience in the species and likely a questionable local market demand). In the Philippines, the choice of interventions after typhoon recovery was not so much technically inappropriate as it was seen as a standalone system, when it could have been more effectively made a component of an integrated farming system.

### 2) *Blend of local expertise and specialized external expertise*

Response to a disaster invariably requires quick action and the appropriate expertise to carry out the activities. In most disaster recovery efforts, local expertise needs to be complemented by external specialist expertise. Familiarity with the social and

economic circumstances, culture and political dynamics of the area make the local personnel invaluable to the work. Usually this is not easy to find and the starkest example of a disaster causing shortage of personnel who can conduct or assist in the conduct of impact and needs assessment, planning and rehabilitation work was the impact of the Indian Ocean tsunami on human lives.

The assessment of impacts and needs organized by FAO in Aceh, Nias and Northern Sumatra relied on the surviving or available local government workers in fisheries and aquaculture for assistance to the assessment mission in logistics and directions, gathering information, interviewing and organizing farmers for interviews, and looking for key informants (they themselves served as key informants), and on-the-spot assessments of damage. For the assessment work, a national expert from the Aquaculture Directorate and an international aquaculture environment expert working with NACA teamed up to conduct the assessment. The subsequent rehabilitation work under ETESP-Fisheries relied on national NGOs and recruited as much as possible local workers. NACA, as the project manager, laid down the principle that all things being equal, a local applicant would be preferred over others who are not from the locality.

### *3) Access to local expert advice in project design and planning*

With its long history of aquaculture development, there is considerable expertise within Laos that could have contributed to project design and its implementation. In addition to the Department of Livestock and Fisheries, the expertise of a number of international NGO's (e.g. WWF) could have benefited the project planning. However, this did not occur owing to budgetary concerns and the request of the Government to work through official governmental channels only.

### *4) Need for a project management team with complementary expertise*

The critical importance to project management of a local technical staff with the suitable expertise is indicated, in a negative way, by the Laos flood response. The project had an Emergency Officer who spoke the local language. While this helped with the implementation of the project especially at the district level, but the project seems to have relied heavily on this one person, who had limited fisheries expertise. The project would have benefited from the recruitment of local aquaculture experts of which there are now several in Laos who have been trained under various technical assistance projects in such institutions as the Asian Institute of Technology.

## **2.1.2 Support to Operations**

### *1) Technical support*

In all the cases, the local government agencies needed a good deal of capacity building for implementation. The slow building risk events such as the Koi Herpes Virus (KHV) in Indonesia and the Harmful Algal Boom in the Philippines benefited from the presence of technical agencies and personnel with high levels of competence for planning and implementing the interventions. The Philippine team comprised scientists from the Marine Science Institute of the University of the Philippines, and the fisheries bureau had well trained technical personnel in its regional research and training centres. These were supported by external expertise from Norwegian and Scottish environment and mariculture organizations.

The Lao flood rehabilitation programme met with a problem of institutional participation. One important government agency was overlooked and made its feeling known. The implementation might have benefited from additional technical expertise from NGOs and government institutions.

## **2) Coordination**

The FAO post tsunami damage and needs assessment mission recommended a structured and well coordinated programme approach for rehabilitation of aquaculture that served as a guide to the projects that ensued. The aim of the programme was to facilitate the (i) coordination of financial and technical assistance to support diverse needs for aquaculture rehabilitation across a large coastal area, (ii) development of effective mechanisms for delivering support, (iii) effective targeting of support based on needs, (iv) matching of needs with the available technical and financial assistance, and (v) integration of the livelihood approach with other support.

A mechanism was recommended to be established at National, Provincial and District levels to facilitate coordination and communication by organizing locally recruited teams working at District level with the Fishery agency to implement district recovery programmes. The functions of the District team was to assess needs and prioritise support, facilitate communities to develop and implement aquaculture rehabilitation plans, facilitate implementation directly, or draw on support opportunities, e.g. NGO's , cash for work , etc), and provide communication links at district level and between district and provincial/national levels to share experiences and facilitate coordination.

The suggested approach was to seek the support of formal and informal village organizations and farmers to plan and implement recovery. Expertise available within Indonesia (including Acehnese students and staff working elsewhere in the country) would be drawn upon to build the district teams and support capacity and provide technical assistance, supplemented with external assistance. Partnership between different agencies and donors was to be promoted for effective and coordinated support.

The Philippine typhoon rehabilitation response suffered from the lack of administrative linkage between the project technical resource and coordinating unit, which was based in a local university, and the municipal extension agency. Monitoring of progress was sporadic and supervision of the project implementation activities was based mostly on the good relations between the project coordinator and the extension technicians, rather than on an institutional basis.

## **3) Seed source and procurement**

In Aceh, input quality was the key to successful aquaculture because poor quality shrimp seed had been a source of disease problems in the province for several years before the tsunami. This situation required additional investment in technical assistance to raise awareness of selecting good quality seed, supporting communities to prepare good planning documents, linking communities to quality suppliers, and hands-on training in better management. Contracting systems were developed to procure only quality seed through a special contract between farmers and hatcheries, comprising critical components such as disease testing and fitness of post larvae.

In Laos, the seed came from Vientiane which was quite a distance to the other two provinces so that the fingerlings arrived in highly stressed state. There were no ready holding ponds or tanks to which they could be temporarily placed to recover before stocking.

## **4) Objectives of training**

The training that accompanies or precedes the distribution of inputs is both a technical input to assure production success and an opportunity to introduce better management practices. In Aceh, the project design of the aquaculture subcomponent was guided by environmental criteria established early through consultation among a

wide range of development actors and NGOs; the outcome was the development and promotion of the “Better Management Practices” manual which was extensively used for farmer training.

#### **5) *Timing and relevance of training***

In Laos, training was beset by many problems: the project was only able to distribute the seeds nine months after the training was conducted on the culture management of the species. An evaluation unsurprisingly found a large drop in farmers’ retention of knowledge and skills. In addition, the training content was geared at a level that the farmers found impractical (it was research-oriented, and the presentation in printed media was text heavy with very few helpful illustrations and pictures that farmers found it difficult to comprehend). It takes time to devise a training manual dedicated to the species and systems being promoted so that the next best thing would be to develop a very practical hands-on course conducted by a team that consists of one or two trained experts and an experienced farmer.

#### **6) *Species for rehabilitation***

The choice of species of fish to distribute for resumption of production is a critical technical issue. This was important for grouper farmers in Thailand because there is a trade-off between growing species that could be harvested earlier but with a lower market value and species that had a higher value but took a longer time to rear to market size. This issue occurred in Thailand, when the expert engaged for this aspect of the rehabilitation procured and distributed seed of a species that is of high value but takes 18 months to rear to marketable size. The result was farmers accepted the seeds and then sourced their own seed of earlier maturing species. One problem in introducing a species farmers are not familiar with is the time it takes for them to learn its management requirements.

In Laos, the assessment of needs overlooked the farmers’ growing interest in raising catfish so that catfish was not initially procured for distribution; instead frog culture was identified as an alternative livelihood when hardly anyone was interested in raising it; in fact a much earlier FAO project had this information but was either ignored or not made available to the assessment team.

#### **7) *Resources and arrangements for restoration of production capacity***

In Aceh, whatever savings the farm households had were allocated first to the basic needs for survival so that they had little or no financial asset for restoring their production facilities. No formal or informal (i.e, personal such as relatives) sources of credit were available. The extensive and near total damage of the pond systems and the supporting facilities such as water supply and drainage canals water sources in any case would have made individual restoration efforts futile. When things settled down, the Aceh project found that directly contracting farmer groups through community contracts proved more successful for achieving rehabilitation of ponds and organizing inputs than use of contractors.

In the Thailand case, the association had a mutual savings and revolving fund which the association decided to lend to families that sustained the most serious damage. Nonetheless the repair of all other damaged cages still needed external sources of financial input to procure materials. But labour was provided free by the fish farmers without charging it to the donor agency’s grant.

#### **8) *Schedules, procurement procedures and logistics***

The timing of activities has to be carefully considered in project design and planning. Delay is a recurring theme in the implementation - and in many cases the launching -- of emergency projects. In Aceh, the pond rehabilitation activities required more

time than anticipated to achieve full completion due to climatic conditions. Delays in project start up in some areas caused execution to occur during rainy seasons. Implementation plans therefore need to be carefully developed to relate to seasonality of production to prevent delays.

In Laos, the project itself was delayed so that the original purpose of recovery from a disaster was shifted to simply better production. Throughout its implementation, it was often plagued by delays attributed to procurement policy and procedures abetted by poor planning and logistics. In addition, the failure of the project design to consider the time it would have taken to select the beneficiaries and deliver the inputs through Government's channels created a situation in which fingerlings were distributed when the ponds did not have water.

#### **9) *Marketing and market access.***

The low productivity of local aquaculture practices from many individual farmers would have made individual marketing efforts relatively costly for lack of scale. There was need therefore for a coordinated collective production to achieve viable volumes of product for export, and to capture the economic growth opportunities possible through access to better markets for the product (in Aceh, shrimp). Farmers were organized into clusters for better adoption of good practices and higher economy of scale. Built into the better management practices were attributes for better market access: the products were safe and of good quality and the farming practice was environmentally friendly. These attributes were highlighted in promoting the sector, its image and its products to buyers. The project also cooperated with another project in Aceh (the World Bank's International Finance Corporation) that was providing services for linking importers or representatives of importers with local producers and exporters.

#### **10) *Tracking progress***

Provision of assistance to farmers is not a one way no-obligation transaction. Beneficiaries have to be accountable for the implementation or proper use of the assistance. This requires a good monitoring system. In the Aceh project, monitoring of community project implementation focused on farm and facilities design and layout, BMP adoption and group organization. Technical monitoring was needed from the beginning of project implementation to ensure farmers follow their agreed plans and technical guidelines. In the Laos flood rehabilitation project, monitoring was

### **2.1.3 Sustainability**

#### **1) *Ensuring continuity***

A project always has to face the question of what happens after it terminates. This is a planning but also a technical issue. In Aceh, since brackishwater farming had significant technical constraints before the tsunami its rehabilitation was seen to take a longer time than the project life span of four years. The technical issues were therefore related to capacity building and research and development than the project span could offer. In the end, the project had to decide on its final year to include, with additional funding, a mechanism for continued technical assistance to producers by establishing and starting up the Aceh Aquaculture Communications Centre and the Aquaculture Livelihood Support Centres.

#### **2) *Link to long term development***

Aceh is probably atypical for aquaculture because of the extent of devastation - more than 30,000 ha of tambaks were damaged, the cages in Aceh and Nias were destroyed and much of the support services was paralysed or destroyed. But the lessons are useful anyway in the way the assistance to fisheries and aquaculture were fully guided by the build-back-better concept and put into practical application by the holistic

strategy and sustainable livelihood approach to the rebuilding programme. The initial planning conferences among donors and development agencies had set five years as the period for reconstruction, which became the commonly accepted target for all the assistance projects and a basis for developing their exit strategies.

The challenge arises in deciding not so much at what point and when to exit as what the project should accomplish to achieve a take off point for sustainability, how much resources it requires and how long it takes to achieve such a take off point. Invariably the exit strategies of the various assistance projects in Aceh went beyond restoring productive capacities. The strategies were built on the institutionalization of policies and the establishment of robust administrative, technical and economic support systems that provided some assurance of sustainability to the livelihood development projects. For example, the Aceh project established among other local institutions sustainable livelihood centres run by the farmers, promoted the establishment of farmers associations, developed better management practice guides and promoted these through intensive training of farmers, and established links between the producers and buyers.

On the other hand, the Laos flood response did not seem to have any strategy to sustain what the project set out to establish. There was no link to national policy or to provincial development strategies. At evaluation time, there was a significant amount of unspent project funds which the evaluators recommended should be used for “more targeted and focused follow up activities”.

#### 2.1.4 Inclusiveness

##### 1) *Participation*

One of the socio-cultural (and sometimes political) issues in the provision of assistance is that a few are more active and thus tend to appropriate more of the benefits for themselves. The characteristics of aquafarmers in Aceh for instance is that very few are active farmers (they voice out their opinions and demands and tend to be insistent in having their demands met but they also exhibit leadership qualities) and the majority are passive (they tend to just go along with their more active compatriots). The situation occasionally led to non-transparent project administration and attempts to capture the benefits by the few active farmers. To ensure participation and transparency among group members, intensified meetings with village groups before and after fund disbursements in particular were required through active facilitations by field facilitators. This encouraged community awareness in project administration and implementation.

The aquaculture assistance component was implemented as a “whole village” approach to rehabilitation. This was arguably more equitable and effective in rebuilding the sector than focusing on individual farmers or smaller geographical units. Verification of groups plan, site selection, and environmental checking were critical to improve success rate. These assessments helped support better implementation and increased group participation and productivity.

The tsunami rehabilitation of NACA in an island community in Southern Thailand used four occasions to identify and subsequently agree with the community the package of technical assistance they needed, namely, an FAO-Ministry of Agriculture and Cooperatives (MOAC) damage and needs assessment survey, a tsunami rehabilitation conference held in Phuket, and two meetings at the village level with the community representatives. The process assured that the most vulnerable members were given priority assistance for cage construction apart from focusing on essential and priority needs that NACA and its project partners could realistically meet.

## 2) Beneficiary selection

The ETESP-Fisheries was formulated as a sectoral project so that during community consultations, this inevitably led to sectoral group selection which left dissatisfaction among non-beneficiaries in some communities. The lesson from this is that community approach and development impact could have been strengthened through a more integrated multi-sectoral approach.

The Philippine post-typhoon rehabilitation project had apparent problems with targeting; the beneficiaries of the pilot activities were relatively well off, had lands and in fact are progressive farmers, except the participants of the coastal fishery intervention. This was the result among others of inadequate consultation with the stricken communities, although there was extensive consultation with government agencies. But the other reason is the project stipulated that the beneficiary owned a piece of land on which to establish the demonstration project. The exception was the coastal aquaculture (seaweed) and fishery (passive fishing gear) intervention; the beneficiaries were mostly landless.

In the Laos flood response, no representatives from the Youth and Women Unions were engaged in project implementation, nor were they invited to attend the training sessions. It was the chiefs of villages who drew up the lists of trainees, and decided who to invite.

In Thailand, it was the farmers group that selected and nominated the 13 participants to the training in cage culture of grouper arranged by the project with the Coastal Aquaculture Research and Development Center of the Thai Department of Fisheries in Krabi Province.

## 2.2 IDENTIFYING NEED FOR A RESPONSE TO AQUACULTURE OPERATIONS IN AN EMERGENCY CONTEXT

The Response Analysis Framework is a systematic guide to identifying the need for and kind of response to an emergency situation. For a more specific guideline that applies to aquaculture, the draft Guidelines for Fisheries and Aquaculture Sector Damage and Needs Assessments in Emergencies: January 2010 (NACA *et al.*, 2010) lays out the principles, procedures and detailed information needed for damage assessment and sector needs assessment. These apply especially to sudden onset disasters but also to harmful algal blooms and drought, which usually affect many if not all economic sectors, not only aquaculture. A concise conceptual and methodological guide that focuses on livelihoods in the analysis of impact and identification of responses is found in the *Livelihood Assessment Toolkit, First Edition* (FAO/ILO 2009). Volume 2, on developing a baseline and contingency plan, describes the types of information and their sources that are needed in making a post disaster needs assessment and identification of response options.

As far as the author is aware, the only example of an actual assessment of impacts and needs for aquaculture rehabilitation from a catastrophic event is the work of M.J. Phillips and Agus Budhiman, which was organized by FAO soon after the Indian Ocean tsunami of 2004 and carried out in the stricken areas in Indonesia (Phillips, M. and A. Budhiman. 2005).

### Box 3 – To aid or not to aid?

An important consideration is the kind of response to a disaster that has severely impacted a largely industrial scale aquaculture sector. The investors and operators' capacities and access to resources would likely preclude a response that is normally given to poor and small scale aquaculture communities. The crop and structures are likely insured. Market-based but easier-term loans to enable them to rebuild and resume operation, and technical advice from government scientific institutes, would likely suffice for their recovery. A related question is whether their workers, who would likely be out of employment until the industry recovers, should be provided relief assistance and temporary employment by government. The industry, if it has been socially responsible, would have established a scheme to address this exigency. A more difficult situation is when the sector that is struck by disaster consists of small, medium and large scale operations, as with the milkfish (*Chanos chanos*) industry in the province of Pangasinan in Northern Philippines<sup>6</sup>. An emergency response is imperative but its management and implementation would have to be done carefully so that the major share of the benefits from the response is not appropriated by the larger operators. The presence of a well-run association or federation in which all of the farmers are members, would facilitate decision making that is participatory, transparent and equitable. In its absence, the response will have to exercise much care that opportunistic behaviour (such as rent seeking and free riding) is prevented or at least minimized.

#### 2.2.1 Assessment of need for a response to slow onset biological risk events

The first part of this section deals with epizootics, harmful algal blooms or HABs, and hypoxia because the responses to these risk events, which are meant to enable the maintenance or resumption of aquaculture operations are largely technical in nature, although with an epizootic, an emergency response may involve a government directive and a regional alert to contain the spread of the disease across boundaries (Reantaso *et al.*, 2005). The second part will deal with the sudden onset natural disasters.

1. Epizootics are hazards that usually impact on aquaculture (but sometimes on wild fish populations) so that the immediate response is invariably very specific and technical in nature (although a policy such as a restriction or ban in the trade and movement of fish and an information strategy are needed). If an effective early warning system is in place, or the problem is detected early, the response to an epizootic – to keep the sector operating – is a containment measure to prevent the spread of the disease to uninfected areas, on-farm protection measures to prevent entry of disease in uninfected farms, destruction of stocks in infected farms, an epidemiology to determine the origin and pathway of the pathogen, and a diagnosis to identify the causative agent, if it is unknown or not fully ascertained. The post-emergency responses to a disease emergency are embodied in the concept, biosecurity, a holistic strategy that encompasses movement of live animals, quarantine, seed production, certification and distribution, feed production and distribution, culture and post harvest processing, trading, and veterinary products and their usage. The scope is from the farm/hatchery to national, transboundary regional and international levels. Seed provided to farmers to re-start operation for instance would be subject to certification and quarantine procedures.

In the disaster cycle, this post-disaster risk mitigation response is also the mitigation measure to the impacts of future risk events. Biosecurity as a

<sup>6</sup> The milkfish aquaculture sector in this province comprises a mix of systems, namely brackishwater pond culture systems whose areas range from less than five to more than 100 hectares, shallow coastal pen culture of tens of hectares of enclosures, and near-shore floating cages.

Policy, legislation and enforcement	Zoning
Risk analysis	Emergency preparedness
Pathogen list	Research
Institutional structure	Information system
Health certification and quarantine	Human resources development
Surveillance, monitoring and reporting	Regional and international cooperation

mitigation measure becomes embedded in a national aquatic animal health strategy, which has these essential elements (Reantaso and Subasinghe, 2008):

2. Harmful algal blooms or HABs, particularly red tide events, while at times only impact aquaculture can create conditions that have adverse effects on coastal communities, on services especially those associated with tourism, on wild fishery and in some cases, on people's health. An early warning system would prepare the aquaculture sector for a HAB event. For cage culture of marine fish, farmers could move their cages to an area that may not be impacted if that option is available or harvest the harvestable sizes, or transfer the fish to land-based tanks. For bivalve farms, farmers could harvest the harvestable sizes otherwise there is no way to prevent contamination of the standing crops. An option is delayed harvesting (if the HAB species is not fatal to bivalves) and public assurance through safety tests of the quality of the products. Inevitably, public perception of the quality and safety of the harvests will be adverse and demand for all seafood products will decline (Hoagland, 2008). Commercial scale farms and traders as well as retailers could very well weather financially the impact of an HAB. However, a crucial post-disaster assistance once production and harvests have resumed is the provision of a food safety and quality test and enforcement of a regulation that assure that all seafood products are safe. This would prevent any product from causing some health problem, and creating widespread aversion to the product and hostility to the industry. Closure of growing areas that are repeatedly impacted by HABs can be a mitigation measure but small farmers usually lack the resources to move not only their operations but their entire household. And in developing countries with dense coastal populations competition for water space is intense and access to suitable growing areas would be extremely limited. Fishing is hardly an alternative because wild catch would either be contaminated or the perception of their safety and quality attributes equally compromised. Fishing in other locations that are not affected by HAB could be an option. Land-based alternative livelihoods including pond aquaculture would be fallback measures. HABs do tend to create a better market demand and higher prices for brackishwater pond-cultured marine fish as well as freshwater fish.
3. Hypoxia from various causes including pollution in enclosed bays and inland lakes have caused massive fish kills of cultured species (in cages and pens) such as the recurrent ones in the Philippines. Responses have ranged from reducing the density of culture units to good management practices especially feeds and feeding. In one extreme measure, the local government declared the closure of the entire lake to cage culture. A wider and more strategic response from the Philippine government was the Philinaq project (described in Appendix 4), which included farm level better management practices, area management and regulation by local governments, organization of fish farmers associations, and technical services such as environmental monitoring, training and extension. These were mitigation responses meant to reduce the likelihood and magnitude of risk of future occurrences.

### 2.2.2 Assessment of need for a response to sudden onset risk events

For the sudden onset and severe disasters, the draft “Guidelines for Fisheries and Aquaculture Sector Damage and Needs Assessments in Emergencies” (NACA, *et al.*, 2010) prescribes a process of three interrelated elements: (1) Baseline, (2) Initial Impact Appraisal and (3) Detailed Sector Assessment. Baseline provides a picture of ‘normal’ aquaculture patterns in areas at risk from natural hazards; Impact appraisal provides the early disaster response appeals with a set of figures that define the overall requirements for rehabilitation and reconstruction so that the process of mobilizing funding can begin; and Sector Assessment provides a thorough assessment of the impact of disaster on livelihoods and identifying opportunities, capacities and assistance needs for recovery at household, community, and local economy levels. It describes a stepwise process including the timing composition of the assessment teams for each element, the kind, breadth and depth of information and their purposes, and the process to arrive at decisions. This discussion paper recommends the adoption of Appendix 3, “Aquaculture: of the draft Guideline and suggests that the Appendix include one more set of responses, the provision or rehabilitation of the market link by improving market access for aquaculture products. The Aceh tsunami rehabilitation assistance amply illustrates the importance of enabling better market access. It is also proposed that these purposes are considered during the damage and needs assessment:

1. from the baseline information and damage appraisal, identify:
  - the weaknesses and strengths in the sector before the disaster
  - what weakness could have induced the most damage
  - which strengths could have contributed to reducing potential damage
  - the critical linkages between aquaculture and other sectors that can (a) abet and (b) lessen damage on the aquaculture sector
2. from the needs appraisal, identify:
  - the key issue that would lead to the resolution of a wider set of issues
  - the key interventions that can provide the best possible recovery outcome
  - the most efficient pathway to recovery

### 2.3 LINKAGES THAT SUPPORT TO AQUACULTURE POLICY AND OPERATIONS HAS, WITH OTHER SERVICES, PROVIDED TO THE FISHERIES SECTOR IN AN EMERGENCY RESPONSE

The tsunami of 2004 has provided a rich source of examples that illustrate the linkages of the support provided to the fisheries sector and the aquaculture subsector. The capture fishery sector invariably suffered the greater losses (in all stricken countries) mainly from the destruction of boats and gears, and damage to facilities such as landing sites, processing plants and ice plants. On the other hand, as fishery resources were not or hardly affected, the restoration of the boats and gears (as well as a reliable supply of ice) enabled fishers to soon resume fishing, earning income and supplying fish to the coastal population. Aquaculture and crop and livestock farming would take time to recover. Priority was therefore given to capture fishery for recovery assistance. Measures to assure food and nutrition security to the entire population included food aid, which would have been urgent at the start but less so with the recovery of capture fishery.

There were four types of support to the capture fishery sector: (a) ensuring food and nutrition to the fishing community which in the context of an emergency was mainly in food aid, soon followed by (b) enabling the sector to resume fishing by replacement or repair of boats and gears and to earn income by (c) restoring the post production facilities and market infrastructure, and (d) policy and management that facilitated the provision of the production, post harvest and market support but also – when it was realized that it was getting out of hand -- to control fishing capacity (FAO, 2007).

Food aid as an emergency support was given to the entire coastal population (at least in Aceh). An extended assistance in subsidized food can depress the price of locally produced fish from capture and culture although this probably was not felt in Aceh because of the suddenly increased purchasing power from a large population of expatriates.

Aquaculture directly benefitted from the restoration of infrastructure (ice plants, processing plants and roads) and market support although the repair and maintenance of numerous boats and gears would have at times competed for labour and material with the repair of aquaculture cages. An indirect benefit to cash-crop and export oriented aquaculture from the restoration of fishing capacity is that the aquaculture sector was able to focus on restoring its capacity to produce the export-oriented products (shrimp and high value reef fish) to generate income. This was the same situation in Thailand. The earned income from exports would have added to the recovery and growth of the local economy. In Southern Thailand, the repair of fishing boats directly benefitted cage culture of marine fish by the renewal of supply of low value/trash fish for fish food. In many cases cage culturists were also fishers (but they targeted food grade fish and used the bycatch and degraded fish while on board for feeding their stock). This, to be sure, was not in line with CCRF provisions, so that subsequent technical assistance included training of farmers in better cage culture practices that introduced them to the environmental and economic advantages of using formulated feed over low value/trash fish.

Policy and management support to the fishery sector was initially on the improvement of technical capacities to fish better. This soon shifted towards managing the capacity of the entire sector, re-imposing fishing regulations to prevent overfishing, as well as improving fishing practices, safety and welfare of fishers, food safety and quality. The latter were soon implemented in the form of better management practices for aquaculture and food safety standards for and certification of aquaculture products.

A major development was the refocusing of policies, management and technical support towards the sustainability of livelihood assets. This new emphasis on sustainable livelihood became the key to addressing the wider set of environmental and social issues.

## 2.4 SUMMARY OF LESSONS LEARNED

### 2.4.1 Technical considerations

#### 1) *Manpower*

- Response to a disaster invariably requires quick action and the appropriate expertise to carry out the activities. In most disaster recovery efforts, local expertise needs to be complemented by external specialist expertise. Familiarity with the social and economic circumstances, culture and political dynamics of the area makes the local personnel invaluable to the work of the team.
- Expert advice in project design and planning would also benefit from local and external expertise and a blend of the management and technical expertise needed for aquaculture rehabilitation. A livelihood expert, usually overlooked, should be a member of the team.

#### 2) *Inputs*

- Timely provision of quality inputs increases the successful technical outcome of rehabilitation. This requires reliable sources of quality seed and feed, efficient logistics for delivery, and training in the use of the inputs. It also requires additional investment in technical assistance to raise awareness of selecting good quality seed, supporting communities to prepare good planning documents, linking communities to quality suppliers, and hands-on training in better management.

- Contracting systems can be developed to procure quality seed through a special contract between farmers and hatcheries that include disease testing and fitness of the fry or fingerlings.
  - The choice of species of fish to provide farmers is a critical technical issue. Farmers should be consulted before a species is decided on and seed is procured.
- 3) *Training*
- Training is both a technical input to assure production success and an opportunity to introduce better management practices.
  - The timing should be such that it immediately precedes the distribution of inputs.
  - Content and presentation should be interesting, practical, relevant and within the comprehension of the farmers.
- 4) *Collective effort and contractual arrangements*
- Individual restoration efforts of farm structures are remarkable but may not be as effective as a collective effort.
  - Direct contract to farmer groups through community contracts could be more effective in the rehabilitation of ponds and organizing inputs than the use of private contractors.
  - Contracting of farmer groups needs more time and effort in technical assistance from the project staff and more participatory planning and design and implementation to assure quality of construction. It was slightly different in the Thailand case; the association had a mutual savings and revolving fund which the association decided to lend to families that sustained the most serious damage. Nonetheless the rebuilding of cages and ponds needed financial input and materials, which were soon scarce and expensive.
- 5) *Time frame*
- This is a critical factor in emergency response. It has to be carefully considered in project design and planning. Implementation plans need to be carefully developed to relate to seasonality of production to avoid a situation when inputs, for instance, are distributed when water is scarce or not available.
- 6) *Better management practices and market access*
- The restoration of production is not a sufficient goal; the farmers have to be able to sell and earn a reasonable return from their products. They can achieve scale with a coordinated collective production and marketing.
  - A better access to market is linked to better quality product and reliable supply. Built into the better management practices are the attributes that improve market access as the products are safe and of good quality and the farming practice is environmentally friendly.
  - For an export commodity, linking the farmers to buyers is desirable. Quality and environmentally friendly practices should be highlighted in promoting the sector, its image and its products to buyers.
- 7) *Tracking progress and compliance with contracts*
- Beneficiaries have to be accountable for the implementation or proper use of the assistance. This requires a monitoring system that can capture status and problems of project implementation. Technical monitoring should start with the beginning of project implementation to ensure farmers follow their agreed plans and technical guidelines.

- The monitoring of impact often gets overlooked in M and E systems that focus on expenditures and delivery. As in the Aceh project, the bases of impact assessment were the uptake of improved practices, farm yields and aggregate outputs, and farm profitability measures. These are practical and objectively verifiable indications of impact.

#### 8) *Ensuring continuity*

- A project could leverage additional assistance when it phases out but it is always desirable to lay the groundwork for the continuation of the recovery initiatives by capacity building of local institutions, establishing a mechanism for the beneficiaries to continue the essential technical support services, and ensuring take up of the lessons and recommendations for sustainability in provincial, state or national policy.

### 2.4.2 Planning issues

#### 1) *Initial assessment*

- The response analysis framework (RAF) was either in its rudimentary form or non-existent before the tsunami of 2004. It would be important to train assessment teams in its concept and application. This will standardize assessment procedures and facilitate a common understanding of the results among agencies and personnel involved in the response.
- Assessment of needs should realistically consider the resources available, time frame for a project, and the time it takes to mount the response. As to the latter, the assessment team must indicate the latest acceptable time for project start before its usefulness is severely diminished by delay.

#### 2) *Linking the response to long term development*

- The rehabilitation project should be aligned to the national development strategy and the sector development plan.
- The results and lessons from the project should be institutionalized into national and local (provincial or state) policies and strategies.
- The sustainable livelihood approach to the rebuilding programme enables a long term perspective to the planning and implementation of the response.
- Building into the response the improvement of ecological and social resilience and adaptive capacity will enable the community to manage better any future risk impact including those from climate variability.

#### 3) *Participation*

- A whole village (or district) approach would minimize the risk of excluding some segments of the population.
- Consultations with the communities should ensure a broad and democratic participation to avoid decisions that are heavily influenced by a few people or which reflect narrow interests.
- During the course of the project, the results of monitoring should be brought back to the attention of the community to sustain interest and group participation.

#### 4) *Technical support*

- Local government agencies should be engaged as partners at the start, which includes building their capacity for implementation.
- The project should as much as possible source expert assistance and workers from the locality and institutions in the area.
- NGOs are an effective partner in focused activities in which they have distinctive competence.

- Government ministries are needed for their technical and in most cases political support; they should be actively engaged in the design, planning and execution of the response.

#### 5) *Coordination*

- A structured program approach for rehabilitation is an essential part of the assessment of needs. It should include these coordination elements: (i) financial and technical assistance to support diverse needs over the area targeted for rehabilitation; (ii) mechanisms for delivering support; (iii) targeting of support based on needs; (iv) matching the needs with the available technical and financial assistance and (v) integration of a livelihoods approach with the other forms of assistance.
- A project information system built into the Monitoring and Evaluation and includes a public information function will enhance sharing of experiences among project staff and components, coordination of project activities, and public awareness of the activities.
- Partnership should be forged with different agencies operating in the area for effective and coordinated action.
- Working relations with local government agencies should be clear and formalized in an agreement.

#### 6) *Monitoring and evaluation*

- Periodic reports of performance against the actual delivery of outputs and budget expenditure is the staple of an M&E system but it is also important to capture impact or indicators of impact of the project.
- Impact assessment can be based on the uptake of improved practices, farm yields and aggregate outputs, and farm profitability measures. These can provide a justification to donors for increased support and identifying key areas for improvement.
- A project level M&E unit can facilitate compliance with the reporting requirements of government or a specialized rehabilitation agency as well as of donors.

#### 7) *Beneficiary selection*

- A widely participatory consultation during assessment, in project planning and launching with all stakeholders can identify better beneficiaries of project assistance.
- A sectoral group selection will inevitably leave out segments of the population that are not engaged in aquaculture. This makes it even more important to have an integrated and intersectoral approach by coordinating with other agencies providing assistance to other sectors.
- A transparent and participatory process of beneficiary selection will avoid discontent or hostility and engender better participation and support from the community.

#### *Standards and procedures*

- Minimum acceptable standards of quality of procured goods, service contracts and other inputs should be set and made clear to suppliers.
- Standard procurement procedures facilitate procurement decisions and serve as a protection against complaints or false claims. However, the procedures should be streamlined to avoid undue delays.

### 2.4.3 Cases

#### 1) *Backyard catfish farming for food security after a prolonged flooding*

Sources: (a) Pongthanapanich, T., Bueno, P. & Sungkhao, J. 2011. Pilot testing of indicators for measuring the contribution of small-scale aquaculture to sustainable rural development: Thailand case study. In M.G. Bondad-Reantaso, P. Bueno & T. Pongthanapanich, eds. *Indicator system for assessing the contribution of small-scale aquaculture to sustainable rural development: outcomes of pilot tests*. FAO Fisheries and Aquaculture Technical Paper No. 545. Rome, FAO; and (b) Personal communications from several visits to the model farm with the Head of the Tambon (Village) Administrative Office (TAO) and farm overseer.

A prolonged flooding of the Chao Phraya River in 2007 submerged fishponds and rendered the river and its feeder channels in the affected areas unsuitable for floating cage culture. One of the municipalities severely affected was Ang Thong province, 100 km north of Bangkok. Fish ponds would take several months to recover. A project was developed with Royal patronage to enable the flooded communities to grow fish for home consumption while the farms and other means of livelihood were being rehabilitated. A simple response was the raising of hybrid clarias catfish – a fast growing and preferred species – in small backyard ponds. Household beneficiaries were given seed, feed and a sheet to line the 5 m x 3 m earthen pond that they had to build with their own labour and resources. Technical advice was provided by the government fisheries extension service. The project achieved its objective of producing fish in a short period (two months, with the provision of bigger fingerlings) for community consumption. A number of the participants retained the ponds and continued growing catfish. The success further earned the interest and more support from the Royal patron: a larger project was developed which was a demonstration and training farm on self sufficiency agriculture i.e. integrated farm.

The case illustrates the advantage of a simple and practicable response that has a focused objective -- to produce fish quickly for food security while recovery is going on. Providing bigger fingerlings so that the people could harvest table size fish over a short period was an inspired technical touch. The larger project that was built on its success demonstrates that a successful initiative can be used to leverage further support.

#### 2) *Laos flood rehabilitation assistance*

Source: see Appendix 4

From the numerous lessons coming out of this experience, one that is of a delicate nature and invariably faces managers of externally funded projects is important to highlight: shared responsibilities and ownership. There appeared to be limited ownership felt by government stakeholders in planning, and implementation including budgetary decisions. Additionally, it was much later and already in the implementation phase when the project was included among the responsibilities of the National Project Coordinator in the Ministry of Agriculture. This omission basically put the project low in the attention of government. The more critical issue was the complaint of lack of involvement of the two agencies in budget decisions. This was code for a wider range of grievances of the government with the project implementation but also a very direct reference to the financial aspects of it. This is an issue that invariably appears in projects with external funding and there is no hard and fast rule to deal with it except to be transparent in transactions, adhere to standard procurement procedures, preferably streamlined to facilitate procurement of inputs and services. This should be made clear with all partners and concerned agencies at the start.

### **3) *Strengthening Capacities for Climate Risk Management and Disaster Preparedness in Selected Provinces of the Philippines***

Source: Bueno, P. B. Report of an assessment of the impacts and potentials of the Fisheries and Aquaculture Good Practice Options under the project, “Strengthening Capacities for Climate Risk Management and Disaster Preparedness in Selected Provinces of the Philippines” submitted to FAO, Dec 2011.

The initial driver of the assistance was a sudden risk brought about by an extremely powerful typhoon. The project was however executed more than two years after the appeal was made. It was meant to enable farmers, fish farmers and fishers to resume production as quickly as possible the intervention was the on-farm or on-site demonstration of improved aquaculture and fishery technologies, called Good Practice Options. The project produced a good portfolio of Good Practice Options which could be integrated in a livelihood development programme, which in turn would be part of a wider programme for strengthening resilience and adaptive capacities of farming communities. However, the institutional arrangement for project implementation and especially the monitoring of progress and provision of guidance to the farmers did not work effectively. The lack of direct administrative linkage between the specialist institutions (the Bicol University) over the municipal agriculture offices was the weak link. In addition, it was subjected to the standard and lengthy procedures for public procurement of goods and services, which among others resulted in delayed stocking and inability to take advantage of the dry sunny days in the region to produce a better growth of planktons and promote better nutrition. The cropping period did not fit the climatic pattern. Finally, the actual beneficiaries were not the very poor; the demonstration farms and their owners are progressive and productive except for the seaweed and squid fishery which are suitable for the poor and landless.

The positive lesson from the case is that a focused technological response to a natural disaster has the flexibility to be expanded in scope to enhance the livelihoods of farmers and small fishers through the farming systems approach. The negative lessons included excessive delay in initiation of the response itself, delays in procurement of inputs which lowered efficiencies and would have affected farmers’ attitudes toward the project and a weak administrative link between project coordinating unit and field implementation agency

### **4) *Response to the Koi Herpes Virus outbreak in Indonesia (Government of Indonesia, NACA, FAO, OIE, and ACIAR)***

Sources: (a) Reantaso, M.B. & Subasinghe, R. 2004. Review: Koi Herpes Virus (KHV). *AquaCulture AsiaPacific Magazine*, 22–23. November/December, (b) Personal communications with Dr Melba Reantaso, FIRA; (c) The case is also informed by the author’s direct and official involvement in the response.

The KHV virus outbreak in Indonesia in 2002 was already beginning to cause extensive damage and losses to ornamental carp growers and the generally poorer but more numerous common carp farmers. The virus was spreading in Indonesia and had a high probability of spreading to the other counties in Southeast Asia. The emergency assistance that was immediately organized was to identify the pathogen, contain its spread, mitigate its impact on farms, and establish its pathway, in other words, conduct an epidemiological study. These were achieved in a short time by a team of three regional specialists working with a team of Indonesian disease experts. This emergency response was subsequently expanded into a regional assistance programme, developed by NACA and FAO and provided TCP assistance by FAO. The scope of the regional programme included the entire range of technical, strategic, capacity building, regulatory and policy issues in aquatic animal health management. The assistance programme was in line with Indonesia’s national aquatic animal health management strategy, placed in the framework of the Asian regional aquatic animal health programme developed

and assisted by FAO, NACA, and OIE (the World Animal Health Organization). The entire effort eventually involved numerous national, regional, and international institutions and agencies including private industry such as a multinational veterinary service and product firm.

The major lessons include the importance of a strategic and policy framework for the response; the ability to mount a quick and timely response without being encumbered by institutional bureaucratic procedures; the capacity building of local institutions and personnel for containment of the epizootic; the application of relevant global technical expertise and scientific procedure; and the development of a regionally relevant follow up action with a broad scope, which was regional cooperation and capacity building on biosecurity.

#### 5) *Tsunami response, Aceh (FAO and NACA)*

Source: see Appendix 4

A major strategic lesson from the responses of FAO and NACA was the engagement of other organizations, institutions, and projects for a broad collaboration as well as for specific project-based joint activities; this was in line with the cluster approach. The second lesson relates to sustainability: the concept and practice of sustainable aquaculture developed and promoted by the response was embodied in the Best Management Practice manual that was produced and promoted widely for adoption. A corollary of this lesson is institutional learning: the project benefited from expertise and information already developed elsewhere by NACA and FAO in BMPs' adaptation, use in farmer and extension workers' training, demonstration, supervision of their implementation and monitoring of the impact (Padiyar *et al.*, undated).

#### 6) *Cyclone Affected Aquaculture Rehabilitation Project (CAARP), World Fish Centre-Bangladesh with USAID financial support.*

Source: Compilation of Donor Funded Projects Active in Aquaculture provided to the author by Dr. Mahmudul Haq Chairman, Bangladesh Shrimp and Fish Foundation, 17 April 2012, World Fish Centre Bangladesh Headquarters, Dhaka.

The project was a response to the destruction inflicted by Cyclone Sidr on five coastal districts in the southwest region in 2007. The project benefited 37 500 small fish farmers who were provided fish and prawn seed, feed, lime, fertilizers, oil cake, equipment, medicine and clothing. Dikes and ponds were repaired and cash incentives given. Farmers were trained. The lesson from this assistance is that a massive and complex response to a disaster can be facilitated by partnership with civil society organizations which have had a long experience in working at grassroots level in the area. Eleven NGOs operating in different parts of the area and possessing various distinctive competences were engaged by the lead agency, the World Fish Centre, for various kinds of work. It does need an effective coordinating mechanism to maintain good control of and provide proper direction to the numerous organizations working with the beneficiaries on similar as well different tasks.

#### 7) *Severe winter in China that killed broodstock, fingerlings and grow out stock*

Source: Miao Weimin, FAO RAP Regional Aquaculture Officer, Bangkok. Personal communications, 19 April 2012.

A severe winter in 2010 that affected nearly all of China killed broodstock and standing crop of mostly tilapia (China is the largest producer of farmed tilapia in the world) and cobia, and damaged farm structures and snapped power lines and poles in counties and rural areas that supply electricity to farms and hatcheries. The northern regions, which grow mostly Chinese carps, which are not coldwater species but can tolerate cold temperature, did not sustain much damage except to farm structures that collapsed under the excessive weight of heavy and prolonged snowfall. The farms

in the southern and eastern provinces growing tilapia and cobia were the ones that suffered most, in mortality of stocks and destruction of physical assets. To mitigate the impacts of similar severe winters, generally expected to occur more frequently, brood farms and hatcheries in the south and east have set up greenhouses for the broodstock and hatchery tanks, installed back-up power generators, and increased the depths of culture ponds (a deeper water affords more protection to stock from a very low air temperature). Farms in the north have redesigned farm and hatchery buildings to increase their strength and reduce pile up of snow on roofs.



## 3. A review of the existing standards and guidelines that relate to the support for aquaculture operations in the context of emergency response

Guides for three domains of operation are described, namely, the fundamental, sectoral and procedural. The SPHERE Handbook which elaborates the Humanitarian Charter and the Sustainable Livelihoods Approach (SLA) can serve as the basic guides for planning and executing a response to any disaster. The guides specific to the fishery sector are the CCRF, Ecosystems Approach to Fisheries Management and the CONSRN Strategic Framework. Recommended as procedural guides are the Response Analysis Framework, Livelihoods Analysis Toolkit, and the Assessment of Needs and the Impacts of the 26th December 2004 earthquake and tsunami on aquaculture in the Provinces of Aceh and North Sumatra, Indonesia.

### 3.1 FUNDAMENTAL GUIDES

#### 3.1.1 Humanitarian Charter

In severe risk events that need humanitarian assistance, aquaculture will be one of the sectors, but probably not the principal sector, to be impacted. Agencies with the mandate and capability to render relief, rescue and other humanitarian operations will take precedence over the rehabilitation mission of technical agencies. Their approach will most likely be in line with the Humanitarian Charter ([www.sphereproject.org](http://www.sphereproject.org)). It will be important, nevertheless for the more focused relief and restoration work in aquaculture to adhere to the four protection principles and observe the core standards of the Charter. And it would do well for the fisheries and aquaculture agency to integrate their efforts with those working on the broader agricultural sector and avoid a narrow aquaculture focus.

#### 3.1.2 Sustainable Livelihood Framework

This framework provides the critical element -- sustainability of livelihoods -- into otherwise heavily technical project assistance to the aquaculture sector, whether geared for emergency or long term development (see Rakodi and Jones, 2002). The sustainable livelihood focus is the key to addressing the wider issues of environmental and social responsibility, and the fundamental issue of poverty in the context of farming household.

### 3.2 SECTORAL GUIDES

#### 3.2.1 Code of Conduct for Responsible Fisheries

The Code's aquaculture provisions (Article 9) and the various technical guidelines that have been developed or are being drafted are a source of useful reminders when developing an emergency response and more so when the emergency phase slides into the long term development phase. The five provisions of the Technical Guideline

for Article 9 implementation, with provision No 5, “Responsible aquaculture at the production level”, as the core can be adapted as the framework for the technical part of the intervention.

### 3.2.2 Ecosystems Approach to Fisheries Management

The concept and methodology of EAF is in a way the reciprocal of SLA. While SLA looks at the relations of the resources to the livelihood strategy of the farming household, EAF brings back into the household perspective the role of the resources in its pursuit of livelihoods. The extension of fisheries management from a conventional approach to be consistent with EAF essentially involves the ‘managers’ of the fishery asking four questions about how their fishery contributes to sustainable development. These questions serve as checklists for planning an emergency response in aquaculture:

- What impacts are the fishing activities we manage having on the target resources, the dependent and associated species, and the ecosystems that we are responsible for?
- What impacts are these fishing activities having on the resources or other human activities that are managed by other agencies/sectors?
- What are the economic/social benefits and costs of these fishing and other related activities to the sector and to society as a whole?
- What other human activities and other drivers beyond our fishery management control are affecting the fishery’s capacity to reach their management objectives?

### 3.2.3 CONSRN Strategic Framework

The framework was specifically developed for the post tsunami rehabilitation efforts but it can apply to any natural rapid onset disaster and drought. It addresses a range of capacity-building issues that include policy and institutions, livelihood assets, and environmental and resources management. It contains six guidelines, summarized below (CONSRN, 2005).

- Improving policy and institutions, aimed to develop a responsive and well regulated policy and institutional environment for fisheries and aquaculture at national and local level; should involve communities and recognize the importance of local level needs in planning and regulation.
- Providing appropriate physical assets in a timely manner and equitable way to replace what have been lost while ensuring sustainable use of natural resources.
- Restoring the natural environment, while ensuring that coastal communities have equitable access to inputs and the natural resources.
- Providing appropriate financial support, to ensure that the right financial mechanisms are in place for those affected.
- Improving capacity in support of community livelihoods and responsible coastal resource management, in which everyone has a part or representation in decision making, so that the coastal systems are managed for the benefit of everyone in the community.
- Rebuilding of social assets, to ensure the development of communities and community organizations which are empowered to take part effectively in post-disaster planning and rehabilitation activities

## 3.3 PROCEDURAL GUIDES

### 3.3.1 Response Analysis Framework

The Facilitation Guide for a Response Analysis Framework for Food and Nutrition Security Interventions at District Level provides a systematic guide that can be directly adopted for disaster needs and response analysis. The core principles -- consensus building among multiple stakeholders; transparency in decision making; accountability

in implementation of response actions; joint planning, collaboration and coordination; sustainability through integration into routine planning/decision making processes; and replicability through simple methods and building on what exists -- are relevant and directly applicable to addressing the technical and planning issues related to emergency responses in aquaculture.

### **3.3.2 Livelihood Assessment Tool Kit**

In addition to looking at the impact of a disaster on people and their current coping strategies, the LAT approach identifies capacities and opportunities for recovery and increased resilience. It goes further than most assessment methods.

### **3.3.3 Assessment**

An assessment of the impacts of the 26th December 2004 earthquake and tsunami on aquaculture in the Provinces of Aceh and North Sumatra, Indonesia, by Michael Phillips and Agus Budhiman (2005). This is a comprehensive and systematic assessment covering the operational, technical, strategic, and policy factors in impact and needs assessment. Its value is that it is a report of an actual work carried out soon after the disaster struck, and conducted under a very challenging working environment.



## 4. Recommendations for best practice that relate to the support for aquaculture policy and operations in emergency responses

### PREREQUISITES

There are two critical assumptions for the response: (i). *that it is aligned with the national aquaculture development strategy and plan (which in turn is expected to be in line with the country's social and economic development goals); and (ii) that an appropriate recovery plan has been developed and adopted by the stakeholders.* The first assumption is met during the assessment of damages and needs, which can be initiated during the relief and rescue phase, the second during the initial planning for rehabilitation which can be initiated toward the end of the relief and rescue phase. These are the specific pre-conditions:

- The Assessment is validated in a series of stakeholder's workshops preferably at the local and the national levels.
- The rehabilitation Plan understands and responds to the capacity of fish farmers to make the most from the support.
- The Plan for reconstruction sets a logical sequence of action; restoration of production capacity proceeds when essential structures such as dwellings, roads, water systems and energy source as well as markets have been rebuilt or repaired.
- The Plan is endowed with sufficient flexibility to address unforeseen but important influences during the Plan period.
- The scope of the Plan includes extended recovery and preparation for long term development.

### BEST PRACTICES

The experiences and lessons that have been reviewed suggest four key best practice areas: (i) restoration of production capacity, (ii) restoration of livelihood assets and building sustainable livelihoods, (iii) improving management of the restoration and long term development; and (iv) building ecological and social resilience to future shocks. These four best practice areas are linked and build on each other's results.

#### 4.1 RESTORATION OF PRODUCTION CAPACITY

**“The capacity for sustainable production is quickly restored.”**

The priority target of the recovery assistance is to enable the farmers whose farms are production-ready (not damaged or easily repaired) to resume production. The restoration plan aims to rebuild, repair or replace with better design and construction the facilities for culture; identify those common facilities such as water intake systems that are required to support all farms; ensure that the response is timely and takes into account the seasonality of production cycles as well as the capacity and resources for delivery of technical assistance and inputs. It preferably includes a Social Impact Assessment.

The technical aspects of this phase are as follows:

#### 4.1.1 The essential physical components and technical support for resumption of production are in place

At this stage the essential components are seed, feed, farm structures and technical services.

The species, in particular, should be compatible with livelihood strategies, farmers' socio-economic circumstances. The fish farmers should be consulted as to what species they would like to culture. Whichever the farmers choose, ascertain that there are seed sources that are accessible? Ensure that seed are tested and certified for disease-free status; the last thing a recovery effort needs is high mortality from disease or complaints of slow growth and poor performance. A good first harvest after resumption of production is a morale-boosting outcome for the community and the recovery workers. Feed will depend on the species for culture and its important attribute is that it is specific to the species and stage of growth, provided in a timely manner, and its quality maintained. The indicators for the inputs are listed below.

##### 1) *Seed*

- Species provided for culture to replace destroyed stocks are as much as possible the same species that have been farmed before the disaster, screened and assured free of disease.
- Hatchery-bred seed are promoted for culture, and sourced from reputable hatcheries.
- Reputable hatcheries are identified and engaged to provide the appropriate species at a desired size.
- The size of fingerlings is such that it reduces exposure of the stock to risks and enables a quicker harvest.
- Source as locally as possible to avoid stressful transportation of fingerlings; use holding ponds or tanks for fingerlings before restocking programmes start to enable them to recover from the stress of transportation and transport in early morning or late afternoon using appropriate packing densities and containers to further avoid stress.
- Seed are certified and health management measures are taken to prevent introduction of pathogens into the farms.
- Provide recovery assistance to nearby hatcheries.
- Assist hatcheries in procuring certified broodstock.

##### 2) *Feed*

- Formulated feed is promoted to replace low value fish/trash fish if the cultured species is carnivorous.
- A proper feed storage and distribution centre for the community should be constructed to enable large bulk purchases and quicker distribution.
- Where people do not have the capital to procure feed, a certain percentage of the total support costs of fingerlings, nets and feed is given to support a sufficient growth rate in the first period of stocking.
- Source of feed for carnivorous marine species in pen and cage culture could be sourced from fishers' by-catch during the recovery period while introducing farmers to formulated feed to encourage a switch in the future
- Training is provided in proper feed and feeding and health management.

##### 3) *Production structures*

- The farms that are less heavily damaged are repaired next; the ones that are seriously damaged are third in priority. The farms that are less heavily damaged are repaired next; the ones that are seriously damaged are third in priority.

- Facilities for culture are rebuilt, repaired or replaced in a way that strengthens their resilience to future hazards and enhances their contribution to long-term development.
- Density and spacing of cage culture units are made according to the estimated carrying capacity of the water body.
- Designs and construction standards of the facilities are improved.
- In a pond system, the layout of the pond system, intakes and discharge channels are designed to minimize impact of effluent discharge on receiving waters.
- Water intake, distribution, discharge systems are re-designed to improve efficiency.
- Repair, rebuilding or replacement is contracted to the farmer groups instead of to private contractors.
- An environmental impact assessment (EIA) is undertaken.

#### 4) *Technical Support Services*

- Assistance is provided to critical production input suppliers such as feed producers/suppliers, fertiliser suppliers and other supply providers such as ice plants.
- Contracts between input suppliers and farmers are developed with mutually agreed provisions on quality, schedule of delivery and price.
  - A bulk purchase system with a well planned schedule is designed to reduce cost of supplies to farmers and cost of transaction to suppliers
  - A standard for quality of feed and seed is agreed as this would favourably impact on production outcomes. A quality standard is an opportunity to introduce better practices to the input suppliers for them to adhere to the standard.

#### 4.1.2 **Farmers are trained in good area management practices at the areas level and better farm management practices at the production level**

If the farmers have not been organized before the disaster, use the opportunity provided by the recovery assistance to encourage them to form farmer clusters. At a later stage in the recovery period, the clusters will be encouraged to coalesce and form into a formal association. An NGO may be enlisted in forming the association.

The recovery programme should be on a whole community basis (as applied by the ETESP-Fisheries, Indonesia) rather than for individual farmers. This avoids the risk of missing important beneficiaries and increases efficiency of servicing.

##### *Indicators:*

- Tested BMP Guidelines<sup>7</sup> are adapted for farmers' and extension workers' training.
- Training programmes are conducted for farmers and extension workers.
- Farmers are organized into clusters.

#### 4.1.3 **Develop and apply a simple monitoring and evaluation system for the implementation of the production programme and the results**

The overall work plan for the production assistance can serve as the basis for the M and E. The monitoring of its status can be assisted by the farmer clusters through a periodic reporting scheme. Monitoring and evaluating the implementation of the recovery plan and the result of production is done on a cluster or group basis.

<sup>7</sup> There are now available Better Management Practice manuals and good aquaculture practice guides that have been developed for shrimp (India, Indonesia, Thailand, Vietnam), pangasius catfish (Vietnam), carps (by FAO SEC, applicable for Central Asia and the Caucasus), brackishwater and near-shore aquaculture (Philippines), marine cage culture (NACA and FAO for Southeast Asia and China) that have been tested in various situations including the rehabilitation of aquaculture in Indonesia after the Indian Ocean Tsunami in 2004 by NACA and FAO and partner organizations. These are freely available and the expertise has been developed in India, Indonesia, Vietnam and Thailand for their implementation. The principles apply to equivalent aquaculture systems anywhere in the developing world and the practices can be adapted for a particular production system and species.

**Indicators:**

- An M and E system is designed that captures the technical and economic performance of the farms.
- A record keeping form and protocol is developed and the farmers and their wives trained in record keeping.
- A simple cost and return analysis of either the aggregate results or the results of a sample of farms is carried out. This can provide an objective basis for improvements and, should the results be encouraging, a persuasive evidence for farmers to continue adopting the BMPs and improving on their technical efficiency, and to donors and government of the impact of the intervention.
- A project information and communications support system is established.

## **4.2 RESTORING AND STRENGTHENING LIVELIHOOD ASSETS, BUILDING SUSTAINABLE LIVELIHOOD OPTIONS**

### **“Livelihood assets are built back better to support sustainable livelihood options.”**

This builds on the restoration of production capacity. The best practices are as follows:

#### **4.2.1 The Project leverages expertise in livelihood development and training and technical assistance; technical expertise in better management practices; professional and scientific advice from relevant institutions including the NGOs; and microfinance institutions**

**Indicators:**

- Cooperative arrangements are made with relevant institutions as well as individuals to provide – if possible on a voluntary basis – the services of specialists in these areas.
- A framework for cooperation is developed that may include BMP development and training, organizing and managing farmers and women associations, livelihoods development and training, market chain analysis, and microfinance literacy.

#### **4.2.2 Small scale village enterprises preferably based on aquaculture and based on a market chain study are identified and piloted**

A simple but thorough feasibility study should be carried out to assist in selecting the appropriate livelihood options and to inform a strategy for marketing and improved market access.

**Indicators:**

- Selected livelihood options are piloted for demonstration purposes by selected beneficiaries.
- The pilot schemes are financed by market-based financing but if not entirely possible, the start up and operational cost of the project is financed through a microfinance service.
- Both technical and management skills in operating the pilot projects are taught to the beneficiaries.
- Product quality standards are introduced in the pilot projects.

#### **4.2.3 Ability of farmers to better access markets is strengthened through organized marketing, access to market information, and adoption of product certification scheme**

At the start of the recovery process, the aggregate volume of product could be small but pooling the harvest and developing an organized marketing scheme will increase economy of scale. The Better Management Practice guidelines will be supplemented

by the introduction of a quality certification scheme to gradually introduce farmers to this market access tool. The success of adoption of a quality certification scheme will facilitate the introduction during the later phase of the response of an environmental certification scheme or label. The achievements of the farming community should be widely disseminated and used to attract prospective buyers.

*Indicators:*

- Group marketing is organized
- Links are developed between farmers and buyers
- Products are promoted to various markets.
- Product certification for quality is developed
- A marketing information system is established.

#### **4.2.4 Farmers access to market-based financial services is facilitated**

An important service that should be brought as part of project activities is microfinance. An NGO with this service or a formal institution should be engaged to conduct the microfinance literacy training and develop a micro-financing service initially for the livelihood options being piloted and subsequently for the aquaculture sector.

*Indicators:*

- A microfinance provider develops a loan programme for the small farmers and small businesses.
- Loan provisions include an enterprise or farm management plan.
- Farmers and wives are assisted in loan application including developing a simple enterprise management plan

#### **4.2.5 A farmer/women association managed mutual savings fund, if appropriate, is promoted and members are trained in its concept and management**

If there is none yet, a mutual savings fund should be encouraged. It is preferably owned and managed by an association of farmers and women members. This is not an easy and simple innovation to introduce and the project should be careful that the mutual savings fund does not become propped up and maintained by a continuous stream of cash transfer from the project.

*Indicators:*

- Training is conducted on the organization and management of a mutual savings fund.
- Microfinance literacy is included in the training programme.
- Assistance is provided in developing the guidelines in managing and operating a mutual.

### **4.3 IMPROVING THE MANAGEMENT OF AQUACULTURE RESTORATION AND DEVELOPMENT**

#### **“The management of restoration and long term development is strengthened through a balanced combination of mandatory, market based and voluntary management mechanisms”**

This set of best practices builds on the formation of farmer clusters, promotion and adoption of Better Management Practices and good aquaculture practices, which are self-management mechanisms; the introduction of product quality certification as well as product labelling, which are a market-based incentive mechanism; and the compliance with legally set environment standards. Emphasis is given to voluntary and market based governance to improve performance beyond legally set standards

and reduce the strain on local government resources for surveillance, monitoring, and enforcement of regulations. The best practices are as follows:

#### **4.3.1 Farmer and women associations are professionalized through more intensive management training; leadership training is provided to selected members**

This project activity area builds on the earlier formation of farmer clusters and a more formal association.

##### *Indicators:*

- Training courses for managing an association and leadership development are developed preferably with the assistance of the relevant institution in the country.
- Study activities such as educational visits are arranged for a visit and exchange of views with a recognized successful farmers and women association.
- Women and men and representatives of the youth are selected – preferably nominated by the association – for the leadership training course.
- The training programme is at an appropriate level and scheduled to the convenience of the participants (not too lengthy and the time and days decided through consultation with the farmers and women).

#### **4.3.2 Codes of conduct and better practices are promoted for adoption by seed producers including brood farms, hatchery and nursery operators**

Having engaged the seed producers in the supply of seed for recovery, the project should take the opportunity to introduce better management practices for hatcheries and seed trading<sup>8</sup>.

##### *Indicators:*

- Workshops are organized for dialogues between fish farmers and the brood farm, hatchery and nursery operators, and traders on seed quality requirements and pricing.
- A code of practice in seed production and trading is adopted and promoted through training and information.

#### **4.3.3 Capacity of farmers is strengthened to comply with legal standards and to adhere to voluntary codes of practices and certification standards**

Being associated and acting as a group does not only increase the economy of scale of small producers, it is a significant step towards increasing capacity to comply with legal and voluntary standards and voluntary codes of practice and BMPs.

##### *Indicators:*

- The training courses incorporate the basic elements of regulatory and voluntary governance mechanisms.
- Specialized short seminars or meetings are organized to discuss the important legal instruments and regulations and the voluntary management instruments that relate to environmental, food safety, product quality and disease control, and discuss their implications on good aquaculture.
- Local government officers are engaged as members of the training team.

<sup>8</sup> The BMPS for these segments of the supply chain have been developed in Vietnam by the Danish International Development Agency (DANIDA) supported Sustainable Development of Aquaculture (SUDA) project. The ETESP-Fisheries project in Indonesia rehabilitated two marine fish hatcheries in the area and trained staff in better hatchery management and operation practices.

- Specialists in environmental, food safety and health management are engaged to provide seminars.

#### **4.3.4 Capacity of local government and extension agencies for management and provision of technical assistance are strengthened through training**

The strengthening of capacity of local government units and extension agencies is achieved by involving their active participation in the planning and implementation the various activities described in the preceding best practices. An enlightened local government that is made aware of the community needs is likely to facilitate processes and public services needed for a speedy rehabilitation.

##### *Indicators:*

- The local government officials and extension workers are trained on BMPs, good aquaculture practices, and other skills and then engaged as members of the training team for the various courses.
- A periodic forum for dialogue between local government officials and farmer groups is organized

#### **4.4 BUILDING SOCIAL AND ECOLOGICAL RESILIENCE TO FUTURE SHOCKS “The restoration builds back and improves ecosystems and habitat, improves the adaptive capacity of the community and increases their self reliance”**

The preceding best practices contribute in building up the resilience of the aquaculture sector. By restoring production and improving productivity, enhancing the livelihood assets and promoting sustainable livelihood options, resilience to economic shocks is increased. This set of best practices aims to further strengthen the community’s foundation by building its social and ecological resilience and capacity to adapt to risk impacts.

##### **4.4.1 Opportunities for improving the supportive ecosystems for aquaculture are explored and supported**

The restoration of production phase should already include the plans for improving the natural assets and habitats, reforesting denuded or destroyed forests or increasing vegetative cover, safeguarding the soil from erosion and freshwater sources from pollution, and the culture areas from flooding, strengthening the dikes, relocating cages if these are on the path of freshwater influxes.

##### *Indicators:*

- Measures are identified for restoration or enhancement of the natural assets of the community.
- Community projects are developed that comprise voluntary and paid activities.
- Contracts for specific projects are made with the community for paid projects. The contract provisions include standards of performance and compliance.

##### **4.4.2 Where applicable, a fishery resource conservation and enhancement project is developed**

A coastal fishery or an inland water body such as a lake or a river may provide an opportunity for the development of a project that involves the fishers and fish farmers to protect the habitat and enhance the fishery resource. It should involve the associations of fishers and aquaculturists and the youth.

**Indicators:**

- The conservation and protection measures and regulations for the water body and its fishery resources are developed by the community with assistance of the fishery resource enhancement and fishery enforcement units.
- Authorization is obtained from government for the community to enforce the regulations that they have developed.
- A surveillance system is developed and implemented.
- An enhancement programme for the water body is developed with advice from technical experts. Releasing juveniles into a water body is carefully planned and implemented and based on the relevant CCRF technical guidelines to avoid impact on biodiversity.

#### **4.4.3 Energy conservation, waste recycling and management, and water conservation measures are introduced and promoted for adoption Integrated farming where applicable is promoted**

Projects to demonstrate efficient energy use and conservation, and efficient use of water and conservation are prepared and established in selected co-operators's farms.

**Indicators:**

- Demonstration projects are identified
- Co-operators are selected and trained in their implementation
- A performance measure is developed that aims to show savings or increased productivity or both.
- Project results are shared and discussed in farmers' forums.
- The project starts including climate change issues in the farmers' forums.

#### **4.4.4 The feasibility of developing an ecotourism activity is studied and, if feasible, resources are leveraged to initiate the project**

A healthy mangrove can be developed into an ecotourism area, as has been done in a number of coastal communities. The youth in the community have been active in these projects. A well-ordered and uncluttered cage culture area with interesting looking species such as grouper and lobsters can also be promoted as an ecotourism stop in tourists' itinerary. These and similar opportunities should be explored by the Project. The activity promotes sustainable environmental practices and adds to the livelihood opportunities of the community.

**Indicators:**

- The Project initiates a feasibility study with the assistance of the government tourism or an appropriate agency and if the indications are positive, a project is developed for support.
- The community participates in the study through consultations.
- A project management plan and budget is developed should the feasibility study be positive.
- The community is organized for project implementation.
- A monitoring system is developed for the project.

#### **4.4.5 Participation of the youth in community projects is encouraged**

Some educational activities tailored for the youth should be explored, which gives them the knowledge and skills and encourages their participation in environmental conservation and restoration.

*Indicators:*

- Projects for the young people in or out of school are identified with their participation and that of their teachers.
- Agreed projects are developed that are of educational value to the young people and of practical value to the community.
- The young people are encouraged and assisted to form a youth organization.

**4.4.6 Community participatory processes in decision making are encouraged and improved on as needed**

This practice should be embedded in all project activities. The approach is to promote a culture of democratic and participatory decision making in the community.

*Indicators:*

- Training programmes include lessons and exercises in participatory decision making.
- All meetings and consultations with the community are conducted following the participatory, transparent and democratic processes.
- The information and communication support system of the project

**4.4.7 Formal links are established between the community and national and sub-national providers of services and technical assistance**

The Project should facilitate the establishment of or strengthen linkages between the community (through the association/s) and the agencies, R and D centres, universities and technical educational institutions, professional societies, industry and trade groups, and other providers of technical support for aquaculture and rural development. The linkages can be a mix of formal and informal arrangements. The outcome from this set of best practices is an increased social capital.

*Indicators:*

- Projects involve the collaboration of the relevant institutions and agencies in their planning and implementation.
- Formal agreements such as a memorandum of understanding are entered into with institutions or agencies on a specific activity, or on a programme, or a more general thematic level.



## 5. Key technical resources for planners and implementers

Planners and managers of emergency responses for any sector shall be more effective if they had a broader perspective and understanding of the fundamental concepts and best practices in humanitarian responses and building back better. In this regard, these information materials are recommended:

- SPHERE Handbook on Humanitarian Charter and Minimum Standards in Humanitarian Assistance ([www.sphereproject.org](http://www.sphereproject.org)),
- Hyogo Framework of Action 2005-2015: Building the Resilience of Nations and Communities to Disasters ([www.unisdr.org/we/coordinate/hfa](http://www.unisdr.org/we/coordinate/hfa)),
- Guidelines for Emergency Assessment issued by the International Federation of the Red Cross and Red Crescent ([www.ifrc.org](http://www.ifrc.org)), and
- Learning from Disaster Recovery: Guidance for Decision Makers by the ISDR and IRP ([www.unisdr.org/files/3619\\_LearningFromDisasterRecovery.pdf](http://www.unisdr.org/files/3619_LearningFromDisasterRecovery.pdf))

The resources relevant to aquaculture that are recommended include the information materials that provide the conceptual, methodological and technical basis for planning and executing recovery responses for the sector. These are listed and described in Appendix 3.



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# Support to post-harvest fisheries and markets in response to emergencies

by

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# 1. Introduction

## 1.1 BACKGROUND TO THE POST-HARVEST SECTOR

The whole process of catching, or growing, fish and preparing it for human consumption is a complex economic activity dedicated to the production of food. This places mankind at the centre of the eco-system with the responsibility to use it wisely in order to manage and conserve the benefits. Although this paper concentrates on emergency response for rehabilitation of the post-harvest sector, within fisheries and aquaculture there are many interlinked sectors that are so closely integrated that it is not possible to consider the impact of a disaster on any single sector in isolation from the others.

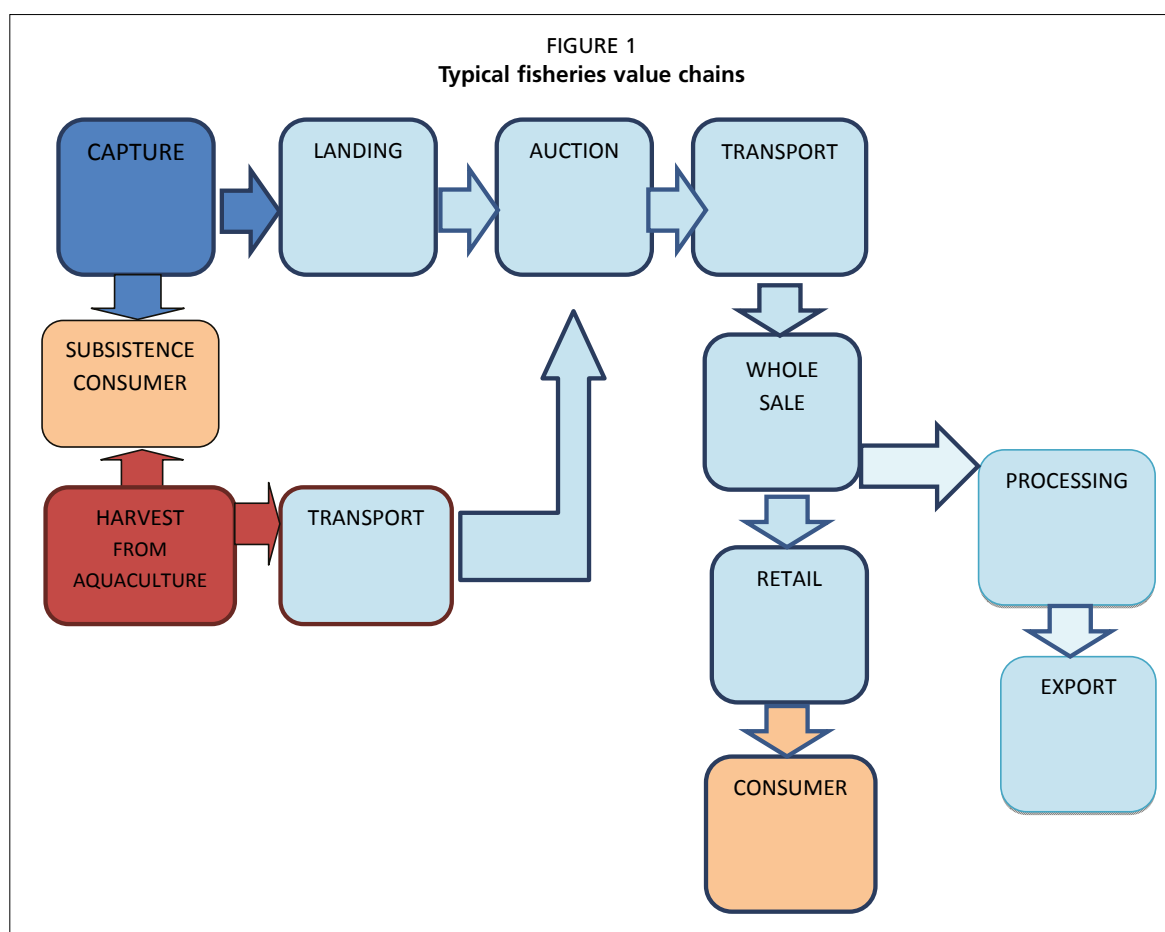
A value chain approach, where all activities from capture or harvesting right up to the plate are viewed as a continuum can be an effective way to approach this complexity. A value-chain provides a framework for analyzing the roles of all the stakeholders. In the aftermath of a disaster they are impacted to varying degrees, depending on their position in the value-chain, their contractual relationship and the relative strength of negotiation in their relationship with suppliers and clients. No one sector, or group of stakeholders can be considered in isolation because any restriction of the flow of fish products to the market, either because fish is not being caught, is lost from ponds or spoils in storage, means that no cash value accrues to those in the value chain. Livelihoods suffer and food security is threatened if incomes are reduced or removed. Typical fisheries and aquaculture value chains are summarized in Figure 1, where the elements covered by the post-harvest sector are shown in light blue.

While the foregoing justifies fish and fisheries as an economic (cash generating) activity it does not allow for the importance of fish in the food supply or demonstrate the reliance on fisheries to provide livelihoods for many in both developed and developing countries. Fish is particularly important in the economies of many developing countries. A snapshot of the production, consumption and trade in fish and fishery products is given below.

Based on FAO preliminary estimates for 2011, produced in early 2012, total world fish production (capture and aquaculture), excluding aquatic plants, has shown recent new growth, increasing from 143 million tonnes in 2008 to a preliminary estimate of 152 million tonnes for 2011. Overall, 81 percent of total world production of fish and fishery products takes place in developing countries. In particular, it is aquaculture production that is dominated by the developing world with 93 percent. For 2011 preliminary figures indicate that aquaculture production has reached 49 percent of the total world production.

Eighty-nine percent of the world's aquaculture production is in Asia. Preliminary global production data for 2011 indicate 62 million tonnes (excluding aquatic plants) or 41 percent of total output to come from aquaculture while capture fisheries production has stabilized at around 90 million tonnes. This is of particular relevance considering the recent exposure of the Asian region to emergencies as a direct result of natural disasters. Unfortunately it is a situation that is set to persist and in view of rapid population growth, to worsen.

World per capita consumption of fish has risen steadily over the past decades. Consumption in the 21st century has continued to grow with estimates for 2011 pointing towards new advances in per capita consumption to 17.8 kg. With capture fisheries stable, its contribution towards per capita consumption is declining. There is



increasing general recognition of the contribution of fish to overall food security; both as a source of fish as food and income to support sustainable livelihoods. Fisheries are also a creator of jobs as well as a contributor to economic growth and development (FAO 2010). Less highlighted is the crucial role fish and fishery products play in nutrition, and as a source of nutrients of fundamental importance, not readily found in other foods. This is especially the case for women during pregnancy and to their offspring during the first years of life (FAO/WHO 2011). In this context, it should be noted that in many least developed countries, fish and fishery products often constitute a much higher share of consumers' source of animal protein than elsewhere. Preliminary FAO estimates of international trade in fish and fishery products for 2011 show export value reaching almost USD120 billion. The proportion of world fishery production traded internationally remains fairly stable, at around 37 percent. Developing countries are of fundamental importance as suppliers to world markets with close to 50 percent by value of all exports. Net export revenues from fish trade earned by developing countries reached USD27.4 billion in 2010. For many developing nations, fish trade represents a significant source of foreign currency earnings in addition to the sector's important role in income generation, employment, food security and in nutrition.

Insofar as the post-harvest sector can be considered in isolation from primary production activities, it covers all operations that are undertaken between capture or harvest and the market, or the consumer as Figure 1 demonstrates. Additionally many fishers also engage in post-harvest activities on board their vessels, when they ice or otherwise treat their catches. In most fisheries the post-harvest sector includes the infrastructure requirements for landing, ice supply, storage, processing, transport and market facilities. In some cases, for example landings and markets, the responsibility may be shared with port or municipal authorities and in others there are strong inputs

from the private sector. In some cases catches or products of aquaculture may go directly to subsistence consumers, but in general the scale of operations may vary from a small artisanal fresh fish landing for day boats to a major fishery harbour and associated large fish processing factories. The individuals engaged in the sector can include fish peddlers, those who transport fish to processors and marketers, operators of cold storage and ice plants, middle men and agents, operators of processing plants and those they employ. The government provides the regulatory framework for management, covering infrastructure as well as inspection and control of quality and safety, including inspectors and laboratory technicians.

Any destruction of infrastructure, as a result of a disaster, removes a significant link in the value chain and impedes supply of fish to the market with the attendant impact on incomes. By the same token the value chain necessarily includes fishing vessels and aquaculture facilities. The responsibilities are mixed between government and the private sector, including in some cases cooperatives. There is a considerable variation from place to place but normally landing centres, water supplies, wholesale (and often retail markets) and sometimes ice plants are under government control while handling, distribution and processing facilities belong to private individuals or cooperatives.

Another key area included in the sector is the government's prime responsibility for control of fish quality and safety through fish inspection and prevention of public health risks. Disaster situations are usually associated with an increased challenge to public health, through the environment and the food chain. All products need to be monitored at all times to assure public health safety but in the case of export products these need to be controlled and certified by a government agency as the competent authority. The private sector producers must also have the capacity to control quality and safety in order to meet the requirements. As demonstrated above fish exports are of significant economic importance to developing countries; so loss of laboratory facilities or trained laboratory staff as a result of a disaster not only impacts directly on the safety of the food supply but also on the opportunity to generate export income, even if fish products are available.

Table 1 gives an overview of the range of components of the post-harvest sector with an indication of the entity most likely to be responsible for operation. It provides a framework for post-disaster rehabilitation of the sector that can be amplified during the damage assessment and early recovery needs phase of emergency response.

TABLE 1  
Components of the post-harvest sector

	Nature/extent of damage	Estimated cost of damage	Rehabilitation or reconstruction needs	Estimated cost of rehabilitation or reconstruction	Responsible
Landing centers					Generally government port authority
Auction centers					Government (Municipal)
Wholesaling centers					Government (Municipal)
Retail Markets					Municipal
Storage sheds					Usually Private
Freezing facilities					Private
Cold storage facilities					Private
Ice plants					Mixed private/govt
Insulated trucks					Usually private
Insulated boxes and fish boxes					Mixed
Laboratories					Government
Inspection centres					Government
Refrigerated trucks					Private
Processing facilities					Private
Processing equipment					Private

## 1.2 ANALYSIS OF THREATS FROM DISASTERS ON FACILITIES AND ACTIVITIES

FAO has defined a disaster as: “the occurrence of a sudden or major misfortune that disrupts the basic fabric and normal functioning of a society (or a community). An event or a series of events that give rise to casualties and/or damage or loss of property, infrastructure, essential services or means of livelihood on a scale that is beyond the normal capacity of affected communities to cope with unaided”.

According to FAO a disaster turns into an emergency when people are unable to meet their basic needs, or there are serious and immediate threats to human life and well-being (FAO 1998).

There is now a significant body of evidence linking the long-term impacts of climate change to an increase in natural disasters caused by the impact of weather conditions on coastal communities (cyclones, floods and droughts). This is described in the fourth assessment of International Panel on Climate Change (IPCC) (IPCC 2007) and further elaborated in a special report of the IPCC on managing the risks of extreme events and disasters to advance climate change adaptation (IPCC 2012). The expectation is that both the frequency and the severity of climate related natural disasters will continue to increase. Thus in the future there will be increasing reason to build adaptation to climate change into all aspects of the management of fisheries in order to sustain livelihoods (FAO 2007).

Natural disasters also cover unusual events such as earthquakes, volcanic eruptions and the potential resulting tsunamis. All of these events have an immediate impact on the livelihoods of fishing communities and the infrastructure required for the production of fish. Small scale fisheries, typical of developing countries exposed to disasters, are particularly heavily impacted (Hall 2011). It is estimated that there were 3.3 million deaths from natural disasters between 1970 and 2010 and the number of people exposed continues to increase as poverty forces many to live in dangerous environments. It has been estimated that one fifth of total humanitarian assistance is directed to disasters.

### Box 1 – Trends and statistics on natural disasters

According to the disaster database that the WHO Centre for Research on the Epidemiology of Disasters (CRED) maintains and the US Agency for International Development Office of Foreign Disaster Assistance (USAID/OFDA), the number of natural disasters has increased from around 75 to more than 400 per year since 1975. This rise is caused almost entirely by an increase in weather-related disasters: over the last three years hydro-meteorological disaster increased by more than 100 percent from about 100 in 2004 to more than 200 in 2006, coupled with increased vulnerability of poor people. Natural disasters have also increased in variability, with a sharp rise in small and medium scale disasters. Climate change is most likely to blame for this new trend, which according to recent research is expected to continue and subsequently increase risk.

*Source: International Disasters Database (EM-DAT) (available at <http://www.emdat.be/database>) and IPCC*

As if this were not enough there are also man-made disasters to be considered. These include oil and chemical spills, as well as long-term pollution, such as by heavy metals or PCB's (See Box 2), which are accumulated in the food chain, eventually leading to human health risks. Long-term pollution effects are considered as slow onset disasters, for example the pollution of Minamata Bay, Japan with mercury from mining activities started in 1912, but the critical impact on the health of people consuming fish from these waters was not seen until the 1950's. Droughts and the effects of climate change are other examples of slow-onset disasters.

**Box 2 – Pollution by polycyclic aromatic hydrocarbons (PAH's) and heavy metals**

PAH's reach the food chain from oil spills either from solution or from particulate matter, sediments or contaminated feed. They are carcinogenic but are metabolized to polar compounds in the body. These accumulate in the gall bladder and are excreted. Although they rapidly decline in fin fish they are more persistent in molluscs. Chemical monitoring is very expensive but sensory analysis is used as a control measure. If a trained taste panel does not detect taint then the products are fit to eat.

PCB's cover a wide range of compounds resulting from industrial processes. Their ingestion results in cancer and a number of serious non-cancer health effects on the immune system, reproductive system, nervous system, endocrine system and others. Two incidents resulting in disaster occurred in Asia both from contamination of rice oil with PCB's from defective heat exchangers. These were in 1968 in Japan (Yusho) and 1979 in Taiwan (Yu-cheng) both resulting in serious illness among consumers. Recognition of the danger led to production of PCB's being stopped in the 1970's, but they are extremely persistent in the environment. They are slowly being eliminated by natural processes but are only declining by 50 percent every decade.

Heavy metals particularly (mercury and cadmium) from industrial processes and the natural environment enter the aquatic food chain. All are potent toxins. Mercury is a neurotoxin, causing neuro-developmental defects in neonates and young children and increased coronary heart disease in adults. Cadmium causes neural tube defects and is toxic to many organs and tissues including the heart and bones. Seafood products have been an important vector for human intoxication by mercury and cadmium.

The neurological impact of mercury was demonstrated by industrial pollution in Japan in the 1950's, where in the Minamata area consumption of fish contaminated with mercury led to severe health effects. In Iraq in 1971 the same effects were noted after the population had consumed bread made from wheat treated with mercury compounds. The recognition of the dangers from cadmium was also from Japan. Effluent from mining for metals in Toyama Prefecture entered the environment over a long period. The cadmium was accumulated in fish products, vegetables and rice whose consumption led to severe illness.

In all cases once a disaster is recognized a scientific risk analysis should be conducted leading to a risk management plan and a communication plan (FAO/WHO 2011).

As described in Box 2 the insidious long-term health effects of the release of polycyclic aromatic hydrocarbons (PAH's) from oil spills, polychlorinated biphenyls (PCB's) and dioxins as well as heavy metals from industrial processes into the aquatic environment can result in severe damage to human health if not monitored and controlled (FAO/WHO 2011).

It is also regrettably necessary to consider disasters that result from conflict and its aftermath. These may in themselves lead to destruction of infrastructure or livelihoods but can also potentiate the impact of natural disasters. The environmental effects of recent conflicts will be apparent for many years to come.

Climate change, seen as the driver to the increase in natural disasters as the frequency of extreme weather events rises, also threatens the fishing community through increasing coastal erosion, resulting in loss of infrastructure and homes. Biological threats also result from climate change with the potential for major outbreaks of human and animal diseases. An increase in invasive species has been noted, including shifting distribution of harmful aquatic blooms of red tide algae and the distribution of pathogenic microorganisms (Hallegraaf 2009). Those managing national food safety, who also supervise control of the fisheries post-harvest sector, have the responsibility to continuously monitor the situation even before a disaster occurs and to monitor

intensively after any perturbation. When coastal areas or islands become uninhabitable as a result of rising sea levels the dispossessed will have to move, creating severe overcrowding elsewhere, with an asymmetric burden on the poor.

Depending on the seriousness of a natural disaster the net result on the post-harvest sector may be destruction of facilities and loss of production. This leads to severe disruption of livelihoods as incomes disappear. There are also the attendant humanitarian effects that may be short term (as post-disaster stress generally is) or long-term, such as loss of family, friends and a community, loss of housing and employment, isolation, destruction of schools; leading to poor education opportunities and a whole range of other impacts.

In general people do not wait for help to arrive before starting to rebuild, after the initial trauma has been overcome, but government infrastructure and services are rehabilitated more slowly. Although the private sector owners of infrastructure often are able to find capital for reconstruction the poor have little access to credit, resulting in indebtedness and increased poverty. At this stage a disaster turns into an emergency with a need for specific reactions by national and international players. However, the surprising resilience of communities after the main impact of a disaster has been absorbed should never be overlooked.

When the humanitarian needs have been satisfied and rebuilding of livelihoods has started it is most important to link rehabilitation activities to longer term development goals. Well designed emergency interventions that are successful will flow on to improved longer term development of the community and the governance. However, failures at this stage inevitably have a negative impact, making future improvements much more difficult.

Table 2 attempts to summarize the physical impacts of a disaster on the post-harvest sector and the implications of these impacts on livelihoods.

TABLE 2

**Disaster impacts on post-harvest facilities and activities**

Disaster Types	Impacts on fisheries post-harvest facilities and activities	Implications of those impacts on the livelihoods in fishing communities
Hurricanes /cyclones	Destruction of infrastructure and disruption of livelihoods. Threats to environment	Loss of housing, employment opportunities and income. Rebuilding starts but poor have no access to credit resulting in indebtedness. Cost of food rises at least in short term
Tidal surges / tsunamis	Largely as above but more damage to facilities – washed away	As above
Earthquakes	Physical destruction	As above
Volcanic eruptions		As above
Floods		As above
Oil spills / chemical spills and long-term release of pollutants	Long-term public health impacts – contaminated environments leading to lack of confidence in product safety	Potential health effect on community specifically women of child bearing age and neonates. Low demand leads to low earnings
Nuclear leaks	As above	As above
Drought	Lack of water for ice and processing aquaculture production impacted	Food supply reduced – food costs rise
Climate change	Dramatic long-term effect on sustainability of resources, their environment Increasing biological threats – human animal and plant diseases Increase of extreme weather events	Low lying coastal environments and some islands will become uninhabitable – urban drift will continue
Complex Emergencies Conflict and the aftermath	Destruction, contamination (possibly long-term), loss of transport and negative impact on resources	Communities subject to trauma and loss Food and fuel supplies impacted Disposable incomes reduced

## 2. Best practice and lessons learnt from emergency assistance to the post-harvest sector

### 2.1 TRANSITION FROM DISASTER TO EMERGENCY

When a disaster turns to an emergency the moral imperative is first to satisfy immediate humanitarian needs. These include medical assistance, food, clean water, shelter and assistance with coming to terms with a dramatically changed life. This implies a need for a flexible and rapid intervention that FAO, with a cumbersome bureaucracy and inbuilt inertia, is not best placed to provide. Within the UN system the World Food Programme is equipped for, and experienced in, this role as are a number of other UN agencies, as well as international and national non-governmental organizations. The International Committee of the Red Cross and Medecins sans Frontiers spring quickly to mind. FAO (and other UN agencies not specialized in disaster response) come into their own in coordination, providing technical inputs to assessment of damage and early recovery needs, raising funds and implementing post-disaster rehabilitation.

A general prescription for emergency support activities for coastal communities after the immediate humanitarian needs are satisfied is given below. Although these are typical the examples are largely drawn from rehabilitation activities in the countries affected by the 2004 Indian Ocean tsunami.

- Cash for work, clearing debris from landing sites, beaches, estuaries and ponds, replanting mangroves
- Providing tools, sheds and training to boat builders
- Repairing and replacing craft, gear and engines
- Rehabilitating embankment areas and irrigation channels
- Helping kick-start post-harvest sector related economic activities like production of ice and salt, providing transport and capital to fish vendors, rebuilding fish processing units
- Repairing infrastructure on a small scale, as large-scale projects take time

### 2.2 FAO EMERGENCY ASSISTANCE TO THE POST-HARVEST SECTOR

An FAO data base compiled in 2012 lists more than 150 emergency assistance projects that have been implemented by the Organization since 1995. A very high proportion had a significant fisheries component, with rehabilitation of post-harvest facilities and activities included in the overall reconstruction framework. Food and nutrition security also features in many projects. The sums allocated by donors vary from a low of around USD 100,000 up to USD16 million following more severe disasters or complex emergencies. Much has been achieved. However, there are obvious disadvantages from having to coordinate a large number of small projects, particularly when the objectives have been constrained by the donor to relate to specific rehabilitation or reconstruction efforts. This has clearly been reflected in FAO's performance as an emergency relief provider.

An impediment to the performance of some large organizations in emergency response has been that they tend to suffer from a silo mentality that prevents cross-

disciplinary interaction. Projects with a narrow focus, conceived in an emergency, face a danger of missing out on the important transition from disaster relief to solid long-term development of fisheries unless this aspect is included from the very early stages.

### 2.3 IDENTIFICATION OF EMERGENCY ASSISTANCE NEEDS FOR THE POST-HARVEST SECTOR

After immediate humanitarian assistance has been assured the first intervention to rehabilitate fisheries, including the post-harvest sector, is the conduct of a comprehensive damage and early recovery needs assessment. The team charged with conducting this assessment should be dedicated to that single goal for the short time necessary and not distracted by demands to deliver relief assistance. A generally applicable example of the content of a damage and early recovery needs assessment, this one taken from a post-conflict emergency, is given in Table 3. The post-harvest component of the assessment must be integrated with all other aspects of fisheries and coordinated closely, through the national ministry responsible for fisheries, with other government ministries, particularly agriculture, health and trade as well as civil society organizations. Post-disaster trauma at local and ministry level must not be allowed to slide into a sort of disaster myopia, where every aspect is viewed through the lens of the emergency and planning for the future is ignored. Here the FAO slogan “Building back better” that came out of the 2004 tsunami is a useful lesson.

TABLE 3

#### A damage and early recovery needs assessment used in the aftermath of the Israeli military action against Lebanon in 2006

DAMAGE ASSESSMENT	
A. Pre-War Sector Description	(2 pages)
B. Data Availability	(0.5-1 page)
C. Overall Impact of Hostilities	(1-2 pages)
D. Direct Physical Damage and Losses	(4 to max. 6 pages)
D.1 Physical Damage	
D.2 Income Loss	
D.3 Other	
E. Indirect Impact and envisaged Repercussions	(2 to max. 3 pages)
Part II:	
EARLY RECOVERY NEEDS ASSESSMENT	
A. Humanitarian Assistance	(1-2 pages)
B. Overall Early Recovery Strategy	(1-2 pages)
C. Specific Early Recovery Needs	(4 to max. 6 pages)
D. Medium to long-term Sector Recovery Guidelines	(1-2 pages)
E. Coordination and Implementation Arrangements	(1-2 pages)
F. Issues, Risks and Follow-up	(1 page)

The process of identification of early recovery needs for fisheries differs significantly from that for agriculture in general. In order to get small scale farmers back into production the basic needs are often hand tools, seeds and fertilizer, which can be allocated at so many dollars per unit. The situation in fisheries is totally different because the whole value chain must be restarted with disproportionate financial inputs to restart the various elements. Allocation of a fixed sum per family will only provide for humanitarian relief. Unless the whole production chain is revitalized, no cash flow results and incomes vanish throughout the chain. This essential difference has sometimes proved difficult to explain to INGO's and NGO's that have previously been involved with traditional agricultural rehabilitation.

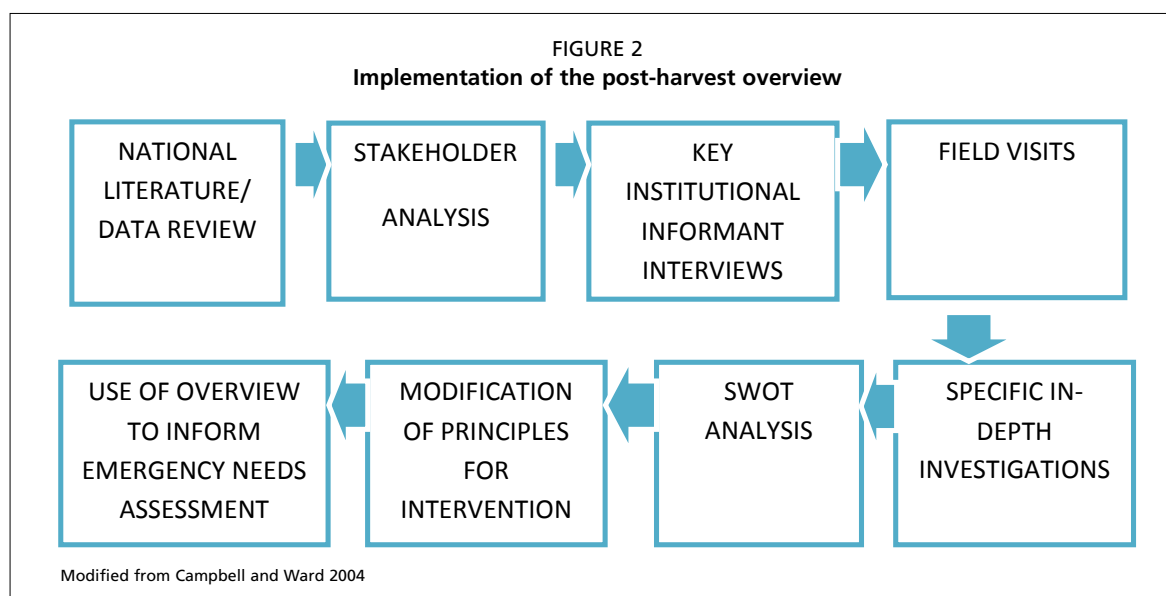
At the start of the damage assessment process it is useful to undertake a rapid post-harvest overview (PHO) a technique pioneered by Campbell and Ward (2004). This allows a systematic analysis of the post-harvest sector, as it was before the disaster. Close consultation with the community will assist in determining how reconstruction

can best be carried out. It may not be possible under emergency circumstances to follow all the steps, as outlined in Figure 1 but the important issue is to collect information as quickly as possible and not to get bogged down in specific detail. Consultation with all the stakeholders is imperative.

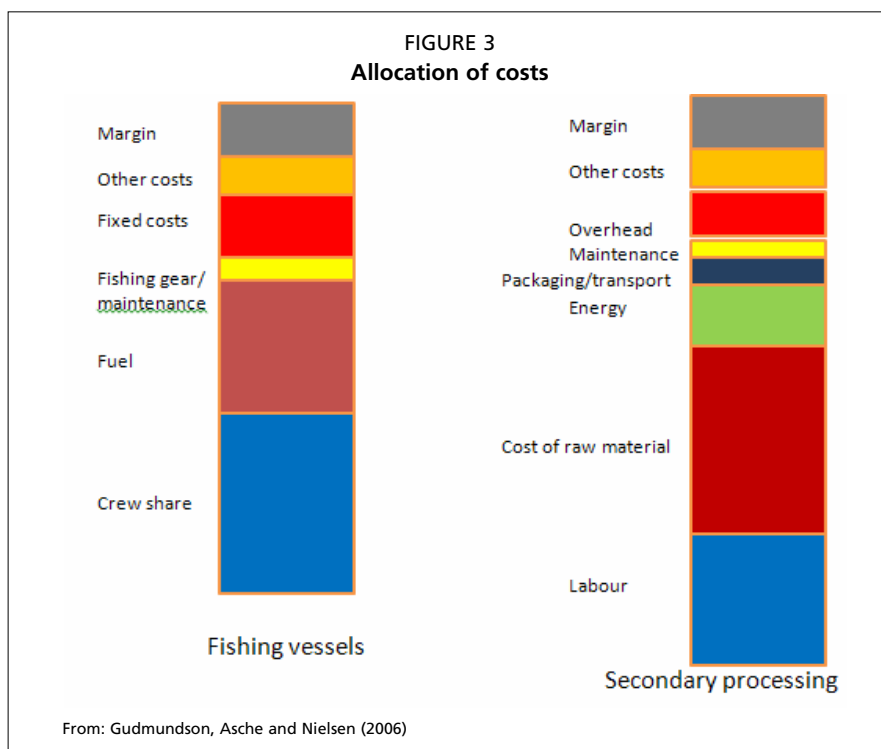
The techniques of participatory rural assessment are useful in ensuring that the community is fully involved, but those conducting the PHO must be aware that there will be post-disaster stress in the community. Local knowledge is vital and community leaders as well as private sector entrepreneurs should be identified. It is also important to include government personnel in the activity, both from the technical as well as administrative branches, as they will have to assume responsibility after project assistance ends. The outcome of the PHO should allow for rehabilitation, based on the previous situation, as well as enabling planning for building back better. An immediate outcome of the PHO should be a value chain analysis of all production activities to determine how value is apportioned from catching (or harvesting) to the consumer. In addition to identifying priority elements for emergency assistance there is also an opportunity to determine what proportion of the retail price accrues to the fisher. Information is power and this knowledge eventually empowers the fishers and tends to level the playing field.

A value chain contains all the activities that are necessary to bring a product to market, in the case of fisheries from the water to the consumer. A typical fisheries value chain consists of harvesting, by capture (or from aquaculture), landing, auction, distribution, retail sale (or processing) and the consumer. Some characteristic fisheries value chains are shown in Figure 1. Once the value chain has been mapped, through consultation with government staff, stakeholders and other interested parties it can be analysed using value chain analysis. The first action is to identify the steps in the chain, then to identify the flow of product through the chain, all the stakeholders and the governance. In an emergency situation it is best not to be too ambitious but to first take a qualitative approach by assembling as much information as possible. Then a more complex quantitative phase is needed to identify all the costs at each step and then the revenues. It is then possible to determine how value added is distributed among all the participants.

Examples of the costs and revenues calculations and distribution are given in Figure 3. Much of the information required can only be collected from discussion with stakeholders, by direct questions, structured interviews and focus groups. Supplementary information comes from statistical data and government records.



It is essential before undertaking the overview to be aware of the scale of post-harvest operations in the area where the disaster took place. These can vary from very small, where an individual buys small lots at fish landings and either distributes them on foot, by bicycle or motor cycle. They may also be taken home for small scale processing and subsequent sale. In many communities much of the low-cost fish for local consumption is provided by such small to medium entrepreneurs. At the other end of the scale are large processing plants producing high-value products for export markets. They can employ many workers and provide sustainable livelihoods through wages.



## 2.4 LINKAGE OF POST-HARVEST SECTOR TO OTHER AREAS OF FISHERIES AND AQUACULTURE

As emphasized previously fisheries is a food production activity that requires a series of linked and coordinated components. The damage and early recovery needs assessment of the whole fisheries sector conducted after an emergency will describe these linkages and demonstrate their interdependence. The section below identifies specific linkages between the post-harvest and other sectors of fisheries and aquaculture. These are summarized in Table 4.

With regard to food and nutrition security the loss or damage to post-harvest assets and infrastructure means that for a period the contribution of fish to the food supply is seriously reduced. There may be a simple cause, such as the loss of fish boxes following a flood or cyclone that can be quickly overcome to the more serious destruction of infrastructure – ice plants, storage facilities, roads, distribution network etc. Until these are rebuilt fish production and marketing will be constrained and rebuilding requires long term programmes. Until this is fully achieved loss of fish as food will continue. This can compound the threat to food security caused by lack of incomes and low food availability caused by destruction of transport links and markets. The first priority is to assure the provision of adequate supplies of clean water and safe traditionally accepted staples, without particular regard to nutritional quality in the early stages, but assuming sanitary conditions are met. Subsequently the quality of the diet can be

improved. Although fishing communities are traditionally fish consumers the direct role of fish in food security for this community is often overemphasized. Rather, income from fisheries, as wages or profits, allows the establishment of culturally acceptable eating patterns that defines a food secure family or community. However, when fish is used for emergency feeding programmes outside the fishing community, great care should be taken that fish is culturally acceptable to the beneficiaries and that it fits within their traditional food habits.

In the capture sector when fishing vessels and equipment are damaged or lost a vital first link in the value chain is lost and until they are repaired or replaced there will be no fish to market. The post-harvest sector suffers as well. A first priority is the replacement of productive assets of individuals in all sectors of fisheries. These range from vessels and gear to equipment used for processing and sheds for storage. Experience shows that the process of selection of beneficiaries to receive assistance must be carefully done, together with representatives from fishers' organizations and dedicated, honest local officials. This is particularly true in the replacement of the more valuable assets, such as large items of fish processing equipment and fishing vessels. An important initial action is the specification for packages of fishing gear and simple processing equipment for wide community distribution. These can be provided rapidly to restart production. The larger infrastructure landing centres, auction halls, storage and processing premises and markets will take time to replace but immediate assistance can restart activities and rebuild community life. An important lesson learnt from the post-tsunami emergency reconstruction efforts in Aceh, Indonesia is to ensure that corruption in allocating assistance does not further enrich elite groups.

The post-harvest sector depends heavily on infrastructure such as landing centres and market facilities that are normally provided by government at a national or local, level. Because of the high costs involved great care must be taken in planning reconstruction. An example from Indonesia of the type of survey and specification required in order to rehabilitate post-harvest infrastructure is given below:

- Conduct a survey in eight coastal sub-districts where the fisheries infrastructure suffered damage from the tsunami to identify the need for construction or rehabilitation of the fish landing, marketing and/or processing facilities.
- Prepare an overall plan for a new landing, marketing and processing infrastructure. The plan should be specific for each site in terms of landing facilities, buildings and cold storage as well as processing areas and ice plant if these are justified. The size of the infrastructure at each location should be designed on the basis of the average fish landings.
- Produce a design proposal for each site with an estimate of costs.
- Submit a final report of the findings, together with drawings, which includes all the above information.

In the case of aquaculture facilities the government is normally responsible for access roads quarantine, veterinary services and often seed supply from government hatcheries. The private sector normally invests in the actual production facilities. Much of aquaculture production from developing countries is high-value shrimp destined for export, so it is vital that the linkages between the regulatory authorities involved in the control of aquaculture and the competent authority controlling food safety during production be close. The government's competent authority for issuance of health certificates for export (of capture and aquaculture products) also has the responsibility to ensure that these products meet the requirements of the importing country. No less for the domestic market there must be close coordination on quality standards and safety between those regulating aquaculture and processing. Feed and seed for aquaculture are particular cases where linkages must be maintained, in order to ensure food safety and freedom from fish diseases.

Fisheries policy and management are implemented by government authorities and have an overarching influence on every sector. The post-harvest sector should be included as a stakeholder when policies are being determined. Also resource management plans must include the economic impacts on fish processing and marketing when determining such things as total allowable catches and allocation of quotas. FAO has adopted an eco-system approach to the management of fisheries, which is a useful tool. However, strong linkages to the trade and industry aspects of fisheries need to be included when management plans are being drawn up.

TABLE 4  
Understanding the linkages between support to fisheries post-harvest facilities and activities and other support provided in emergencies

Areas of Support provided to fisheries sector in emergencies	Linkages with post-harvest facilities and activities	What are the implications for planning? (what considerations should be made)
Food and nutrition security	Destruction of post-harvest facilities reduces fish production and therefore consumption	Urgent need to plan for reconstruction and replacement of assets for handling, processing and marketing so that the value chain can return to productivity
Replacement/repair of fishing vessels and gear	Many similarities with rebuilding post-harvest infrastructure and activities	Careful selection of beneficiaries for allocation of emergency assistance
Provision / repair of infrastructure – e.g. landing sites / market facilities / aquaculture facilities	All these are necessary components for the rehabilitation of post-harvest activities	Planning of large infrastructure replacement projects should be integrated with future development plans
Support for post-harvest activities and marketing		
Provision of land, seed and feed for aquaculture	Shrimp aquaculture production is targeted for export and quality standards must meet international standards	Feed quality and implications on food safety Available land for post-harvest facilities
Support for fisheries policy and management	Resource conservation and management is vital to sustain post-harvest livelihoods	Useful advances in community and co-management should include the post-harvest sector

## 2.5 LESSONS LEARNT FROM EMERGENCY INTERVENTIONS

Over the past 30 years FAO has contributed to numerous emergency interventions (more than 150) to rehabilitate fisheries all over the world, including such instances as: after hurricanes in the Caribbean, conflict in Cambodia, Sierra Leone and the Democratic Republic of Congo, post-conflict reconstruction and cyclones in Bangladesh, the massive assistance after the Indian Ocean earthquake and tsunami in 2004, post-conflict damage assessment in Lebanon and more recently after cyclone Nargis in Myanmar. Considerable experience has been collected and a powerful number of lessons have been learnt, and some unfortunately forgotten. The most important lesson is that in responding to emergencies big is not necessarily best as the two following examples show.

A persistent source of failure within the post-harvest sector has resulted from attempts to build ice plants in unsuitable locations, particularly in the absence of electrical power. These have often been gifted to cooperatives, sometimes formed for the purpose. Well intentioned donors, as well as some international agencies have failed to recognize that an ice plant is a sophisticated piece of equipment that needs good management, maintenance and a supply of spares and clean water. These have frequently been unavailable in the locations selected, where electrical power is often sporadic or unavailable. After opening with great fanfare the classic path to failure includes reliance on one generator, not designed for continuous operation (no back up set provided), breakdown followed by lack of expertise for repairs and funds for spare parts. Operations are suspended and during a period of inaction equipment is pilfered and the plant is then in terminal decline. Off-the-shelf plants are often not designed to

operate in harsh marine environments and corrosion limits their life span. Seldom are funds set aside for replacement. Unless power and good management are available it is usually a better option to produce ice in a central location and to distribute to landing centres by insulated truck, which can also return carrying fish.

On the other hand rehabilitation of small scale fish processors, often women, engaged in fish drying has been successful in many locations. Remember that it has been estimated that up to 50 percent of those involved in the post-harvest sector are women. The costs per head of such interventions are modest; beneficiaries look after the equipment as they feel ownership and women are enabled to work close to home. The operation provides an outlet for surplus catches and stimulates profitable downstream opportunities in marketing.

In summary immediate emergency interventions are best kept modest until the situation has stabilized and time has been made available for effective planning of future developments.

In all cases evaluation of emergency assistance needs should be carried out by a comprehensive disaster and early recovery needs assessment team integrated over the full spectrum of fishery activities. This team should be dedicated to the task of preparing an immediate emergency assistance plan that can lead, in time, to a fisheries development plan. When the situation starts to stabilize the plan can be implemented as part of the transition from disaster to recovery. Appendix 1 contains a checklist list of questions on common planning challenges that should include the challenges faced by the post-harvest sector. The complexity of this list implies a need for close cooperation between technical experts from the various sectors of fisheries and, particularly, national government counterparts. The outcome should be an assessment of immediate emergency needs leading to longer term development plans.

Disasters and emergencies rapidly fade from the public eye and are replaced in the news by fresher stories. Experience shows that a common requirement across all sectors is an effective media communication strategy, to keep the plight of those suffering from an emergency before the public and donors, as well as to communicate with beneficiaries. The immediate target groups of such a strategy are:

- **Beneficiaries** reached through local media and participatory approaches
- **The general public** (both in the country affected and the world at large) can be reached by print media, radio and television
- **Key international partners** reached through the media or directly by reports
  - governments and NGO's in donor countries
  - development bank partners
  - UN partners
  - private sector donors
  - CSO - civil society organizations
  - opinion makers

The strategy can be used to show how FAO stands out from other organizations through its expertise in livelihood rehabilitation and building a better world without hunger. Increasing visibility impacts on donors and assists to keep funds flowing and demonstrate transparency, both to those in the affected country and internationally.

The following case studies are based on the author's direct experience. Emergency response is conditioned by many factors including the national psyche, which implies that successful remedial activities from one country or community may not translate to other places.

### **Provision of a wholesale/retail market as a focal point for rehabilitation**

Fish landing centres and markets in Banda Aceh, the capital of Aceh province were destroyed by the 2004 tsunami. As a result there was no focal point for the collection and distribution of fish when fishing resumed. Two temporary wholesale and retail

fish markets planned and constructed by FAO for the provincial fisheries authorities were widely appreciated by the community and provided some structure for trading. The provision of these temporary fish landing and marketing centres in the most seriously damaged part of the provincial capital, acted as a focus for restarting fish marketing activities, enabling fishers and traders to restart production and increasing the availability of fresh fish for local communities.

### **Restarting fish distribution**

Through the distribution of 21 motorcycles and 100 bicycles equipped with pannier baskets or insulated fish boxes to mobile fish traders, a tsunami recovery project in Aceh, Indonesia, supported the re-establishment of the distribution network for fish. As a result, the traders were able to transport fresh fish further inland and restart their income-generation activities. In addition, 221 insulated boxes of 200 litre capacity were distributed to 166 fishermen and traders for the storage of fish, which allowed fishers to remain out at sea for longer periods and enabled traders to sell the produce in more distant markets. The overall result was that a modest investment expanded the range of fish distribution, provided livelihoods and assured that fish was available to consumers.

### **Fish processing in Indonesia**

The small scale fish drying industry in Aceh was totally wiped out by the 2004 earthquake and tsunami. As part of the FAO emergency response and in partnership with the provincial fishers' organization, the Panglima Laut, and the provincial fisheries administration, Dinas Perikanan, specific locations where re-equipping this industry would have maximum impact were identified. The understanding was that if rehabilitation could be done quickly production could be restarted – the larger infrastructure for marketing and distribution (ice plant etc.) would take time to plan and build. The two main processed products are salted, boiled and dried small fish and salted and dried larger species. Materials for the construction of processing sheds, drying racks and storage areas were provided for those sub-districts where there are fish drying activities. These were donated together with other requirements such as boilers and salting vats, which are manufactured locally, and pressure kerosene burners that are ordered by a local supplier on demand. The processors who received assistance included many women's groups and individual female processors. The rapid intervention with funds provided by the German government enabled production to restart and assisted livelihoods to recover. Downstream activities in marketing also provided further opportunities for enterprising groups of women. Although successful in a number of areas there was a hiatus for one group whose processing and storage sheds were cleared away to allow for rerouting a road, an event that could have been foreseen by better coordination with local authorities.

### **Successful introduction of processed boneless milkfish production in Indonesia**

As post-tsunami rehabilitation proceeded in Indonesia it was possible to envisage the planning of projects with a longer term development focus. An FAO project funded by the America Red Cross took on this challenge. As a joint activity between the post-harvest and aquaculture sectors, milkfish raised in ponds were processed as a high value boneless product and found ready markets through supermarket sales. Productive livelihoods were established for women fish processors and aquaculture producers.

### **Food safety in Lebanon**

The war prosecuted by Israel in Lebanon from 12 July to 15 August 2006 caused immeasurable destruction to the lives and livelihoods of the Lebanese people and to the infrastructure of Lebanon. The hostilities claimed over 1 100 civilian lives, left

more than 4 000 wounded and displaced up to a quarter of the population. The scope and scale of the destruction were massive, ranging from direct loss of life to extensive damage to essential infrastructure, including hospitals, schools, roads, and bridges.

On the 13 July the Jijeh power plant on the coast south of Beirut was attacked breaching the containment wall and releasing over 1 5000 tons of oil into the sea. This led to a two week fire while the plume, which ultimately stretched to 200 km, was being carried north by prevailing winds and currents. The coastline over this distance was exposed to oil contamination as remnants of burnt fuel and the heavier fractions either hit the coast or sank in a 500 m strip, while the lighter fractions continued north. The oil also made the fishing vessels inoperable as the floating oil blocked cooling water intakes resulting in engine damage. These direct effects caused economic losses due to the need for replacement of gear and lines and cleaning of boats. The associated indirect impact of the need to clean harbours and shorelines and the possible longer-term environmental damage will be felt for a long time.

Just as it became possible to resume fishing it became apparent that there was growing resistance to fish consumption from Lebanese consumers because of perceived food safety problems following the oil spill. In response samples of catches and environments (including water) were collected by FAO and analysed in Sweden through a joint programme with UNEP. The results showed that PAH concentrations in fish muscle decreased rapidly and levels that would compromise food safety were not observed. A communication campaign through the media contributed to reassuring the public and demand strengthened.

### Market information for the fishing industry

As a post-disaster development activity in Aceh, Indonesia, FAO together with the Spanish international development agency implemented a project to provide market intelligence to the fishing industry. The two components were:

- A data base on market prices in Aceh and other areas of Asia from which information was distributed by sms text messages and via mass media
- A trade promotion and development process to introduce Indonesian fish processors to products, standards and markets in neighbouring Asian countries

While initially successful the first component met a stumbling block when the central government, which had fostered the system as a nation-wide pilot, was unable to find funds for further development of a national system. However, the provincial system of information by sms has remained active. The trade promotion element has also proved to be extremely successful and significant quantities of processed products are being exported through the links established.

### Provision of valuable infrastructure

In many emergency situations the well-intentioned construction of important infrastructure has been less than well-conceived. Provision of ice plants has proved to be particularly troublesome as examples from Indonesia, Somalia and Nicaragua demonstrate. The main lesson learnt is that while there is every reason for replacement of lost infrastructure, where it had been effectively utilized; hoping to kick start development by unsuitable or unsustainable introductions has a high failure rate. This is particularly so when communities lack continuous power supplies, spare parts and maintenance as well as professional management. The recipe for success is - plan carefully, make sure all the necessary conditions are met and ensure competent leadership.

## 2.6 SUMMARY OF LESSONS LEARNT

Each emergency is unique, with its own characteristics and tempo so a general prescription for emergency intervention is impossible. However, experience shows that

in the post-harvest sector there are a number of areas that merit specific attention when interventions are planned.

- The first response should be a damage and early recovery needs assessment carried out by a dedicated cross-sectoral team.
- A rapid post-harvest overview builds information on which a value chain analysis can be based.
- Before committing to major capital items, particularly ice plants, ensure that all utilities and trained staff are available.
- Modest investment to restart production can have a strong positive impact on livelihoods while it is essential to restart distribution to generate cash and to provide food.
- A carefully planned communication strategy can assist to inform beneficiaries, the donor community and the general public.

## 3. Standards and guidelines for the post-harvest sector

### 3.1 KEY INTERNATIONAL AGREEMENTS

#### Codex Alimentarius

International standards governing food quality and safety are established in the Codex Alimentarius produced by the FAO/WHO Codex Alimentarius Commission. Member governments undertake to base national standards on those Codex Alimentarius standards (FAO/WHO. 2012) they have adopted and not to discriminate against imported products that meet the standard. For fish products the standards are set by the FAO/WHO Codex Committee on Fish and Fishery Products, which also produces guidelines, as codes of practice that accompany the standard. The Codex code of practice for fish and fishery products (FAO/WHO. 2009) is relevant in an emergency context as it is intended for all those engaged in the handling, production, storage, distribution, export, import and sale of fish and fishery products. The Code will help in attaining safe and wholesome products that can be sold on national or international markets and meet the requirements of the Codex Standards.

#### WTO Agreements

International health-related trade restrictions are covered by two World Trade Organization (WTO) agreements that came into force in 1995. The first is the WTO Sanitary and Phytosanitary Agreement (the SPS Agreement) that covers health-related issues (WTO. 1995a). The other is the WTO Agreement on Technical Barriers to Trade (the TBT Agreement) that governs the technical requirements (WTO. 1995b). The agreements require that countries should not discriminate against products from countries with equivalent systems of food safety protection. The agreements also demand that all protection measures be based on science but accept that countries may have the need for specific measures to protect particular groups of consumers. The Codex Alimentarius is established as the arbitrator in cases of dispute.

#### FAO Code of Conduct for Responsible Fisheries

The FAO Code of Conduct for Responsible Fisheries was adopted by the member states of FAO in 1995 (FAO. 1995). In the foreword it states: “The right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources.” It provides a non-binding set of guidelines on how fishery resources can be responsibly used and managed. Useful technical guidance, which is applicable also in an emergency context, is provided to the post-harvest and trade sectors by Article 11 of the Code. Article 11.1 covers responsible fish utilization while Article 11.2 covers responsible international trade. The voluntary best practices for these two areas in the Code are further explained by specific technical guidelines (FAO. 2009).

National food quality and safety regulations, building codes and environmental rules

All emergency interventions relating to facilities and actions must take into account any national regulations that may be in force, governing all aspects of fish quality and safety including: hygiene and sanitation, construction of processing and storage facilities, markets and transport equipment. In situations where these are inadequate

the first requirement must be to ensure that no unsound practices or construction are encouraged and that the general principles of the Codex Alimentarius are followed. The requirements for effective and sustainable rehabilitation emphasize the need for close coordination with local authorities on all aspects of planning and encourage the use of national architects to plan reconstruction.

### Best practice statements

The process of emergency rehabilitation and reconstruction should be governed by the best available practice. It is useful to formulate the most appropriate set of applicable best practices at the time that damage and early recovery needs assessment is being developed. A group of high level goals of best practices for building back better in the post-harvest sector are given below, accompanied by a series of action statements.

#### **Response plan is based on a detailed analysis of the post-harvest sector**

- Damage and early recovery needs assessment is conducted at the first opportunity
- A rapid post-harvest overview (PHO) is undertaken before post-harvest interventions start.
- Plans identify opportunities for rapid asset replacement in the small scale processing sector that can help to restart production and fish distribution.
- All equipment provided is suitable, meets the standards and is available locally.
- Planning of large infrastructure replacement projects is integrated with future fisheries, community and national development plans.

#### **The response incorporates the diversity of the stakeholders in the post-harvest sector at the local and national level**

- Stakeholder analysis is undertaken and used to inform the planning process.
- At small scale, the selection of beneficiaries is equitable and guided by participation of community and fishers organizations to ensure that replacement assets are allocated without corruption.
- The role of women in the post-harvest sector is recognized in plans.

#### **Replacement infrastructure is appropriate to the community and is based on an analysis of its role in the value chain and technical and economic feasibility:**

- Replacement infrastructure is professionally planned and constructed following national building codes.
- In the absence of power supplies, maintenance facilities and professional management ice plants are not constructed.
- Possible topographical changes as a result of the disaster are considered in infrastructure replacement plans.

#### **Actions respond to market demands and are consistent with trade regulations**

- Landing centres and auction facilities are appropriately sized to the market requirements, allowing for development.
- Transparent information on market prices prevents profiteering by middle men.
- Seafood imports and exports meet the established quality and safety standards

#### **An effective communication strategy is developed**

Communication is effectively developed with the following groups in order to involve the community, keep donors informed on how their funds are used and attract new money:

- **Beneficiaries** through local media and participatory approaches
- **The general public** through print media, radio and television

- **Key international partners** through the media or directly by reports.

These include:

- governments and NGO's in donor countries
- development bank partners
- UN partners
- private sector donors
- CSO- civil society organizations
- opinion makers

**Emergency assistance is delivered in line with government policy and strategy.**

- Government staff are thoroughly involved with international experts in both the planning process and rebuilding activities.
- Inventories of inputs to the sector are kept and provided to the relevant government agencies.
- Post-harvest sector overview and value chain analysis contributes to the future development plans
- Guidance is sought from the FAO Code of Conduct for Responsible Fisheries (CCRF) by checking rehabilitation and reconstruction plans against the provisions of the Code.
- Post-harvest reconstruction activities are in concert with Article 11.1 of the Code
- Considerations on restarting trade are governed by Article 11.2 of the Code
- Plans for large infrastructure projects (landing centres, markets, ice plants etc.) for which the government is responsible use local expertise for design and are tendered in a transparent and accountable way.

**Systems are established to monitor and report on the safety and sustainability of the resources**

- Following oil spills or toxic chemical releases the environment and the food chain are surveyed for pollutants.
- Systems to check long-term accumulation of pollutants in apical predators are established.
- A resource impact analysis is undertaken in respect of the recovery plans.
- Resource management plans include the economic impacts on fish processing and marketing when determining such things as total allowable catches and allocation of quotas
- Once a disaster is recognized a scientific risk analysis is conducted of the impacts on the resources and ecosystem leading to a risk management plan and a risk communication plan.
- The risk analysis framework is applied to consumer safety and used to inform consumers on food safety issues.
- Ensure commercial pressure does not lead to compromising resource sustainability

**Public health safety and the quality of fish products are strengthened through recovery activities.**

- The rehabilitation of government inspection systems is based on the Codex Alimentarius and its accompanying standards, while following national regulations.
- The government's role in fish inspection and quality assurance is resumed after re-equipment and capacity development of staff.
- Reconstruction plans demonstrate the incorporation of the Codex Alimentarius Code of Practice for Fish and Fishery Products as the standard for reconstruction and meet national building codes.

- Safe products for domestic markets that meet national health and safety standards and export products that meet the standards of the importing country are ensured.
- There is close coordination on feed and food product quality and safety between those regulating aquaculture and processing.

### Key technical resources that should be available to planners and implementers

#### Fisheries management and governance

FAO Code of Conduct for Responsible Fisheries <http://www.fao.org/docrep/005/v9878E/V9878E00.htm>

Presents a set of non-binding principles to improve the governance of fisheries and is relevant to guide rehabilitation efforts. To be read in conjunction with:

FAO. Responsible fish utilization FAO Technical Guidelines for Responsible Fisheries. No. 7. Rome, FAO 1998, 33p. <http://www.fao.org/docrep/003/w9634e/w9634e00.htm>

And

FAO. Responsible fish trade. FAO Technical Guidelines for Responsible Fisheries. No. 11. Rome, FAO. 2009. 23p. <ftp://ftp.fao.org/docrep/fao/011/i0590e/i0590e00.pdf>

Eco-system approach to fisheries (EAF) FAO Fisheries Department. The ecosystem approach to fisheries. *FAO Technical Guidelines for Responsible Fisheries*. No. 4, Suppl. 2. Rome, FAO. 2003. 112 p. <http://www.fao.org/DOCREP/005/Y4470E/y4470e02.htm#bm02>

And: FAO. Fisheries management. 2. The ecosystem approach to fisheries.

2.2 Human dimensions of the ecosystem approach to fisheries. *FAO Technical Guidelines for Responsible Fisheries*. No. 4, Suppl. 2, Add. 2. Rome, FAO. 2009. 88p. <http://www.fao.org/docrep/012/i1146e/i1146e00.pdf>

The EAF presents a framework for reconstruction of all areas of fisheries in a manner that addresses the multiple needs of societies to draw from today's ecosystem without compromising the possibility for future generations to draw the same benefits from aquatic eco-systems.

#### Food safety

Codex Alimentarius Standards: [www.codexalimentarius.net/standard\\_list.asp](http://www.codexalimentarius.net/standard_list.asp)

List all accepted standards, including for fish and fishery products. Essential to meet export quality and safety standards and the best guide for products for the domestic market

Codex Alimentarius Code of Practice for Fish and Fishery Products <ftp://ftp.fao.org/docrep/fao/011/A1553E/A1533E00.pdf>. Provides guidance on how to achieve standards, maintenance of quality and safety, construction of premises for the handling, storage and processing of fish, cleaning and a wide range of other issues.

Lee, R., Lovatelli, A. & Ababouch, L. 2008 Bivalve depuration: fundamental and practical aspects. *FAO Fisheries Technical Paper*. No. 511. Rome, FAO. 135p. <http://www.fao.org/docrep/012/i0201a/i0201a00.htm>

Safe effective bivalve mollusc depuration is essential following disaster events.

FAO. 2009 Guidelines for risk-based fish inspection. *FAO Food and Nutrition Paper* No.90 89p. Rome. <http://www.fao.org/docrep/011/i0468e/i0468e00.htm>.

Describes the food safety hazards associated with fishery products and indicates control measures.

**Huss, H.H., Ababouch, L. & Gram, L.** 2003. Assessment and management of seafood safety and quality. *FAO Fisheries Technical Paper* No. 444 Rome, FAO. 230p. [www.fao.org/docrep/006/y4743e/y4743e00.htm](http://www.fao.org/docrep/006/y4743e/y4743e00.htm). An introductory manual on all aspects of safety and quality.

WTO SPS and TBT Agreements [http://www.wto.org/english/tratop\\_e/sps\\_e/sps\\_agreement\\_cbt\\_e/intro1\\_e.htm](http://www.wto.org/english/tratop_e/sps_e/sps_agreement_cbt_e/intro1_e.htm)

This agreement underpins all aspects of international trade in agricultural and fisheries products. The citation is a training module that is useful to promote understanding.

Food safety risk analysis. [www.fao.org/docrep/012/a0822e/a0822e00.htm](http://www.fao.org/docrep/012/a0822e/a0822e00.htm)

This Codex publication explains the principles of risk analysis that can be applied to safety and to general issues in order to assess, manage and communicate risk.

**WHO.** 1991 – Guidelines for Drinking Water-Water Quality, Volumes 1, 2 and 3 (\*), CBS Publishers, Delhi, India. The definitive manual for water quality for human consumption and food processing.

### Facilities

**Medina Pizzali A.F.** 1988 – Small-scale fish landing and marketing facilities, Food and Agriculture Organization of the United Nations, *Fisheries Technical Paper* 291, Rome Italy. (<http://www.fao.org/fishery/publications/technical-papers/en>). Contains important information for planning landing centres and markets.

### Support material

Post-harvest overview manual.

**Campbell J. and Ward A.** 2004. Fisheries Post-Harvest Overview Manual. An output of the DFID-funded Post-Harvest Fisheries Research Programme produced by IMM Ltd, Exeter, UK.

Complete instructions for the immediate conduct of a rapid review of post-harvest activities.

Value chain analysis.

[http://www.dfid.gov.uk/r4d/PDF/Outputs/HPAI/WKS081124\\_Annex16.pdf](http://www.dfid.gov.uk/r4d/PDF/Outputs/HPAI/WKS081124_Annex16.pdf)

[ftp://ftp.fao.org/es/esa/lisfame/guidel\\_valueChain.pdf](ftp://ftp.fao.org/es/esa/lisfame/guidel_valueChain.pdf). A value chain analysis helps to understand the structure of a fishery as well as to determine the flow of benefits.

**Gudmundsson, E., Asche, F. & Nielsen, M.** 2006. Revenue distribution through the seafood value chain. *FAO Fisheries Circular*. No. 1019. Rome, FAO. 42p <http://www.fao.org/docrep/009/a0564e/a0564e00.htm>. Guidelines for development of a value chain in fisheries.



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- IPCC,** 2012 *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, & P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY, USA, 582 pp.
- WTO.** 1995 Agreement on technical barriers to trade. [www.wto.org/english/docs\\_e/](http://www.wto.org/english/docs_e/)

[legal\\_e/17-tbt\\_e.htm](#)

**WTO.** 1995 Agreement on the application of sanitary and phytosanitary measures. [www.wto.org/english/docs\\_e/legal\\_e/15sps\\_01\\_e.htm](http://www.wto.org/english/docs_e/legal_e/15sps_01_e.htm)

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## Appendix 1 – List of participants

Common planning challenges	Checklist
Initial Assessment	<ul style="list-style-type: none"> <li>• To what extent are impacts on the technical area understood in the initial assessment.</li> <li>• To what extent are the implications of the impacts understood?</li> <li>• To what extent has an appraisal of appropriate interventions been undertaken?</li> <li>• To what extent has the capacity, of the local government and key service providers, to respond, been assessed?</li> </ul>
Linking to long-term development	<ul style="list-style-type: none"> <li>• To what extent has the response been based on the contingency plans (where they exist)?</li> <li>• To what extent does the response improve preparedness for future disasters?</li> <li>• To what extent does the response support local industry and services?</li> <li>• To what extent does the response build on peoples existing adaptive strategies and coping mechanisms?</li> <li>• To what extent does the response have an exit strategy and clearly defined link to long-term development?</li> </ul>
Participation	<ul style="list-style-type: none"> <li>• To what extent are vulnerable groups included?</li> <li>• To what extent is traditional knowledge included in solutions?</li> <li>• How are social and cultural norms included in planning?</li> <li>• How are the inputs and approaches discussed with a representative range of stakeholders?</li> </ul>
Technical support and agency competencies	<ul style="list-style-type: none"> <li>• To what extent do the people in the delivery agencies have the required competencies to understand, plan and respond to the needs in the sector?</li> </ul>
Response coordination	<ul style="list-style-type: none"> <li>• To what extent are the services provided complementary to the wider humanitarian response?</li> <li>• To what extent are the services provided in this technical area consistent with other services for the sector?</li> <li>• What mechanisms for coordinating response have been developed?</li> </ul>
Monitoring and Evaluation of impacts	<ul style="list-style-type: none"> <li>• To what extent have systems been established to check and refine the implementation as necessary?</li> </ul>
Beneficiary selection	<ul style="list-style-type: none"> <li>• To what extent does the assistance meet the needs of all stakeholder groups?</li> <li>• What mechanisms have been used for understanding needs and defining target groups?</li> <li>• Have all stakeholders in the community been consulted in drawing up a list of beneficiaries?</li> </ul>
Policy	<ul style="list-style-type: none"> <li>• To what extent are the policies and regulations that relate to the sector and its stakeholders reflected in the planning?</li> <li>• To what extent do the plans reflect internationally agreed standards?</li> <li>• To what extent have the policy constraints relating to the development of the sector been recognised in the response?</li> <li>• To what extent does the response link into the long-term efforts to reduce vulnerability to climate change?</li> </ul>
Use of the Code of Conduct	<ul style="list-style-type: none"> <li>• To what extent have the principles and practices of the Code of Conduct for Responsible Fisheries, specifically Article 11, been incorporated into the response?</li> </ul>



# Responding to the needs of vulnerable people in fisheries and aquaculture emergencies

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# 1. Vulnerability to disasters in fishing and fish farming communities

## 1.1 UNDERSTANDING VULNERABILITY

Disaster situations can easily create the impression of having a “levelling” effect on the populations on which they impact – the negative impacts of a major catastrophe seems to impact everyone in a particular area indiscriminately. However, closer study will often highlight how such disasters, and the responses to these disasters, will affect different groups of the population in very different ways and the intensity and duration of impacts will vary considerably.

Often, while the immediate impacts of a disaster may indeed reduce almost everyone in a community or an area to a similar condition of destitution and helplessness, variations in the conditions of people prior to a disaster can play an important role in determining how they are able to cope with the situation and the speed with which they are able to recover.

For international or local agencies involved in providing relief to affected populations immediately following a disaster, and those engaged in the process of rehabilitation and reconstruction in its wake, understanding the relative vulnerabilities of different groups within a disaster-affected population is key in enabling such agencies to tailor their interventions and ensure that appropriate support is being provided to different groups at different stages in the disaster relief and recovery process.

However, the complexities involved in identifying “vulnerable” groups in a disaster situation, and assessing the nature and dynamics of their specific vulnerabilities in a disaster and post-disaster context, should not be underestimated. Agencies and their operators may need to take into account a complex set of overlapping, and interacting, vulnerabilities. Some may be “underlying” vulnerabilities that have long-term effects either on the general population in a particular area, or on particular groups of people within that population. The specific vulnerabilities associated with natural

### Box 1 – Vulnerability

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

(UN/ISDR, 2009).

### Box 2 – Interlocking vulnerabilities in coastal communities in Orissa, India

Coastal communities affected by the 1999 super-cyclone in Orissa, India were characterised by a complex set of inter-locking vulnerabilities that affected different groups in the communities in different ways, and gave rise to different levels of exposure to the effects of the disaster and different capacities to respond to it. Migrant fishers from Bangladesh camping on beaches were the most exposed and vulnerable, not only because of their location, but because they did not understand warnings provided in the local language and were largely hidden or unrecognised by local institutions. Other coastal communities also had relatively limited contact with local government and administration, either because of their social marginalisation, their low caste status or their acute poverty. While the cyclone created an emergency situation that affected everyone in the area, the characteristics of different groups meant that their capacities to respond and cope often varied considerably.

(IMM, 2001)

disasters and their consequences then need to be “overlaid” on top of these existing vulnerabilities and the interactions between them properly understood.

At the highest level, worldwide, less-developed countries, where people are subject to higher levels of poverty and where the resources to improve disaster preparedness and response are often lacking, are more subject to natural hazards (Alcantara-Ayala, 2002). This already means that people in many less-developed regions of the world are both **exposed** to natural hazards because of the locations where they live and, when they are affected by these hazards, they are more **sensitive** to their impacts (Olmos, 2001) because they are likely to be poorer, to receive less institutional support, and to be less likely to make their voices heard in relation to relief and rehabilitation decisions.

However, even in the context of more developed nations, where improved infrastructure and better institutional response mechanisms should help to reduce the vulnerability of populations to disasters, the experiences of disasters such as Hurricane Katrina in the United States has shown that such “...ecological disasters are not egalitarian” (Zoraster, 2010). Poor and vulnerable groups of the population tend to live in more polluted, less secure and higher risk environments, tend to be less well-informed about disaster risks and response, be less mobile, more likely to be suffering from diseases or conditions that make them unable to deal with extreme conditions and less able to recover from major disruption in their lives (Zoraster, 2010).

*“.....‘vulnerable’ refers to people who are especially susceptible to the effects of natural or man-made disasters or of conflict. People are, or become, more vulnerable to disasters due to a combination of physical, social, environmental and political factors. They may be marginalised by their society due to their ethnicity, age, sex, disability, class or caste, political affiliations or religion. A combination of vulnerabilities and the effect of an often volatile context all contribute to people being vulnerable for different reasons and in different ways. Vulnerable people, like all those affected by disaster, have various capacities to manage and recover from disasters. A thorough understanding of vulnerable people’s capacities and the barriers they may face in accessing humanitarian support is essential for a response that meets the needs of those who need it most.”*

*(The Sphere Project, 2011)*

The dimensions of vulnerability outlined in this definition are clearly generic to all populations and are not necessarily specific to fishing or fish farming communities. However, for aid, relief and development agencies operating in a post-disaster environment it is particularly important to understand how these vulnerabilities are manifested within the fisheries sector and to avoid to risk of regarding fishing and fish farming communities as homogeneous groups. While some elements of the vulnerability faced by different groups in fisheries and fish farming may be very similar to those encountered in other sections of the population, other features are quite specific. For example, while women generally face particular forms of vulnerability during a

### Box 3 – Drought emergencies and old people in Ethiopia

Studies have shown how old people are disproportionately affected at times of drought. Where their family and community support networks have broken down as a result of displacement or death, they are often left alone and vulnerable and, even where they still have these networks, their lack of mobility and limited range of coping strategies makes them particularly sensitive to the impacts of emergency situations. In the past, these vulnerabilities have often been missed by agencies conducting emergency needs assessments and older people have been excluded from relief and other emergency programmes as a result. Nutrition programmes have often tended to focus on child nutrition and have not taken account of the fact that many older people would renounce food in order to feed younger members of the household, often leading to deterioration in their own nutritional status. In addition, some of the standard means of measuring nutritional status were found to be inappropriate for older people and alternatives had to be identified.

*(Tilstone, 2001)*

disaster and during the relief and rehabilitation process, women in fishing communities may face particular forms of vulnerability that are related to their roles in fisheries and fish farming (Oxfam, 2005).

Those involved in the fisheries and fish farming sectors are often diverse in terms of other characteristics that may affect their relative vulnerability as well. In the same area, different ethnic, religious or caste groups may well be involved in different types of fishing activity and they may experience different levels of vulnerability in relation to potential hazards. For example, in isolated *beel* areas of north-eastern Bangladesh, different groups of people involved in fishing are distinguished by a complex set of social, religious, caste and economic characteristics which in turn influence their access to resources, the types of fishing activity they carry out, where they live, the condition of their housing and their access to formal institutions and information. All of this can significantly affect people's capacity to respond to the flooding emergencies that frequently affect the area (FAP 17, 1994).

Relative poverty is also an important factor influencing vulnerability. Taking poverty levels of different individuals and groups within broader fishing and fish farming community into account is important particularly as fishing communities as a whole are often labelled as vulnerable to poverty. This can lead to them being regarded as uniformly 'poor' and the important differences in well-being and wealth within these communities being overlooked (Béné *et al.*, 2009). Many agencies involved in relief and rehabilitation work in the fisheries sector after disasters tend to focus on the small-scale fisheries and aquaculture sub-sectors. This is often justified as small-scale operators are often concentrated in low-lying coastal areas where they are more exposed to the impacts of hydro-meteorological hazards, and also because they may be more subject to poverty and therefore more in need of support. However, as a result, the 'small-scale' sub-sectors, whether in capture fisheries or in aquaculture, can end up being regarded as homogeneous from the point of view of wealth and poverty. This can be misleading as it can lead to important specific vulnerabilities being ignored or masked as entire communities are labelled as 'poor' and generic solutions identified for their members which ignore important differences in people's needs and capacities to take advantage of relief and rehabilitation efforts (The Sphere Project, 2011).

In considering vulnerability to hazards in fishing and fish farming communities, the **interconnectedness** of different activities and sub-sectors, and the roles of different groups within these sectors also needs to be taken into account. While agencies working on emergency relief and rehabilitation may focus their efforts on the small-scale sector, many activities within these sectors may be highly dependent on larger scale operations that may provide inputs, marketing facilities or important services on which the small-scale sub-sectors depend. For example, in South India, the owner/operators of small-scale fishing units may seasonally depend on work as labourers on larger-scale fishing units and rely on marketing linkages that are primarily supported by the larger catches generated by mechanised boats. For women involved in fish processing and marketing, catches from larger-scale vessels may be critical for accessing low-cost fish that can be obtained at reasonable prices (Townsend *et al.*, 2012). Similarly feed for small-scale aquaculture operations may rely from by-catch from mechanised fishing activities and, particularly in the aftermath of a disaster, this may provide the most immediate source of feed for re-establishing aquaculture activities.

In the rest of this section, some of the more generic forms of vulnerability facing fishing and fish farming populations in relation to hazards are laid out. Sections 1.1 – 1.3 make use of the Vulnerability Framework (Allison *et al.*, 2005) while the subsequent discussion in Sections 1.4 – 1.5 make use of the Sustainable Livelihoods Framework (adapted from FAO, 2009) to provide a framework for analysing and understanding the more specific characteristics of vulnerable groups in the fisheries and aquaculture sector.

#### Box 4 – Vulnerabilities of women in fishing communities during the Indian Ocean tsunami

The tsunami that affected coastal communities right across the Indian Ocean in 2004 had particularly severe impacts on women and highlighted the specific nature of their vulnerability to disasters of this kind. Women play an active, and often dominant role in fish marketing in fishing communities, particularly in India, and, because of the timing of the disaster, during the early morning, many women were on beaches waiting for fishing craft to return so that they could buy fish. Throughout the region, men are far more likely to be able to swim than women and even men's ability to climb trees helped ensure better male survival rates. Traditional forms of dress for women also represented an impediment for women caught by the wave. Women's role in the house and childcare also meant that more women were at home with their children when the disaster struck (Oxfam, 2005). As a result, a disproportionate number of victims of the tsunami were women. In some places in Aceh, Indonesia, over 75 percent of the total number of victims were female and in some parts of coastal Tamil Nadu, India, more than 3 times more women dies compared to men (Oxfam 2005). During the relief and rehabilitation phase, women in fishing communities were often excluded, as least initially, from many relief efforts focussed on the sector simply because of a widespread perception that the restoration of fishing craft and gear was above all a male domain. This ignored the key role played by women in post-harvest fisheries. During subsequent rehabilitation efforts, some of this imbalance seems to have been more effectively addressed.

(FAO, 2007; ICSEF, 2006).

The Vulnerability Framework can be used to understand key aspects of the vulnerability in peoples livelihoods in terms of their **exposure, sensitivity** and **adaptive capacity** in relation to hazards. This helps to analyse these different aspects of vulnerability and distinguish different levels and degrees of vulnerability among those potentially affected by a disaster.

The Sustainable Livelihoods Framework provides a means of analysing those specific factors that may contribute to vulnerability. This framework has several key features:

- People's **characteristics** which can include their gender, age, ethnic group, language, caste or class, ability, history and location and all those aspects that essentially determine who people are. The positioning of people and their characteristics at the centre of the framework is essential as it encourages a focus on the specific characteristics of people and differences rather than on more generalised factors. These characteristics are important as they often play a key role in determining the vulnerability of particular groups within a disaster-affected population.

- The **livelihood assets** that people, or their households, are able to access and make use of in order to develop their livelihood. These assets can be categorised in many ways but generally key categories include **human, natural, social, financial, physical** and **political**. The ways in which people can draw on these assets, use them for **livelihood activities**, exchange and convert them and ensure that they have continued access to them is key in their capacity to create a livelihood. These then generate specific **livelihood outcomes** that

may be more or less sustainable, and provide the basic requirements in terms of nutrition, shelter, income and human dignity. Clearly outcomes are also shaped by people's expectations and past experience.

- **Policies, institutions and processes** play a critical role in mediating people's access to the livelihood assets they require and strongly determine the outcomes that they achieve. This set of factors includes policies, laws, markets and regulations, whether developed through formal institutional channels or informally, as well as the mechanisms and institutions that develop these. The relationships between people and these institutions are clearly critical as they determine the extent to which people can influence decisions that affect their livelihoods and their access to livelihood assets. These relationships, in turn, may be strongly influenced by social and cultural norms and values.

- The **vulnerability context** which includes shocks, stresses and seasonal factors that influence people's livelihoods. In the broadest sense these are those factors over which people, and institutions, may have little or no control.

The Sustainable Livelihoods Framework adds value to an analysis of a disaster situation in several ways that are particularly important when addressing the needs of vulnerable groups.

- First of all it encourages a **people-centred, holistic** analysis of livelihoods, which is particularly important when looking at specific individuals or groups and understanding the dynamics and complexities of their livelihoods;
- The analysis of people's **asset** base encourages a more **holistic approach** to understanding livelihoods which is particularly important in the case of vulnerable groups who may have high levels of dependence on **social assets** (networks of support among family, neighbours and friends) and human assets (their acquired knowledge and skills), but relatively limited access to the natural, physical and financial resources that are often the focus on relief and rehabilitation efforts;
- It also focusses attention on the linkages between the livelihoods of different individuals and groups and the **agencies** and **institutions** that either support them and enable them to create viable livelihood strategies, or which alternatively may fail to provide adequate support or even actively hinder the achievement of appropriate outcomes. Again this aspect of particular importance for more vulnerable groups in the population as they are more likely to be dependent on institutional support and specialised agencies in order to overcome the obstacles they face in achieving adequate livelihood outcomes.

Together, these frameworks can provide a useful starting point for analysing the complexities and linkages involved in understanding vulnerability and vulnerable groups in fisheries and aquaculture in disaster situations. In Figure 1 below, these two frameworks – the Sustainable Livelihoods Framework and the Vulnerability Framework – are juxtaposed.

## 1.2 EXPOSURE OF FISHERS AND FISH FARMERS TO HAZARDS

'Exposure' to natural hazards, particularly those of hydro-meteorological origin, is often a characteristic of fishing and fish farming communities.

Fishing and fish farming communities are generally situated in proximity to water bodies of one kind or another. The majority of natural hazards that lead to disaster situations are of hydro-meteorological origin and this inevitably means that fish and fish farming communities have a relatively high-level of exposure to natural disasters (Alcantara-Ayala, 2002). With global warming, it is widely predicted that both the severity and the frequency of hazards like tropical storms and extreme weather and storm surges is likely to increase over the next decades and thus the exposure of fishing communities to these hazards will also increase (IPCC, 2001). At the other extreme, drought is another form of natural hazard that is likely to become more common in the future. Exposure to drought particularly affects freshwater fishers and fish farmers who rely on water flows and rainfall for their activities, although clearly the impacts of drought on food and drinking water supply may be felt across all sections of society including marine fishers. In Somalia, natural disasters in the form of severe drought, as well as conflicts with neighbouring countries and civil strife

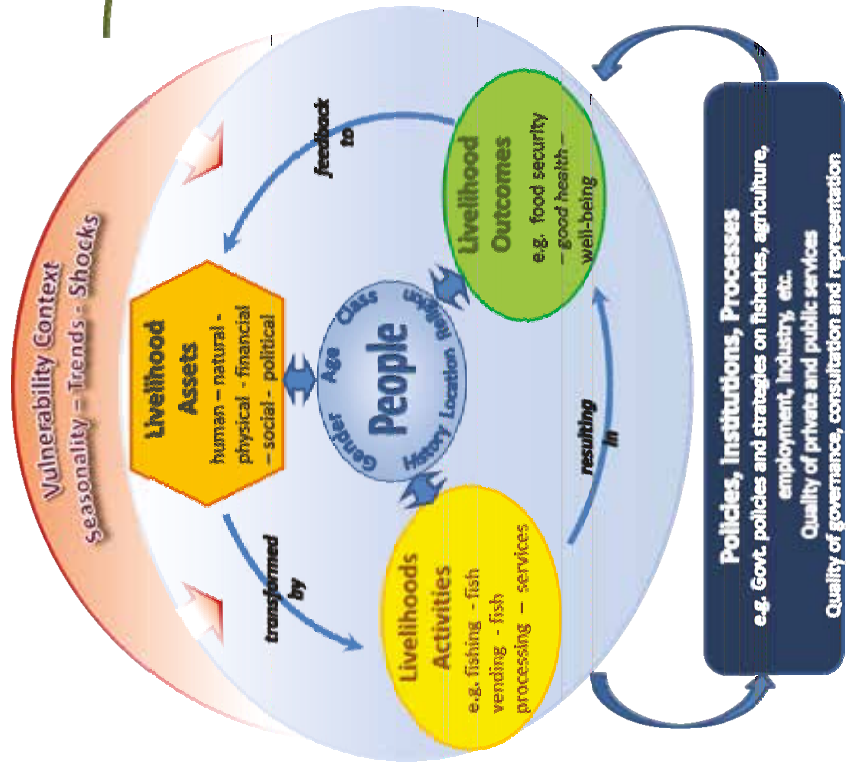
### Box 5 – Hazards

A hazard is a 'dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.'. It is important to recognize that a 'hazard' only becomes a 'disaster' when it impacts on people who are vulnerable to that particular hazard

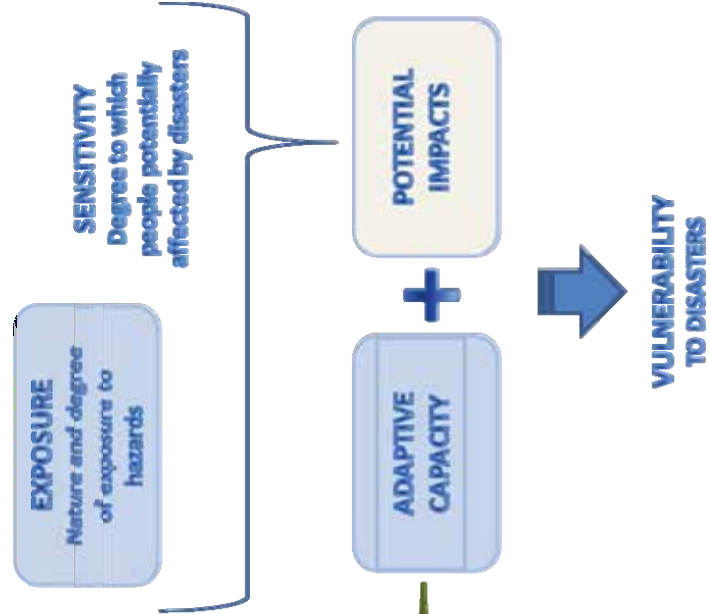
(Twiggs, 2004; UN/ISDR, 2009).

FIGURE 1  
The Livelihoods Framework and the Vulnerability Framework

**Livelihoods Framework –  
defining underlying vulnerabilities**  
(*adapted from FAO, 2009*)



**Vulnerability Framework –  
defining specific vulnerabilities**  
(*adapted from Allison et al., 2005*)



have combined to create a complex disaster situation that may have specific impacts on fishing communities, and elicit specific types of response from them, as well as affecting the broader social setting in which they operate.

Other forms of hydro-meteorological hazard, such as floods and landslides, even though they may occur far from the coasts or lowland areas where fishers and fish farmers operate, will often have particularly severe impacts in the vicinity of rivers and water bodies where freshwater fishers are concentrated and much aquaculture activity takes place. As well as direct impacts as a result of floods or flows of debris, water quality may be changed, fish spawning grounds in freshwater areas disrupted, water flows shifted and the aquatic ecology on which fisheries resources depend radically affected.

In recent years, several of the most dramatic natural hazards to have occurred have been geological in origin – caused by earthquakes such as the massive quakes off the west coast of Sumatra in Indonesia in December 2004 and the Japanese quake in March 2011 – but their impacts have been linked to hydrology – the catastrophic *tsunami* generated by those earthquakes. In both of these cases, fishing communities in coastal areas have been among the most groups affected (Clinton, 2006).

Proximity to water, and a reliance on aquatic organisms for a livelihood, thus represents an important element in the vulnerability for fishing and fish farming communities (Badjeck *et al.*, 2010). The dangers associated with fishing as an occupation, quite independent of the presence of specific natural hazards, are well known and result in significant loss of life in the sector on a regular basis. Clearly, working on water also leaves fishers particularly exposed to natural hazards at sea or on water bodies. As well as producing flooding, aquatic systems can also become vectors for pathogens, pollution and predators that can have destructive impacts on the livelihoods of fishers and fish farmers. Fish farmers may be particularly vulnerable to these types of impact where disease enters the aquatic system from other fish farms and is spread through the water supply necessary for fish farming downstream (Brown *et al.*, 2010; Campbell, 2010). Pollution, which may either be directly produced by industries or the result of other human activities in upstream areas or watersheds, such as logging or land clearance, can also have serious and catastrophic impacts downstream on fisheries and fisheries related livelihoods (Campbell *et al.*, 2006).

Similar effects of industrial and shipping accidents are seen in coastal areas impacts in marine fishing communities as well. The Deepwater Horizon oil well explosion and subsequent oil pollution along the coast of the Gulf of Mexico in Louisiana in 2010, and its impact on coastal fisheries in the area, typified this exposure of fishing communities to man-made disasters that affect the aquatic environment (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011). In addition, the impacts of such disasters on fisheries are not limited to the immediate effects of pollutants on fish populations and quality of fish for human consumption. Such hazards may have longer term impacts on the aquatic environment that negatively influence its productivity, damage biodiversity and the long-term value of fisheries, as shown by events such as the Exxon Valdez oil spill in Alaska in 1989 (Miller, 1999).

It is important to recognise, however, that ‘exposure’ to hazards is only **one element** that contributes to vulnerability. If a particular group of people or community is well-

#### Box 6 – Exposure to hazards

‘People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses’. In relation to disasters and emergencies, exposure refers to the nature and extent to which people, the communities they live in and the different activities they depend on for their livelihoods, are exposed to the physical effects of a particular hazard

(UN/ISDR, 2009; IPCC, 2001).

prepared, resilient and receives appropriate support, it may well be able to deal with its exposure to a particular hazard and minimise the impacts of that hazard should it occur. The extent to which a hazard translates into a disaster for a particular population depends largely on its sensitivity which is discussed below.

#### Box 7 – Sensitivity to hazards

“Sensitivity” to hazards refers to the extent to which any particular population is liable to suffer impacts as a result of encountering a hazard. In brief, sensitivity constitutes the reasons why exposure to a hazard turns into a disaster, with its accompanying impacts on human life and livelihoods.

(IPCC, 2001).

### 1.3 SENSITIVITY OF FISHERS AND FISH FARMERS TO HAZARDS

While the **exposure** of fishers and fish farmers to hazards, and particularly natural hazards, is frequently linked to their dependence on, and proximity to, the aquatic environment, their **sensitivity** to these hazards is more complex and is likely to require deeper analysis of both current and historical conditions in order to be fully understood.

The relative sensitivity of fishing and fish farming communities to hazards is dependent on a wide range of features and characteristics.

- Compared to urban employment or agricultural work, fishing activity, which is essentially a hunting activity, means that fishers are highly mobile and this can often increase their sensitivity to hazards. In some cases fishers undertake migrations that may mean that they live and work, at least temporarily, in circumstances where they are not recognised by local institutions and agencies, their presence may be largely unnoticed by officials and they may not even speak the local language. In the event of a hazard occurring, this may mean that they are left uninformed and unassisted and render them particularly sensitive to the impacts of the hazard. The plight of migrant Bangladeshi fishers on the coast of Orissa during the cyclone of 1999 typified this situation (Campbell *et al.*, 2001). Even on a more regular, daily basis, the mobility inherent in fishing activities will often mean that the exact location of fishers is unknown making it particularly difficult to provide them with support of any kind during a disaster.
- The majority of fishing and fish farming activity in areas in developing countries which are most exposed to natural hazards is carried out by small-scale operators of one kind or another (Alcantara-Ayala, 2002). While the term “small-scale” can potentially cover anything from an extremely marginal fisher exploiting coastal resources with minimal equipment to a rural entrepreneur running a small fish farm and rural hatchery, many small-scale operators in these areas operate in situations where their access or control of resources and assets is limited. This does **not** mean that all small-scale operators can be regarded as “poor”, but it does mean that they often face a set of constraints that can increase their sensitivity to hazards and make them more susceptible to disaster situations. Examples of such constraints may be:
  - Limited reserves or savings to help them deal with periods of crisis or lack of production;
  - Poor influence and contacts with institutions and agencies, meaning that it is difficult for them to access support and assistance in a crisis;
  - Inability to influence policy decisions regarding disaster preparation and readiness meaning that they may lack the fundamental requirements for dealing with a prospective hazard such as disaster warning systems or appropriate safe areas;
  - Poor physical infrastructure, housing and services that offer little protection in the face of a disaster and are easily subject to destruction in a disaster situation;

- On occasions, high levels of dependence on a particular activity such as fishing or fish farming making them particularly sensitive to the disruption of that particular activity as a result of a disaster;
- **Dependence on markets** is generally a key characteristic of fisheries operations. Markets for fisheries are often relatively well-developed in response to the perishable nature of fish as a commodity and the need to move fish quickly from the point of landing to consumer markets. Some aquaculture operations in rural areas may be more oriented towards household consumption, but the vast majority of capture fisheries operations are primarily aimed at providing fish for sale on the market. This has important implications for the sensitivity of fisheries to disasters. If market mechanisms survive a disaster, or if the scope of a disaster is such that it leaves some accessible areas relatively unaffected, this means that fishers who have not had their activities severely impacted may be able to continue fishing and find markets for their produce. In addition, where fisheries production can be rapidly rehabilitated it can play an important role in re-activating local markets as, once equipment has been replaced, capture fisheries can quickly start to generate income and demand for services in support of fishing operation

On the other hand, where market mechanisms are disrupted, even fishers who have not been directly impacted by a disaster may feel its effects on their livelihoods by not being able to sell their catches, at least in the short-term. Similarly, events such as pollution or severe contamination, where some aquaculture activities are impacted, may have knock-on effects on other neighbouring operations which, even though unaffected directly, are considered by market regulators or by consumers as “at risk”. In the wake of the Deepwater Horizon oil spill in the Gulf of Mexico in 2010, many fish producers in adjacent areas unaffected by the disaster found that demand for their produce declined as consumers were concerned about pollution and contamination (Oil Spill Commission, 2010).

#### 1.4 ADAPTIVE CAPACITY OF FISHERS AND FISH FARMERS IN THE FACE OF DISASTERS

Vulnerability is also determined by people’s capacity to deal with a hazard, or cope with it and recover from it. once it has affected them and become a disaster. Like people’s sensitivity to hazards, their **adaptive capacity** in the face of a hazard is complex and depends on a wide range of interacting factors ranging from the scope and severity of the disaster, people’s ability to avoid the impacts of a hazard, the inherent resilience of the livelihoods on which people depend, and the effectiveness of the mechanisms put into action to provide support in the relief and recovery process.

Several features specifically regarding fishing and fish farming communities is likely to influence their capacity to adapt in a disaster situation:

- From the point of view of their principal livelihoods activities, fishers have, at least potentially, some advantages compared to other livelihood groups. Provided they can access the necessary equipment, fisheries, at least in the marine environment, will often recover relatively quickly from a disaster and offer possibilities for rapid reestablishment of people’s livelihoods (Campbell *et al.*, 2001). Clearly there

##### Box 8 – Adaptive capacity in the face of disasters

‘A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means, personal or collective attributes, or capabilities. ‘The ability of people, organizations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters.’ This definition of “coping capacity” includes

(UNISDR, 2009; Levina *et al.*, 2006)

are exceptions – major man-made disasters such as oil pollution in the wake of shipwrecks or oil well leakages may compromise fishing activities over a large area in the long-term (Miller, 1999). However, compared to agriculture, where loss of crops and food reserves are not easily replaced in the short term except through direct aid, fisheries can offer possibilities for a relatively rapid return to production.

- For fish farmers, patterns of adaptation are more likely to be similar to those of agriculturalists with the need for longer-term rehabilitation and the completion of culture cycles before activities can be restored to pre-disaster levels.
- Both capture fisheries and fish farming, whether in marine environments or freshwater, involve specialised equipment. The levels of sophistication and cost involved in obtaining this equipment can vary significantly. Any fishing craft for fishing off-shore, deeper waters is likely to represent a major investment and will require highly specialised skills and materials for its construction – the process of replacing such hardware in the wake of a disaster will therefore be correspondingly more complex. By contrast, some fishers may depend on extremely simple fishing gear that can be easily constructed and replaced enabling them to return to fishing rapidly following the loss of productive assets. However, a key point regarding adaptation in a post-disaster situation affecting fishing or fish farming communities is that access to specialised skills is often key for recovery of livelihoods. Where skills are not locally available, or where human capital has been severely reduced as a result of a disaster, this can prove challenging.

## 1.5 INHERENT FACTORS INFLUENCING VULNERABILITY

### 1.5.1 Hazard types and vulnerable groups

The sensitivity of different groups of people who are subject to the same exposure to a particular hazard is often quite different. For example, different fish farmers living in the same community in the same location in a lowland area where all are exposed to a natural hazard such as pollution coming from upstream sources, might have quite different levels of sensitivity and that sensitivity can be influenced by many factors. Those involved in pond aquaculture (and perhaps relatively better off because of their ownership or access to land and water sources for ponds) might be able to isolate, at least temporarily, their ponds from external water sources and minimise the effect of pollution. Others, without land and relying on open-water areas for cage culture activities, might not have this option open to them and so be more sensitive to a hazard of this kind. However, if the pollution hazard was to be combined with flooding that reaches ponds as well as open-water areas, the relative sensitivities of these two groups might be more similar.

Clearly in the face of major events which create large-scale and diffuse destruction, such as a *tsunami* in low-lying coastal areas, a major earthquake or a powerful cyclonic storm, differences in relative sensitivity of different population groups may well be effectively “levelled” by the power and scope of the hazard. However, in many cases, differences in location, type of livelihood activity undertaken, relative wealth and access to key elements of physical, human and social capital can determine significant differences in people’s relative sensitivity to different hazards. A few examples of this might include:

- Possession of a brick or cement built house, compared to a wooden or mud hut could well mean the difference between survival and injury or death during a cyclonic storm (IMM, 2001; Oxfam, 2005);
- Being at sea when a *tsunami* strikes can reduce exposure and risk compared to being on shore (Oxfam, 2005; ICSF, 2005);
- Access to information, through radio or television, can provide early warning of an impending hazard, such as a storm, a *tsunami* or flooding, and enable people to

take appropriate action, whereas lack of access to such information sources, and lack of alternative sources such as public announcements, might greatly increase the exposure and sensitivity of some groups to such disasters (Tanesia, 2007);

- Relative mobility, either in the form of appropriate transport, or physical capacity to move quickly, is also likely to represent an important determinant of sensitivity. For less-able people, capacity to respond to warnings may be quite different compared to those with full physical capabilities and their sensitivity to some disasters will be significantly higher (Oxfam, 2005).

In the livelihoods framework shown in Figure 1, several key characteristics of different groups of people are highlighted. Differentiating individuals and groups according to these key characteristics is particularly important in the analysis of vulnerability as all of these features are likely to have a significant influence on the relative vulnerability of different groups of people in fishing or fish farming communities.

*“Not all individuals within a disaster-affected population have equal control of resources and power. People are, therefore, impacted differently on the basis of their ethnic origin, religious or political affiliation. Displacement may make vulnerable certain people who in normal situations would not have been at risk. Women, children, older people, persons with disabilities or people living with HIV may be denied vital assistance or the opportunity to be heard due to physical, cultural and/or social barriers.”*  
(The Sphere Project, 2011)

The following discussion looks at how some of these key characteristics of different people can create more inherent vulnerabilities within particular groups of the population. Many of the features discussed here are not specific to fishing and fish farming populations but understanding them and taking them into account as part of the process of post-disaster assessment and the design of interventions in the fisheries and aquaculture sector is nevertheless critical.

### 1.5.2 Exclusion

The Humanitarian Charter and the Protection Principles (Sphere, 2011) provide basic standards that are applicable across all humanitarian interventions, and at all stages of humanitarian interventions, whether in efforts to reduce risk from disasters, in the immediate relief phase or in the design of rehabilitation and reconstruction interventions. Interventions to restore the fisheries and aquaculture sectors affected by an emergency will generally become more clearly differentiated from general relief efforts after the Emergency Response stage when the process of recovery is being planned and implemented. In order to apply the principles outlined in the Humanitarian Charter and Protection Principles, those involved in interventions specifically targeting these sectors need to pay particular attention to the risks of social **exclusion** that may arise during the recovery phase.

Social exclusion can be defined as a ‘..process by which certain groups are systematically disadvantaged because they are discriminated against on the basis of their ethnicity, race, religion, sexual orientation, caste, descent, gender, age, disability, HIV status, migrant status or where they live’ (DFID, 2005). The process of rehabilitating the fisheries and aquaculture sector following a disaster runs the risk of either exacerbating existing patterns of exclusion or creating new patterns if the decisions about interventions are not informed by an understanding of those groups that are subject to exclusion and their relationships with wider society. Post-emergency situations are often characterized by intense pressure from donors and governments on those agencies involved in rehabilitation work to quickly identify and implement reconstruction activities. Where this is not accompanied by careful analysis of the dynamics of exclusion, there is an acute risk that particular groups may be excluded from the benefits of reconstruction or see their livelihoods and well-being undermined.

To avoid these risks, those groups within fishing and aquaculture communities who are vulnerable to exclusion – from decision-making processes, from contact with institutions, from community level action – need to be identified. This will require the development of appropriate means of engaging with them and ensuring that they participate in the benefits of the reconstruction process and are not discriminated against.

#### Box 9 – Gender

Gender refers to the social roles and relations between women and men. It includes the different responsibilities of women and men in a given culture or location. Unlike the sex of men or women, which is biologically determined, the gender roles of women and men are socially constructed, and such roles can change over time and vary according to geographic location and social context.

(Palombi, 2009)

#### 1.5.3 Gender

Of the more than 180 million people worldwide who were estimated as working full-time or part-time in capture fisheries and aquaculture in 2008 (FAO, 2008), roughly half are women. Most of these are concentrated in the post-harvest and marketing sub-sectors, although there is also significant involvement of women in capture fisheries (particularly in inland fisheries) and aquaculture production. These figures serve to emphasise how disasters that impact on the fisheries and aquaculture sectors will **always** have impacts on both

men and women, whether it is communities that are affected or productive assets, and therefore how critical it is that the concerns and priorities of both women and men be taken into account when considering relief and recovery measures for these sectors.

Capacity to deal with different disasters is often affected by gender. While “... *gender is definitely not an automatic indicator of disadvantage and a factor of disaster vulnerability ...*” (Palombi, 2009) it can contribute to levels of vulnerability and men and women do not necessarily have similar needs and capacities in a disaster situation. Therefore is a crucial concern in addressing the needs of fishing and fish farming communities facing a disaster situation.

Different types of disaster commonly have different levels of differential impact on men and women – floods typically cause more male victims than female victims whereas *tsunami* and storm surges cause more victims among women (Oxfam, 2005). These differences are the result of a combination of physical differences (men’s strength and capacity to protect themselves) and gendered differences determined by social and psychological factors (women may not know how to swim because it is not regarded as an appropriate activity for them; men and women may typically find themselves in different locations which means they have different levels of exposure to different hazards; types of clothing worn by men and women can affect their survival during different types of disaster).

Such differential levels of vulnerability are often marked in fishing communities because of the distinct gendered roles assigned to men and women in the sector. While the precise nature of gender distinctions in the fisheries sector vary across cultures and continents, fish harvesting, particularly in marine waters, is almost universally a male-dominated activity. By contrast, women in fishing communities often play a key role in fish marketing. Depending on the type of disaster and the timing, these distinct roles can influence the extent to which men and women might be vulnerable to a disaster. The timing of the 2004 Indian Ocean *tsunami* disaster, which occurred early in the morning in most of the affected areas, was one factor which led to the higher proportion of female victims compared to men, particularly in fishing communities (Oxfam, 2005). For example, when the *tsunami* hit the coast of Tamil Nadu, many men from fishing communities were still at sea or returning from fishing trips whereas

many women fish vendors from the same communities were on the beach waiting for fishing craft to return so that they could purchase fish for their fish vending enterprises (ICSF, 2005). This left women in fishing communities particularly exposed to the risks from the *tsunami* and this was reflected in their casualty figures.

#### 1.5.4 Age

The elderly are also particularly vulnerable during an emergency and their special needs are easily ignored during the recovery and reconstruction process. Older people are often highly dependent on relatives or other community members for their livelihoods and, in the disruption following a disaster, vital supporting networks may be disrupted or lost.

Special attention to the needs of the elderly is often critical to ensure that their concerns are incorporated into recovery efforts. The risks of passing these needs over is high because old people may not naturally be engaged in decision-making processes or consulted regarding their needs. At the same time, within households, old people may play an important role in assisting with the recovery process. Where family members have been lost or incapacitated, older parents may well take on key roles in child care and maintaining the family, and in crisis situations, there is significant evidence that older people often make important sacrifices in order to provide for other family members (Tilstone, 2001).

Older people are often key to the recovery process after a disaster as they are repositories of knowledge and experience that may be essential in order to respond effectively to the challenges of reconstruction. Building on these strengths among the elderly may be key to ensuring their dignity in post-emergency situations. This may be especially important in the fisheries and aquaculture sectors because of the specialized knowledge required in order to rehabilitate productive activities in both sectors.

Young people and children represent special challenges as well. They also tend to be especially vulnerable during emergencies and are particularly sensitive to the disruption of their family lives after a disaster. Ensuring the rights of children to a safe environment, to food security, to access to education and to conditions where they are treated properly and not subject to violence or exploitation may be particularly challenging and require specialized efforts. Where the focus of rehabilitation efforts is on productive activities in the fisheries or aquaculture sector, these key aspects of younger members of the communities involved in the sector can easily be overlooked.

#### 1.5.5 Migrants and IDPs

Particularly in the fisheries sector, migration in pursuit of mobile fisheries resources is often an essential part of fishing strategies and this means that the people involved in fishing in a particular area may often come from a wide range of locations, have different cultures and languages and different levels of contact with local authorities and institutions. In an emergency this represents a major challenge and information about some groups involved in fishing may be limited or lacking. Migrant populations are therefore particularly vulnerable to exclusion from relief, recovery and reconstruction efforts as their local status may be unclear and, where there is competition for limited relief and recovery supplies, they will often end up being excluded from distribution. Understanding the status and location of migrant fishers is therefore a key issue that requires special consideration in addressing disaster situations in fishing communities.

In the context of complex disasters or conflict situations, internally displaced persons (IDPs) will represent a further major challenge. IDPs are often subject to discriminatory treatment even in normal circumstances, and in a disaster situation the risks of exclusion from rehabilitation efforts, violence and exploitation, and failure to

ensure their fundamental human rights will often increase. The vulnerability of IDPs in a disaster situation is increased by the fact that responsibility for treatment and support to IDPs is often not clearly defined (IASC, 2004).

#### **1.5.6 Caste or class**

Depending upon the social and cultural context, people involved in fishing, or fishing communities as a whole, may be identified as belonging to a specific caste group or class and this may affect how they are regarded by institutions, by other members of society and even by agencies involved in disaster relief and rehabilitation. These caste or class distinctions can often have an important influence on the relative levels of well-being of fishing communities and, in particular, may limit their opportunities for livelihood diversification outside of the fisheries sector. This can become particularly relevant during the rehabilitation phase and where policy initiatives post-disaster seek to introduce measures to limit fishing effort and entry to capture fisheries.

For aquaculture, which in many areas is an adjunct to agricultural livelihoods rather than fishing livelihoods, such issues may be less relevant although caste and class can play an important role in determining relative access to resources within rural populations and this can influence both the social and economic status of different groups prior to disasters and their capacity to cope with disasters when they occur.

These caste or class features may not always constitute a vulnerability as they can also help to define a collective identity that may constitute an important strength and source of social capital, particularly in a disaster or emergency situation. However, caste or class affiliations can also hinder the range of livelihood options open to a particular group and so limit their adaptive capacity in the wake of a disaster.

#### **1.5.7 Ability**

The World Health Organization (WHO) estimates that between 7 and 10 per cent of the world's population – including children and older people – live with disabilities. Disasters and conflict can cause increased incidence of impairment and subsequent disability.

Persons with disabilities represent another key vulnerable group in disaster situations. They will often suffer from lack of visibility and relief agencies' lack of knowledge about them, exclusion from decision-making processes, problems of mobility and accessibility, and vulnerability to trauma because of disruption of their family and social support networks (Handicap International, 2005).

In fishing and aquaculture communities, disability issues may seem of limited relevance in efforts to restore productive capacity after an emergency, but consideration of the challenges faced by the disabled members of fishing and aquaculture communities may be important to ensure their well-being. For example, shifting the location of a community in response to perceived future risks may represent a particular challenge for the disabled who rely on familiarity with their immediate surroundings for maintaining whatever mobility they command.

#### **1.5.8 HIV/AIDS**

HIV/AIDS is an additional challenge that may be of particular relevance in mobile or migrant fishing communities where prevalence of the infection is often particularly high, not only in Africa but worldwide (Gordon, 2004). The impacts of HIV/AIDS on households in fishing communities creates a complex set of vulnerabilities that make them particularly at risk in a disaster situation and during the recovery process. Families affected by HIV/AIDS will often have particularly high dependency ratios, with economically active adults often affected by infection leaving elderly people to care for children (IFRC, 2004).

### Box 10 – Key lessons in responses to HIV/AIDS

Several key concepts have been identified as critical in response strategies to HIV/AIDS:

1. Taking account of the scope and stage of epidemic in any particular location;
2. Leadership in avoiding stigmatizing sufferers and encouraging informal information exchange;
3. Focus on empowering people to take action and on building people's capacity to respond;
4. Multi-dimensional responses incorporating measures for prevention, care of the affected and mitigation of impacts;
5. Recognition of the need for impact mitigation measures to avoid "coping" strategies that increase vulnerability.

(Gordon, 2004)

As in other cases regarding vulnerable groups, where the focus of relief and recovery processes is on the restoration of fisheries and aquaculture production, the needs of HIV-affected households where active producers of a certain age-group are not present can easily be ignored completely.

During reconstruction efforts, HIV/AIDS can also undermine the long-term perspective that is important in underpinning decisions on investments, management and future generations. This can make attempts to introduce more sustainable fishing practices or aquaculture management measures in the wake of a disaster more difficult.

Understanding how to address HIV/AIDS and incorporate the best possible forms of care and support into disaster relief and recovery processes requires understanding of a set of best practice relating to HIV/AIDS that may not necessarily be familiar to technical specialists in fisheries and aquaculture. Seeking out this expertise is likely to be critical if the special needs of HIV/AIDS affected people are to be properly taken into consideration.

Those subject to chronic disease, such as victims of HIV AIDS, also constitute a distinctly vulnerable group for whom a disaster situation is likely to be particularly challenging. Their resistance to physical shocks of any kind is liable to be limited and access to the care and medication they require will often be disrupted. Particularly in Sub-Saharan Africa, but also in many other areas of the world, fishing communities have been identified as suffering from particularly high rates of infection from HIV AIDS and those suffering are likely to constitute a significant vulnerable group in some areas.

### Box 11 – When conflict and disasters coincide

The Indian Ocean tsunami disaster affected areas of Sri Lanka that had been the theatre of conflict for decades. Security concerns were particularly severe in some coastal fishing communities and constituted a significant constraint in relief and reconstruction activities. In these conditions, ensuring equity in distribution between different ethnic and linguistic groups became particularly important. The development of close, long-term relationships with local institutions was often critical to ensuring that the concerns of the security apparatus and different ethnic groups .

(Townsend et al., 2009)

#### 1.5.9 Ethnicity and language

Differentiation in ethnic groups involved in fisheries and aquaculture can also play an important role in determining exclusion of particular groups from relief and rehabilitation. This can generate particular forms of vulnerability to insecurity and infringement of basic rights particularly in conditions of complex emergencies or

### Box 12 – Caste fishing institutions in India after the tsunami

Coastal fishing communities in Tamil Nadu and Puducherry were the most seriously affected by the Indian Ocean tsunami disaster in 2004. Traditionally, a key governance role in these communities was played by the traditional caste panchayat institutions. In the wake of the disaster these local institutions faced significant challenges in dealing with the many new demands made on them beyond their normal role. In some cases their capacity was strengthened by effectively managing the equitable distribution of tsunami relief to affected communities. In others their position was undermined as they were perceived as being old-fashioned and incapable of adapting to changing circumstances.

(ICSE, 2005)

conflict. In such situations, fishing and aquaculture communities can become the focus for overlapping sets of vulnerabilities where migratory patterns of activity are combined with internal displacement, exclusion or violence based on ethnic origin or language. This can create special challenges for response mechanisms that may have to deal with institutional prejudice against particular ethnic or linguistic groups.

#### 1.5.10 Caste and class

In many cultures, fishing as an occupation is associated with particular caste or class groups. Fishing is a high risk occupation on a par with hunting and the social and economic status of people involved in it is often relatively low. As a result fishing, and even aquaculture communities may be among the poorest members of society, be particularly exposed to disasters because of where they live and marginalized in institutional decision-making. At the same time, these communities may have their own traditional mechanisms for taking decisions and dealing with community issues. In a post-disaster situation, understanding how these mechanisms may have been affected and the role that they can play in relief and recovery processes is critical. Attention needs to be paid to understanding exactly the scope and spheres of activity of traditional institutions and the roles that these mechanisms might play in emergency conditions.

### Box 13 – Relative poverty and vulnerability in the aquaculture sector

While aquaculture is often an activity that requires levels of investment associated with relatively better off rural households or rural entrepreneurs, there are increasing numbers of poorer people who seek to become involved in the sector as well. However, the relative poverty and levels of influence of people engaging in aquaculture can affect their vulnerability to disasters. Highly controlled pond culture activities require higher investments and are likely to attract better-off investors whereas some forms of pen-culture in open or public waterbodies may be more attractive for poorer people. However, operations in open water will inevitably be more at risk from flooding, disease outbreaks and storm damage.

#### 1.5.11 Chronically poor and marginalized groups

The concentration of natural and man-made disasters in less-developed regions of the world (Alcantara-Ayala, 2002) often means that they affect poorer and more marginalized groups who are especially sensitive to the impacts of such disasters and are likely to have less adaptive capacity to respond effectively. However, experience with major disasters in recent years in more developed nations has emphasized how “..disasters are not egalitarian”. Poor and vulnerable groups worldwide tend to live in more polluted, less secure and higher risk environments, and they tend to be less well-informed about disaster risks and response, less mobile, and more likely to be suffering from diseases or conditions that

make them unable to deal with extreme conditions and impede their capacity to recover from major disruption in their lives (Zoraster, 2010). While fishing and aquaculture communities in general, through their proximity to water, tend to be more exposed particularly to important forms of disaster of hydrological and meteorological origin, within those communities the relative poverty of different groups, and their degree of marginalization from decision-making processes will also affect their sensitivity to disasters and their capacity to cope with and recover from disasters when they occur.

As demonstrated by analysis of poverty over the last decades, chronic and extreme poverty, and the accompanying marginalization from key social, economic and political mechanisms, are often linked with some or all of the other dimensions of vulnerability outlined above (Narayan *et al.*, 2002; World Bank, 2001). A large proportion of the poor in many settings, including in fishing and aquaculture communities, are likely to be elderly people, disabled people, people suffering from chronic illnesses, ethnic minorities or specific, low-status caste or class groupings, or members of linguistic minorities. However there may also be other processes that create high levels of poverty, and its associated vulnerability, at work in fishing and aquaculture communities. The relationships between labourers and manual workers and those owning key productive assets such as fishing craft, engines and fishing gear may play a key role in capture fisheries. For the aquaculture sector, access to land or water bodies, security of title, and the reliability of the rule of law in protecting the rights of poorer people to water may all play an important role as well.

Understanding the dynamics of poverty and marginalization and how it is likely to affect the ways that different actors in the fisheries and aquaculture sectors respond to relief and rehabilitation measures is therefore extremely important.

#### 1.5.12 Identifying and defining vulnerable groups

Understanding the characteristics of groups within the population in an emergency situation is critical in order to identify relative vulnerabilities and tailor interventions to the capacities of different groups. However, there are risks involved in this process of identification. These are highlighted by the Sphere guidelines:

*“Experience has shown that treating these people as a long list of ‘vulnerable groups’ can lead to fragmented and ineffective interventions, which ignore overlapping vulnerabilities and the changing nature of vulnerabilities over time, even during one specific crisis.”*

*(The Sphere Project, 2011)*

While the features and characteristics mentioned above and highlighted in the central portion of the Livelihoods Framework are typically important in defining relative levels of vulnerability, it is clearly important that they not be regarded *a priori* as the factors that **necessarily** define vulnerability. So, while women often face certain specific vulnerabilities in fishing communities in some societies and in some circumstances, they should not be automatically be regarded as vulnerable. Similarly, as outlined below in the discussion of how the Livelihoods Framework can help to understand vulnerability more effectively, many other factors and influences can create complex, overlapping vulnerabilities where different groups may move from being apparently relatively secure to actually displaying quite marked vulnerability, particularly in the dramatic circumstances surrounding a natural or man-made hazard and the accompanying emergency.



## 2. Best practice and lessons learnt from responding the needs of vulnerable groups in emergency response in the fisheries and aquaculture sector

### 2.1 CHALLENGES IN ADDRESSING THE NEEDS OF VULNERABLE GROUPS IN EMERGENCY SITUATIONS

#### 2.1.1 Relevant skills and experience in fisheries and aquaculture agencies

The fisheries and/or aquaculture agencies called in to specifically address the needs of the fisheries and aquaculture sectors in the wake of an emergency rarely have specific skills within their organisations for dealing with vulnerable groups. Overwhelmingly, fisheries-related institutions are characterised by specialists technically qualified in areas such as fisheries biology, fisheries technology, fish handling and the technical aspects of aquaculture. While many staff may have acquired considerable sensitivity to the social and cultural aspects of fishing and fish farming communities, they will rarely have been called upon to specifically concern themselves with the needs of especially vulnerable groups which are more commonly the domain of social services. Fisheries agencies involved in emergency response therefore need to be aware of their limitations in this regard and call in relevant experience where required.

In major emergencies generating large and variegated responses from the international and national communities, there are more likely to be agencies operating as part of the response that have the appropriate skills to help in the identification and handling of vulnerable groups. The concentration of extremely diverse agencies involved in supporting the post-*tsunami* response in South Asia meant that there were agencies present with relatively specialised skills for seeking out and addressing the needs of vulnerable groups such as disabled people and the aged. However, in smaller emergencies the range of skills required may be more difficult to access as there may be fewer agencies involved and specialised skills are less likely to be represented.

#### 2.1.2 Capacity to adequately address gender concerns in agencies involved in relief and rehabilitation in the fisheries and aquaculture sector

While this aspect is effectively a sub-set of point 2.1.1 above, it is necessary to highlight the fundamental importance of incorporating gender concerns, and the skills necessary for identifying and addressing them, into the relief and rehabilitation process. This is particularly critical as fisheries and fish farming agencies continue to be largely dominated by men in many of the developing countries most exposed to natural hazards in particular and this means that the response to disasters in fishing and fish farming populations is often focussed on aspects of fisheries livelihoods that are prioritised by men.

Addressing this particular challenge has several dimensions. On the one hand, at the most basic level, it has frequently been highlighted how women in rural fishing or fish farming communities will usually find it easier to communicate with other women rather than men. This is often influenced by a range of cultural and social factors but

even where these are less apparent it is extremely important that no assumptions be made about the relative importance of having a gender-balanced team involved in post-disaster assessment and the design and implementation of rehabilitation measures.

All too often, attention to gender concerns, and gender “balance”, is stated as a guiding principle of interventions but problems in finding female personnel and people with the appropriate qualifications to work on gender issues means that this balance often remains as a statement of intent and is relatively rarely translated into reality. In addition, proper efforts to pay attention to disaggregation of impacts and targeting of initiatives by gender is all too often sacrificed for the sake of speed of intervention.

Ensuring that capacity to address gender concerns is genuinely mainstreamed into the relief and rehabilitation process in fisheries remains a significant challenge.

### 2.1.3 Demand for speed of response can lead to exclusion of vulnerable groups

In the aftermath of a disaster, there is generally considerable pressure on agencies involved in both relief and rehabilitation to operate as quickly as possible to relieve immediate suffering and restore livelihoods. There is also often pressure from funding agencies and governments to achieve quick results in order to ensure that public opinion sees that appropriate measures are being taken. Speed of intervention is clearly of primary importance, especially in the immediate aftermath of a disaster, but this can often work against attempts to effectively include more vulnerable groups in the decision-making processes about relief and rehabilitation and in making decisions about their own future.

Vulnerability, whether it is among women in fishing and fish farming populations, or old people, or simply those that are relatively poorer and more marginalised, will often be characterised by unwillingness to participate in discussions and a lack of confidence, or recognition among others, that may effectively exclude them from participation in

community-level meetings. Achieving their effective integration in mechanisms to decide on the course of relief and rehabilitation efforts may require considerable time and effort in order to build their confidence and convince themselves that they have something to contribute to these processes. The demand for rapid responses can often mean that the required time is not devoted to this and vulnerable groups end up being excluded.

#### Box 14 – Social support networks for widows in fishing villages in Andhra Pradesh, India

Research into poverty in coastal communities in Andhra Pradesh revealed how village-based fish landings were essential in under-pinning networks of distribution and support within fishing communities that were important for the livelihoods of older people, and particularly widows. As fish was landed, it was accepted practice for small amounts of lower value fish to be either directly given to elderly people present at landings or exchanged by them for other goods that they were able provide— small amounts of food prepared by them, or fruit collected from common lands or village resources. These seemed to play an important role in the food security of some of the poorest community member. However, changes in patterns of fish landings, with more fish going to larger landings, or with more outside buyers competing for fish catches were tending to gradually erode the availability of fish within villages to continue to support these networks.

(IMM, 2003)

### 2.1.4 Vulnerable groups often require special approaches

As mentioned in the previous point, a key part of the “vulnerability” of vulnerable groups is often determined by their marginal position in society and the difficulties they experience in participating in social and collective action. Vulnerable groups are often characterised by their lack of confidence, their self-perceptions that emphasise their weakness and limited capacities, active exclusion by other members of society, or physical impediments due to age, illness or disability. As a result, even in normal

circumstances, they are often difficult to identify, hidden away from general view, unlikely to take part in meetings, and considered marginal to wider decision-making processes.

As a result, identifying, engaging with and ensuring meaningful participation by these vulnerable groups often requires different approaches to those used with the wider community. The initial diffidence towards outsiders of vulnerable people themselves may have to be overcome, as well as attitudes among other community members that the opinions of such groups are less important than those of other community groups. The process of building the confidence of vulnerable groups to participate in collective action, recognise that they have contributions to make and that they have rights to relief and rehabilitation which are the same as other people around them tends to be time consuming and will often proceed at a different pace compared to work with other groups with greater capacities.

### 2.1.5 Favouring visible, “hard” solutions

For similar reasons to those outlined above that encourage speed in interventions, agencies involved in relief operations will often tend to favour interventions that are visible and “concrete”, such as equipment, housing and infrastructure. Such solutions can also play an important role in satisfying donors that their funds are being utilized effectively and that reconstruction is taking place. In part this is also an understandable response to the physical destruction of left in the wake of many disasters and will effectively respond to the priority needs of the population at large.

However, the focus on “hard” interventions may favour better off portions of the fishing or fish farming community that have the capacity and influence to generate maximum benefit from such interventions while poorer, more marginal community members may extract limited or no benefit from the same solutions. For example, rehabilitation (or construction *ex novo*) of road communications in a coastal area may bring benefits to fishers and some post-harvest operators by improving access to markets. However, it can also increase competition at fish landings and result in the erosion of social support networks on which vulnerable groups such as elderly people may be particularly reliant. Box 1 illustrates how apparently positive developments in infrastructure and communications can have important impacts on more vulnerable sections of the community.

### 2.1.6 Limited capacity of vulnerable groups to absorb inputs

Just as “hard”, infrastructure-oriented solutions tend to be favoured during the reconstruction process, the concentration of funding and donor support in the post-disaster situation can often lead to a favouring of solutions that quickly absorb more of these funds. Pressure from donor agencies to accelerate the “spend” on relief and rehabilitation can be considerable and this can work against the development of appropriate solutions for more vulnerable groups. The nature of many of these groups may mean that they have an extremely limited capacity to “absorb” and make use of external inputs – often low-cost solutions may be much more appropriate to their requirements.

The rush to make use of available funding after a disaster can therefore result in a focus on options for relief and rehabilitation that may not include more vulnerable groups and generate limited benefits for them. Clearly, this does not mean that these higher cost solutions are necessarily to be avoided as they themselves may generate important **secondary** benefits that may be passed on to vulnerable groups through the social support and safety networks described above. However, operators in fishing and aquaculture communities post-disaster need to be aware that higher cost solutions may not effectively engage directly with these vulnerable groups and they should verify the extent to which indirect benefits may be generated for them.

### **2.1.7 The limitations of “group” and “community” approaches for vulnerable groups**

Special attention needs to be paid to vulnerable groups where relief and rehabilitation efforts are articulated through groups or community mechanisms. As indicated above, one of the key features of vulnerability, whether as a result of the inherent characteristics of particular groups or because of their poverty and exclusion, is that they often play a marginal role in community or group-level consultative mechanisms. While, on occasions, this may be the result of active exclusion by other, more influential sections of the community, often it is the result of a process of “self”-exclusion – vulnerable groups will often assume that either they have nothing to contribute to group or community decision-making or that others do not want them to participate and so make no effort to engage.

Overcoming this “self-exclusion” of the most vulnerable elements in a fishing or fish farming community can constitute a particularly challenging task for relief and rehabilitation workers and will often require relatively long time horizons and careful, patient work with individuals and small groups as well as efforts to change attitudes and behaviour towards vulnerable groups within the community at large.

### **2.1.8 The limitations of “equitable” or “impartial” approaches**

In dealing with vulnerable groups in a post-disaster situation, emphasis is often placed on ensuring that relief distribution and rehabilitation efforts are “equitable” and “impartial” and do not discriminate against vulnerable groups. Clearly, given the characteristics of vulnerability, principles of impartiality and equitability will not always be sufficient to ensure that vulnerable groups are appropriately catered to. They often require special initiatives using specialised personnel and different approaches from those used for the population at large.

Invariably, particularly in the immediate aftermath of a disaster, there is likely to be an emphasis on providing generic forms of relief that are appropriate for the widest possible numbers of affected people and the opportunities to pay special attention to vulnerable groups may be limited. However, an awareness of the need to address the specific needs of vulnerable groups as soon as possible and bear their special characteristics in mind when developing longer-term rehabilitation measures is critical as an exclusive focus on more “generic” solutions for the fisheries or aquaculture sectors as a whole will generally have, at best, limited impacts on these vulnerable groups and, at worst, may actively work against their interests.

### **2.1.9 The development of “sustainable” options for reconstruction for vulnerable groups**

Paradoxically, the promotion of “Building Back Better” as an underlying principle for reconstruction efforts can constitute a threat for vulnerable groups if the distinctive nature of their capacities and needs is not taken into proper account. One example of this might be the active pursuance of sustainability in the reconstruction of fisheries or aquaculture-based livelihoods. While clearly environmental, economic, social and institutional sustainability are all key objectives that are of key importance, particularly for a natural-resource-based sector such as fisheries and aquaculture, the difficulties faced by more vulnerable groups in extending their time-horizons to take into account notions of long-term sustainability also need to be recognised. The most vulnerable groups in any society will usually be used to thinking in terms of short timeframes taking into account relatively immediate needs and the process of enabling such groups to adopt a longer-term perspective on their livelihoods may be time-consuming and itself a relatively long-term process.

### **2.1.10 Aid-dependence among vulnerable groups**

As a result of the concentration of resources and attention in the wake of major disaster, there are always relatively high risks of creation of a “culture of dependence” on aid. For vulnerable groups, these risks can be particularly high, especially where relief and rehabilitation processes focus on distribution of material benefits and not enough attention and time is devoted to appropriate capacity-building.

## **2.2 OPPORTUNITIES FOR POSITIVE LONGER-TERM CHANGE FROM DISASTER SITUATIONS**

### **2.2.1 Crises and disasters can create opportunity to redress structural causes of vulnerability**

Both generally and specifically within fishing and fish farming populations, vulnerability is often determined by “structural” features – while for some vulnerable groups, characteristics like disability or age may render them more vulnerable, for many groups it is social, economic, political and cultural mechanisms that play an important role in determining their vulnerability status. Gender is a critical example of this – while some differences between men and women are biological, the key differences between what men and women are able to do in a particular context tend to be more strongly determined by social norms, by economic interests, and by the political framework that determines and enacts policies on gender rights and inclusiveness.

The critical situation during and immediately following a major disaster, of whatever type, can constitute an important opportunity for redressing some of these structural causes of vulnerability. Mechanisms of social solidarity that are often generated in a disaster situation, and the extreme conditions to which populations and communities are subject will often change people’s perspectives on their relationships within the community and can help to create new alliances and solidarity across gender, age, caste/class, ethnic group or social and economic lines. The window of opportunity for taking advantage of these shifts in perception following a disaster may be relatively short and the expectations regarding the scope of such changes need to be realistic – important structural change tends to be incremental – but opportunities for accelerating such positive change can often be identified.

### **2.2.2 Collective action to cope with disasters can open minds to equitable arrangements**

Collective action among disaster-affected populations generally constitutes the key element in first response to an emergency. Such action can often create an important precedent for future forms of collective action and social organisation that can underpin future development and positive change within communities.

### **2.2.3 Demands for greater equity in the wake of disasters**

Where such collective action in response to a disaster has been strong and has cut across traditional divisions within society, it can also generate a demand among previously marginalised groups for greater equity in access to key resources and participation in decision-making processes. This can provide opportunities for the development of more robust and inclusive local institutions for community-based decision-making.

## **2.3 SPECIFIC CHALLENGES AND EXPERIENCE IN RESPONSES TO VULNERABLE GROUPS IN EMERGENCIES**

### **2.3.1 Process**

Almost by definition, the responses to emergency situations take place in a context of significant time pressure, particularly in the earlier phases of responses, from the occurrence of a disaster up the completion of the Initial Damage Assessments. Even after this phase, disaster situations are often characterised by intense pressure to make

### Box 15 – Putting people at the centre of disaster response

In the wake of the 2004 tsunami disaster in the Indian Ocean, among the key features of the response process highlighted by evaluators was that local people took the most important role in providing responses to the emergency, particularly during the earlier phase of response. The importance of building on the strengths and capacities of local actors and increasing their ownership of the response and reconstruction process was emphasized as it is by engaging with local people that the most effective responses are likely to be identified.

(Cosgrave, 2007)

### Box 16 – Using available data on vulnerability in Yogyakarta, Indonesia

After the major earthquake that struck Yogyakarta, Indonesia in May, 2006, the initial inter-agency damage assessment was able to draw on a significant amount of data identifying potential vulnerable groups. This highlighted how the area affected by the earthquake had a particularly high proportion of people living on their own who constituted a particular group at risk as a result of the earthquake. The initial assessment also highlighted the role of private charitable foundations in providing services for many of the vulnerable groups in the area and risks created by the reduced capacity of these foundations to continue to provide services in the post-earthquake context.

(BAPPENAS, 2006)

rapid use of the resources that have been made available by the international donor community within a limited timeframe.

This has important implications for the more vulnerable groups in the community. Rapid assessments in a post-disaster situation will often not have time to seek out and engage with vulnerable groups and include their priorities and needs in their assessments. Making the maximum use of existing data can often be key (see Box 16). The use of participatory approaches to assessment has been shown to help in ensuring that vulnerable groups are included as soon as possible in the process of discussing options for relief and rehabilitation and taking decisions about measures that are likely to affect them (Cosgrave, 2007). Capacity among agencies to make use of participatory approaches is therefore important. Participatory field tools, of which there are numerous toolkits available (FAO/ILO, 2009; URD, 2003; FAO, 2012), when used judiciously, can assist teams in engaging with groups that might otherwise not become involved in discussions around relief and rehabilitation.

However, care is required in how these tools are used and in what situations – for example reliance on community-level participatory exercises will usually lead to exclusion of many more vulnerable groups who may not feel comfortable in participating in and contributing to large meetings (Mosse, 2005). It is important that the emphasis in the use of these participatory approaches be on creating opportunities for more vulnerable groups to express their needs and priorities, rather than simply.

From the point of view of more vulnerable groups, the speed with which disaster relief activities are implemented is clearly a challenge and generates important risks. There is often a tendency to focus on the most visible and easily implemented solutions in order to be able to quickly demonstrate “impact” (ICSF, 2005). During the Initial Damage Assessment Phase after a disaster, the importance of swift identification of key sets of issues is widely accepted (Oxfam, 2005), but to ensure that the requirements of vulnerable groups are incorporated into the subsequent reconstruction process, it will often be important to allow more time for detailed identification of vulnerable groups and the development of appropriate processes for engaging with them. The case study shown in Box 17 illustrates how an approach widely used in other contexts was applied to working with vulnerable groups (in this case IDPs) in a complex emergency situation in northern Uganda and how this proved to be effective in supporting more sustainable processes of rehabilitation (Nicholson *et al.*, 2007).

### Box 17 – Long-term support to IDPs in northern Uganda

In the north of Uganda close to 1,400 000 people have been living in IDP camps for many years and, since the 1990s, FAO has been providing seeds and tools to households affected by civil strife, cattle rustling and/or HIV and AIDS to restore their productive capacity and food/income security, usually supplemented with some very basic agronomy training.

Since 2006, the improving security situation in some parts of northern and north-eastern Uganda has resulted in increased access to land by IDPs, whilst others are actually returning to their ancestral farmland. To respond to this new situation, FAO has attempted to use the Farmer Field Schools (FFS) approach in a recovery context- This experience has drawn attention to the potential for including FFS in other FAO emergency programs in northern Uganda, and the option of setting up Junior Farmer Field and Life Schools (JFFLS, basically an FFS adapted to the needs of teenagers). These FFS have worked on small-scale agriculture, livestock raising and fish farming.

Challenges faced by the approach include how to achieve a balance between donated inputs and contribution by participants, the intensive supervision required for many small groups of farmers and delays in the delivery of support. constraint in Uganda, notably for the FFS which opted to focus on fish ponds, as late delivery of fish seed severely tested the patience of participants. However, the approach is seen to hold promise and relevance for long-displaced farmers, and in particular to the needs of the displaced youth of rural origin, as their upbringing in camp and towns over more than a decade often left them with little opportunities to learn any farming or cattle rearing skills.

(Nicholson *et al.*, 2005)

### 2.3.2 Mainstreaming gender

The experience after the 2004 *tsunami* disaster highlighted how, even where agencies attempted to incorporate gender concerns into their assessment and planning of relief, effective mainstreaming of gender concerns requires an in-depth understanding of gender roles, particularly in a sector like fisheries, and skills in gender analysis which are rarely available within specialised fisheries agencies.

The skills and appropriate tools required in order to undertake such analysis include:

- Analysis of women's time use and activities, in order to understand in detail both their existing activities and the capacity to take on new or different activities;
- Seasonal analysis of changes in the time use of women and men;
- The division of labour between men and women in fisheries. While men are commonly engaged in fish capture while women are involved in post-harvest activities, the division of labour in fisheries can be more complex – particularly in some inland fisheries in Africa and Asia women are often also engaged in fish capture in particular situations and in support of men (Tindall *et al.*, 2008);
- Life-cycle analysis, to understand the stage at which women and men engage in different forms of activity in fisheries and aquaculture – in South India, older

### Box 18 – Women in fish auctioning in Tamil Nadu

In traditional fishing communities in coastal Tamil Nadu, the role of auctioneer at the auctions of fish on the beach immediately after landing is a sought after and relatively lucrative role in the fish marketing chain. Commonly, this position is itself auctioned off and, commonly, the position is occupied by men. However, in some communities on the Coromandel Coast, local fisher associations have elected to assign the role of auctioneer to elderly widows involved in fish marketing in the community as a means of providing these particularly vulnerable people in their communities with a reliable means of earning a living.

(Townsend *et al.*, 2012)

women and widows often play a particularly important role in fish processing and marketing and this offered creative options for support to these vulnerable groups in the wake of the 2004 *tsunami* (see Box 18).

- Power relations between men and women, in particular how control of earnings from different activities in fisheries and aquaculture is controlled – in Guinea, control of revenues from proposed new activities for women fish processors, such as salt and vegetable oil production, would have remained with male decision-makers and as a result women were reluctant to diversify (Westlund, 2009). Understanding these power relations often requires analysis on intra-household relations which can be particularly challenging in a post-disaster environment.
- Understanding hierarchies of power within ‘vulnerable’ groups, for example how some women involved in fish marketing may wield more power and influence compared to others (Okali *et al.*, 2007);
- Understanding differential access to key livelihood resources between women and men and the patterns of access and control of fisheries resources, land, ponds and common property resources. Women, along with other vulnerable and poor groups in fishing communities, are often particularly reliant on the use of

#### Box 19 – Addressing gender concerns in post-tsunami relief in India

After the 2004 tsunami disaster, reconstruction efforts in the fisheries sector in Tamil Nadu and Puducherry tended to focus, at least initially, on the replacement of fishing boats and gear as these were relatively easy to identify as needs and produced very visible outputs that were attractive to donors. This often led to attention to the post-harvest sub-sector in fisheries being patchy and sporadic, and because this sub-sector is where women are primarily engaged in fisheries, the needs of women in the sector tended to receive less attention compared to those spheres of activity dominated by men.

Relief agencies also tended to focus primarily on the rehabilitation of small-scale, motorized fishing activities as these were perceived as involving poorer sections of the fishing community compared to the mechanized sector. However, this meant that the needs for work opportunities of the large numbers of fishers who worked as crew on mechanized boats were not taken into account and the reliance of many women fish vendors on the catches of mechanized boats were also ignored in some cases.

The channeling of much relief assistance through traditional panchayat mechanisms, in which women in fishing communities do not participate, also lead to some concerns of women being ignored.

(ICSF, 2005).

It is also important to recognise that ensuring a gender balance in teams involved in carrying out assessments and planning of interventions after a disaster will not always, by itself, ensure that these skills are present. Recognition of the specific nature of gender analysis skills is important in order to ensure that gender is genuinely mainstreamed in disaster relief.

Effective engagement of women in decision-making processes about relief and recovery will often require attention to the types of forum in which women are able to participate and contribute freely. Reliance on “community-level” arenas for decision-making will often lead to the exclusion of women (Oxfam, 2005; Mosse, 2005). For women to contribute more effectively, special meetings involving only women, or even women from particular segments of the population, may be required. The location of meetings is also likely to be important where social and cultural norms discourage women from travelling far from their homes or where their presence in public areas is discouraged. Identification of innovative means of encouraging women to make their voices heard and communicate, both with other women and with wider society, can contribute to this, such as women’s media groups established in Ache, Indonesia after the 2004 *tsunami* (Tanesia, 2005).

### 2.3.3 Lessons in Assessment, Planning and Implementation

Vulnerable groups will often have different needs, and different capacities compared to the majority of people in fishing and aquaculture communities. To respond to these differences, those involved in the design, planning and implementation of relief and rehabilitation need to maintain an open mind and considerable flexibility regarding the types of intervention that are likely to be appropriate for these vulnerable groups.

In order to effectively address the needs of the most vulnerable section of the population, a mix of interventions that includes technical support, replacement of equipment, capacity-building, empowering activities and organisation strengthening, direct cash transfers and cash or food-for-work are likely to be appropriate at different stages of the relief and rehabilitation process (see Box 20). A World Bank assessment of lessons learnt from the response to flooding in Bangladesh highlights how a differentiated approach to recovery can be particularly important and needs to respond to the actual livelihoods and capacities of poorer households (see Box 21). It was pointed out that starting point for interventions should always be a clear understanding of the livelihoods of vulnerable households and how these might be supported (Beck, 2005).

The modality of operation – for example, working at the community level, at the group level, or at the individual household level – also needs to be kept very flexible in order to ensure that appropriate modalities that enable the participation of more vulnerable groups are employed. In particular, it is important to recognise how some vulnerable groups – for example women in some cultures, the very old or very young, or the very poor and marginalised – may not effectively participate in community or group level activities. Such groups may require specific modalities of operating that are quite different from those regarded as effective for the rest of the population.

The timing and distribution of different types of intervention may well be different for different vulnerable groups and this requires considerable flexibility on the part of planning and implementation teams. Externally determined criteria for selection of interventions and modalities of implementation are unlikely to respond to local priorities and may well lead to inappropriate interventions that miss vulnerable groups or are even detrimental to their situation. Criteria for selecting interventions need to be established in concert with local people, and with the specific participation of vulnerable groups, in order to ensure that their requirements are responded to (see Box ).

Given the inherent difficulties in working with vulnerable groups, and the frequent lack of background information on them, the establishment of learning mechanisms within interventions that allow progressive learning about local conditions and capacities and problems of vulnerable groups are essential. These mechanisms need to be explicitly incorporated into project design and used to constantly reassess and adjust interventions, as well as identify possible new areas of intervention, in order to address the issues faced by vulnerable groups.

#### Box 20 – Lessons from slow-onset disasters in Africa

Experience from recurrent drought crises in Eastern and Southern Africa indicate that a mix of interventions for relief is often particularly important in order to ensure that the needs of different groups with different levels of vulnerability are catered for. Identification of which type of intervention needs to be based on a thorough understanding of the problems faced and the risks and advantages associated with each option. Particularly for very vulnerable groups, food aid and cash transfers can play an important role, in spite of concerns about creating dependency. Use of these options, or combination of these options, depends on a proper understanding of the market situation and capacity. A focus on technical solution typical of response to disasters in the fisheries and aquaculture sectors should not ignore the possible role of alternative approaches to relief, particularly for the most vulnerable.

(ALNAP, 2008)

### Box 21 – Criteria for relief interventions after the 1998 floods in Bangladesh

Organizational priorities, assumptions and beliefs, rather than findings from an assessment, often shape the strategy and content of flood response. It is important to allow vulnerable people's own choices, concerns and priorities to influence agencies' response strategy. Holistic assessment and participatory planning can facilitate this process. Commenting on the debate on whether rehabilitation disbursement should be a grant or a loan after the 1998 flood in Bangladesh, DEC noted that 'these debates seem more an issue with an organization's own mandate and choice rather than a function of people's vulnerability'.

(DEC, 2000)

The capacities of vulnerable groups to absorb inputs and adopt new forms of activity or behaviour are often more limited and these groups may be more conservative in their attitudes to new types of activity. This means that it is often very difficult to determine the timeframes of interventions in advance and considerable flexibility is required in order to ensure that the time allowed for interventions to become effective is sufficient.

Donors, particularly in post-disaster situations, will often be subject to strong pressure to demonstrate that their funding has been spent within a limited timeframe and there will therefore often be a need to inform and educate donors regarding the time and approaches required to effectively address the requirements of vulnerable groups.

#### 2.3.4 Monitoring and evaluation of implementation and impacts

Effective monitoring mechanisms are key to ensuring the effectiveness of interventions in addressing the needs of more vulnerable groups and ensuring that interventions targeting other, less vulnerable groups are not having negative impacts on those who are more vulnerable. Where there is significant pressure on operators to complete their interventions rapidly and make use of the resources available for relief and rehabilitation as quickly as possible, monitoring and evaluation that encourages 'downward' accountability to local, affected populations (rather than upward accountability to donors, the media and the public in donor countries) is often given a relatively low priority. The Tsunami Evaluation Coalitions report on response to the 2004 *tsunami* disaster highlighted how the accountability of relief organisations and their interventions to local affected populations tended to decline as the process moved from relief into reconstruction (Cosgrave, 2007).

The importance of reorienting accountability mechanisms towards the affected population has been noted in many key documents relating to disaster relief and recovery (Sphere, 2011). However, less attention has apparently been paid to the mechanisms required to achieve such accountability. There are clearly opportunities to learn from the practice of participatory development to increase the use of the range of options available to engage local people in the assessment and monitoring of interventions aimed at assisting them after an emergency. While beneficiary surveys are often used (Cosgrave, 2007) these tend to focus on assessing opinions about interventions 'after the fact' as opposed to ensuring the active engagement of affected populations in on-going programmes.

This is particularly important in terms of ensuring that vulnerable groups and their special needs are taken into account.

A mix of quantitative and qualitative approaches to monitoring and evaluation is likely to be required in order to effectively capture the diverse experiences of different vulnerable groups.

## 3. Existing instruments and guidelines on vulnerable groups and emergencies

### 3.1 KEY INSTRUMENTS FOR THE PROTECTION OF VULNERABLE GROUPS IN EMERGENCIES

The following existing instruments, while not always specifically designed to address emergency situations, provide important guiding principles regarding the rights and protection of vulnerable groups in emergencies.

As a general framework for any intervention, and particularly in relation to vulnerable groups, the basic UN documents articulating human rights are critical. The core international human rights instruments are:

- **The International Bill of Human Rights and the Universal Declaration of Human Rights (1948);**
- **The International Convention on the Elimination of All Forms of Racial Discrimination (1965);**
- **The International Covenant on Economic, Social and Cultural Rights (1966);**
- **The International Covenant on Civil and Political Rights (1966);**
- **Convention on the Elimination of All Forms of Discrimination against Women (1979);**
- **Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (1984);**
- **Convention on the Rights of the Child (1989);**
- **International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families (1990);**
- **International Convention for the Protection of All Persons from Enforced Disappearance (2006);**
- **Convention on the Rights of Persons with Disabilities (2006).**

These are supported by a series of protocols that are periodically updated and amended.

#### The Humanitarian Charter

As part of the SPHERE Project (2011), the Humanitarian Charter provides an ethical and legal basis for the core standards and principles relating to humanitarian interventions. The charter summarises the core legal principles that have most bearing on the welfare of those affected by disaster or conflict.

Other important instruments dealing with the treatment of different specific vulnerable groups in emergency situations include:

- **Interagency Guiding Principles on Unaccompanied and Separated Children.** (ICRC, International Rescue Committee, Save the Children, UNICEF, UNHCR and World Vision.).

[www.unicef.org/violencestudy/pdf/IAG\\_UASCs.pdf](http://www.unicef.org/violencestudy/pdf/IAG_UASCs.pdf)

Based on international human rights, humanitarian and refugee law, these guidelines aim to ensure that all actions and decisions regarding separated children are anchored in a protection framework. The principles refer not just to disasters but to all potential emergency situations affecting separated children.

- **Paris Principles and Commitments to Protect Children from Unlawful recruitment or Use by Armed Forces or Groups.** (UNICEF).  
[www.unicef.org/emerg/ParisPrinciples310107English.pdf](http://www.unicef.org/emerg/ParisPrinciples310107English.pdf)
- **The Madrid International Plan of Action on Ageing: Guiding Framework and Toolkit for Practitioners and Policy Makers.** (UN).  
[www.un.org/es/globalissues/ageing/vipea.pdf](http://www.un.org/es/globalissues/ageing/vipea.pdf)
- **Handbook for Response Coordinators and Humanitarian Coordinators on Emergency Preparedness and Response** (IASC).  
[www.eird.org/publicaciones/Handbook.pdf](http://www.eird.org/publicaciones/Handbook.pdf)
- **Operational Guidance for Coordinated Assessments in Humanitarian Emergencies** (IASC).  
<http://resourcecentre.savechildren.se/content/library/documents/operational-guidance-coordinated-assessments-humanitarian-crisis>

## 4. Recommendations for best practice and indicators for supporting vulnerable groups in fisheries and aquaculture in emergencies

The following discussion identifies a range of best practice elements that can be drawn from past experience in disaster response and rehabilitation processes. Inevitably, much of the best practice relating to vulnerable groups in fisheries and aquaculture communities is relatively generic – the key lessons for addressing vulnerability are similar whether we are dealing with vulnerable groups in fishing and aquaculture populations or in other contexts. Much of this best practice has already been distilled in other guidelines and best practice documents, but there are specific elements relating to fisheries related groups.

### 4.1 PROCESS

**Statement of Best Practice 1: INCLUSION: Decision-making regarding relief and rehabilitation measures is inclusive and is taken in consultation with the affected population and paying attention to the inclusion and engagement of vulnerable groups.**

#### *Indicators*

- Operators involved in the disaster response process are trained in the use of participatory, consultative approaches .
- Measures and mechanisms for ensuring the inclusion of vulnerable groups in consultative processes specified in plans for relief and rehabilitation.
- Means of measuring the equitable distribution of relief and rehabilitation assistance to vulnerable groups are in place.
- The time frames for planning are appropriate to allow time to identify, engage with and ensure participation by vulnerable groups.
- The need for different forms of assistance that are appropriate for vulnerable groups is explicitly recognised in planning documents.
- Reports specify contributions of vulnerable groups to the planning and decision-making about relief and rehabilitation processes.
- Allocations of assistance to vulnerable groups are specifically identified in reports

### 4.2 MAINSTREAMING GENDER INTO INTERVENTIONS IN THE FISHERIES AND AQUACULTURE SECTORS

**Statement of Best Practice 2: Specific attention to gender-related issues and efforts to address those issues in interventions, should be regarded as a requirement at all stages of the emergency relief and rehabilitation process.**

#### *Indicators*

- Teams include members with skills and experience in gender analysis. (see guidance note 2)

- Proper analysis of underlying gender dynamics in the culture and society affected by a disaster is carried out as well as the specific gender dynamics relating to the fisheries and aquaculture sectors.
- Appropriate approaches to ensure inclusion of women in identification of inputs and decision-making are used during assessment and planning.
- Reports and documents specifically address gender related issues and include concrete proposals for addressing them.
- Interventions for relief and rehabilitation in fisheries and aquaculture take into account both primary production and post-harvest and marketing sub-sectors.
- Expected impacts as a result of interventions are disaggregated by gender.
- Monitoring and evaluation of impacts includes disaggregated data on impacts on women and men.

### 4.3 ASSESSMENT, PLANNING AND IMPLEMENTATION

**Statement of Best Practice 3: Flexibility and responsiveness in the planning and implementation of relief and reconstruction in the fishing and aquaculture sectors should be maintained to ensure that the needs of vulnerable groups can be responded to.**

#### *Indicators*

- The different needs and capacities of vulnerable groups are specifically identified as part of the assessment process.
- A mix of interventions are taken into consideration for implementation and the relative impacts and appropriateness of different interventions for vulnerable groups explicitly taken into consideration.
- A mix of modalities for interventions are taken into consideration to ensure that those most appropriate for vulnerable groups are included.
- Criteria for the selection of interventions are based on experience on the ground and priorities expressed by local people (rather than by donors or outside agencies).
- The design and implementation of interventions should include mechanisms that ensure constant feedback, including from vulnerable groups, and opportunities to learn and adjust interventions based on experience.
- For interventions specifically addressing the needs of vulnerable groups, timeframes are flexible and responsive to their capacities.

### 4.4 MONITORING AND EVALUATION OF IMPLEMENTATION AND IMPACTS

**Statement of Best Practice 4: Monitoring and evaluation of relief and rehabilitation measures are carried out in a participatory fashion and use approaches that ensure that the perceptions and opinions of vulnerable groups on impacts are taken into account.**

#### *Indicators*

- Process monitoring that assesses levels of participation of different vulnerable groups is an integral part of the monitoring and evaluation process.
- Monitoring and evaluation specifically assesses potential impacts of the relief and rehabilitation process on vulnerable groups.
- Monitoring and evaluation reports include sections on vulnerable groups.
- Monitoring conducted through consultation and discussion with target groups, including vulnerable groups, and includes both quantitative and qualitative approaches.

## 5. Key resources

### 5.1 GENERAL GUIDES RELATING TO HUMANITARIAN ACTION

#### **The SPHERE Project: Humanitarian Charter and Minimum Standards in Humanitarian Response**

This manual, prepared and regularly updated by a consortium of international and civil society organisations involved in humanitarian responses to emergencies, probably provides the most complete set of principles and standards regarding relief and rehabilitation work in general. In particular, it also extensively deals with the needs and issues surrounding working with vulnerable groups in emergency situations. Many of the key aspects of vulnerability discussed in this paper correspond to some of the cross-cutting themes identified and discussed in these guidelines.

Available from: [www.sphereproject.org/resources/download-publications/](http://www.sphereproject.org/resources/download-publications/)

#### **Protecting Persons affected by Natural Disasters: IASC Operational Guidelines on Human Rights and Natural Disasters (IASC)**

General guidelines laying out the core actions required in order to ensure protection of populations affected by natural disasters.

Available from: [www.humanitarianinfo.org/iasc](http://www.humanitarianinfo.org/iasc)

#### **Livestock Emergency Guidelines and Standards (LEGS)**

While these guidelines specifically deal with livestock-based interventions in emergencies or the issues surrounding emergencies effecting livestock, they also lay out many important key principles and standards that are of more general relevance for emergencies and, in line with the standards identified in the SPHERE Project, they also make specific mention of “cross-cutting” issues such as gender, age and ethnicity that need to be born in mind and addressed as part of emergency response efforts.

Available from: [www.livestock-emergency.net/userfiles/files/legs.pdf](http://www.livestock-emergency.net/userfiles/files/legs.pdf)

#### **FAO Response Analysis Framework (RAF)**

The Response Analysis Framework has been developed specifically as a means of ensuring that food security issues are more effectively incorporated into emergency response planning. While this does not focus exclusively on vulnerable groups, the framework promotes more careful Response Analysis prior to initiating Response Planning and this would certainly increase the opportunities for carefully analysing vulnerable groups and ensure their proper inclusion in response processes.

Available from: [www.fao.org/fileadmin/templates/tc/tce/pdf/Response\\_Analysis\\_Framework\\_Discussion\\_Papers.pdf](http://www.fao.org/fileadmin/templates/tc/tce/pdf/Response_Analysis_Framework_Discussion_Papers.pdf)

#### **Protection – an ALNAP guide for humanitarian agencies (ALNAP)**

A detailed set of guidelines on how to ensure protection of people in situations of humanitarian emergencies. These guidelines were developed in response to experience during the 2001 Kosovo crisis but have widespread applicability for all forms of disasters and humanitarian emergencies.

Available from: [www.alnap.org/pool/files/alnap-protection-guide.pdf](http://www.alnap.org/pool/files/alnap-protection-guide.pdf)

## 5.2 GUIDELINES ON THE USE OF FIELD-LEVEL APPROACHES TO ASSESSMENT, PLANNING AND IMPLEMENTATION

### **Participation by Crisis-Affected Populations in Humanitarian Action A Handbook for Practitioners (URD)**

This provides a comprehensive guidance on participatory approaches to planning, implementation, monitoring and evaluation in emergency situations.

Available from: [www.alnap.org/pool/files/gs\\_handbook.pdf](http://www.alnap.org/pool/files/gs_handbook.pdf)

### **The Livelihood Assessment Toolkit: analyzing and responding to the impact of disasters on the livelihoods of people (FAO)**

Detailed guidelines on how to undertake a livelihood assessment in a post-disaster situation with details of different participatory tools and methods to use in the field.

Available from: [www.fao.org/fileadmin/templates/tc/tce/pdf/LAT\\_Brochure.LoRes.pdf](http://www.fao.org/fileadmin/templates/tc/tce/pdf/LAT_Brochure.LoRes.pdf)

### **Participation: Sharing our resources (FAO)**

A resource CD prepared by the FAO that provides a comprehensive database of participatory approaches, methods and field tools

Available from: [www.fao.org/sd/dim\\_pe2/pe2\\_040502\\_en.htm](http://www.fao.org/sd/dim_pe2/pe2_040502_en.htm) or accessible on-line through [www.fao.org/Participation/ft\\_find.jsp](http://www.fao.org/Participation/ft_find.jsp)

### **The Positive Path: Using Appreciative Enquiry in Indian Communities (International Institute for Sustainable Development (IISD) / Myrada)**

A guideline on using Appreciative Enquiry approaches in rural communities. Specifically developed in the Indian context but widely applicable in other settings and particularly appropriate for working with vulnerable groups.

Available from : <http://myrada.org/myrada/publications>

## 5.3 RESOURCES ADDRESSING ISSUES RELATING TO SPECIFIC VULNERABLE GROUPS IN DISASTER SITUATIONS

### **Socio-Economic and Gender Analysis (SEAGA) for Emergency and Rehabilitation Programmes**

FAO guidelines on how to mainstream gender issues into emergency relief and rehabilitation programmes.

Available from : [www.fao.org](http://www.fao.org)

### **Women, Girls, Boys and Men: Different Needs – Equal Opportunities: IASC Gender Handbook in Humanitarian Action. (IASC)**

### **Guidelines for Gender-Based Violence Interventions in Humanitarian Settings: Focusing on Prevention of and Response to Sexual Violence in Emergencies (IASC)**

These two guidelines provide a complementary and comprehensive coverage of key gender related issues in emergency situations and additional guidance on addressing gender-based violence. Also available in Arabic.

Available from: [www.humanitarianinfo.org/iasc/pageloader.aspx?page=content-subsidi-tf\\_gender-genderh](http://www.humanitarianinfo.org/iasc/pageloader.aspx?page=content-subsidi-tf_gender-genderh).

### **Handbook for the Protection of Women and Girls (UNHCR)**

Available from : [www.unhcr.org](http://www.unhcr.org)

### **Protecting older people in emergencies: good practice guide. (HelpAge International)**

Specific guidelines addressing issues relating to old age in emergencies, available in English and Spanish.

Available from : [www.helpage-international.org/publications/](http://www.helpage-international.org/publications/)

### **Disabilities and mental health**

#### **How to include disability issues in disaster management (Handicap International)**

A specific guide to dealing with disability in disaster situations specifically developed based on experience from floods in Bangladesh.

Available from: . [www.handicap-international.org.uk/resources/library](http://www.handicap-international.org.uk/resources/library)

#### **Working with people with disabilities in forced displacement (UNHCR)**

UNHCR guidelines on working with differently able people who have been subject to displacement. While not specifically relating to disasters many of the lessons are appropriate.

Available from: [www.unhcr.org/4ec3c81c9.pdf](http://www.unhcr.org/4ec3c81c9.pdf)

#### **Mental Health and Psychosocial Support in Humanitarian Emergencies. What Should Protection Programme Managers Know? (IASC)**

Guidelines on taking account of mental health issues and psychosocial support in humanitarian emergencies.

Available from : [www.who.int/hac/network/interagency/news/iasc\\_guidelines\\_mental\\_health\\_psychosocial\\_upd2008.pdf](http://www.who.int/hac/network/interagency/news/iasc_guidelines_mental_health_psychosocial_upd2008.pdf)



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# Environmental management of the fisheries and aquaculture sectors in emergency response situations

by

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# 1. Introduction to environmental issues in fisheries and aquaculture, and challenges and opportunities presented by post disaster and emergency situations

## 1.1 BACKGROUND

The Food and Agriculture Organization (FAO) and its international partners have been key participants in the international response to large-scale disasters around the globe that may impact the livelihoods of those engaged in capture fisheries and aquaculture. Following a number of major disasters in recent years, FAO is now assembling guidance on emergency response and recovery based on the lessons learned and the overall concept of “building back better”. The Fisheries and Aquaculture Emergency Response Guidance (‘the Guidance’) will consolidate the best practice in disaster response and recovery for fisheries and aquaculture and in turn help to ensure that disaster response and recovery for fisheries and aquaculture is consistent with the Code of Conduct for Responsible Fisheries.

This Thematic Background Paper is one of a number of papers contributing to the Guidance. This particular paper is focused on the environmental impacts of disasters, but more specifically **on environmental management issues and requirements in post-disaster emergency situations**.

A number of existing standards are fundamental in guiding environmental principles within fisheries and aquaculture management including the Ecosystem Approach to Fisheries (EAF), the Code of Conduct for Responsible Fisheries (CCRF), and the Ecosystem Approach to Aquaculture (EAA). These together with other relevant standards and guidance are discussed further in Section 3.

An ecosystem approach to fisheries and aquaculture is intended to ensure that planning, development and management meets social and economic needs without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems (FAO, 2003). The EAF provides a basis for fisheries managers and decision-makers to ensure that the three pillars of sustainability (environmental, social and economic) are supported.

While social and economic dimensions are critical in the EAF, the CCRF, and the EAA; it is the environmental pillar that is the focus of this paper.

The following parameters form the key environmental components discussed throughout the paper:

### Fisheries

- Fish stocks: including the stocks for target species, retained species landed in conjunction with the target species, and discarded species;
- Endangered, threatened and protected species (ETP): including those species in national or international legislation/agreements and FAO International Plans of Action;

- Habitats: which are key in supporting the fisheries e.g. spawning and nursery grounds; and
- Ecosystem: considering the broader ecological community within which the fisheries exist.

### Aquaculture

- Stock species: including spat/seed;
- Feed: including the use of wild resources and feed efficiency;
- Habitats: considering the habitats that support aquaculture developments, appropriate siting and Environmental Impact Assessment (EIA); and
- Ecosystem: considering the broader ecological community and carrying capacity of aquaculture developments, including the role of EIA.

The structure of this paper is as follows:

**Section 1:** the remainder of Section 1 explores the environmental impacts and threats of disasters and the consequential effects on fisheries and aquaculture. Direct and indirect effects are discussed, and the impacts to each environmental component of fisheries and aquaculture as described above are assessed. Opportunities for improved environmental management responses are then explored.

**Section 2:** focuses on describing case studies of previous responses by FAO, UNEP and its partner organizations, and highlights a number of lessons learnt during such responses.

**Section 3:** provides an overview of the existing standards and guidance relating to environmental management in fisheries and aquaculture.

**Section 4:** provides recommendations for best practice and indicators supporting environmental management of fisheries and aquaculture in emergency responses.

## 1.2 ENVIRONMENTAL IMPACTS AND THREATS OF DISASTERS AND POTENTIAL EFFECTS ON FISHERIES & AQUACULTURE

The environment and ecosystems that support fisheries and aquaculture operations are vulnerable to both natural and man-made disasters. Westlund *et al.*, (2007) categorize disasters into three main groups as follows:

- Natural disasters: hydro-meteorological hazards (e.g. floods, waves and surges, storms, droughts), geological hazards (e.g. earthquakes, volcanic eruptions) and biological hazards (e.g. epidemics, insect infestations);
- Technological disasters: directly related to human activity and as a result of failure of a technology or of management e.g. oil or chemical pollution from tankers, pipelines and drilling accidents, nuclear disasters; and
- Complex emergencies: humanitarian crisis resulting from military conflict and for which external assistance is needed.

The types of environmental impacts that may affect fisheries and aquaculture are often comparable across different categories of disasters and therefore discussed below under relevant environmental components. More general environmental impacts associated with different types of natural disasters are provided in Appendix 2.

### 1.2.1 Direct impacts Fish stocks

**Physical and behavioral impacts on fish including direct mortality, or displacement effecting migrations and spawning:** Natural and technological disasters can cause mass mortality of fish and shellfish species, as well as displacement due to environmental changes such as changes in water quality and habitat destruction which can affect migration patterns and spawning cycles.

Allen (2005) surveyed reef fish in Indonesia (Weh Island) after the 2004 tsunami and found fish biomass in minor impacted areas to be four times greater and species diversity to be double that of the heavily damaged areas. Furthermore, many coral-associated

species were absent, as were sand-dwelling fishes on account of sand displacement. Hamilton *et al.*, (2007) found similar results in a post-tsunami assessment of Marine Conservation Areas in the Solomon Islands where reef fish density and biomass had dramatically declined on account of instant mortality (as a result of removal from the sea) and habitat destruction. Most profound effects were noted for large fish with declines in snappers (*Lutjanidae*), surgeonfishes (*Acanthuridae*) and emperors (*Letbrinidae*). No evidence of the proportion of the decline due to instant mortality versus displacement has been found during this review.

Short term effects of oil exposure can lead to acute narcosis mortality in fish due to ingestion of water-soluble oil fractions at parts per million concentrations. Peterson *et al.*, (2003) found that long-term exposure of fish embryos to weathered oil (at ppb concentrations) has population consequences through indirect effects on growth, deformities, and behavior with long-term consequences on mortality and reproduction.

Radioactive pollution post nuclear disasters can enter the marine environment through nuclear fallout and the direct leakage of highly-contaminated coolant water. Of note radionuclides iodine 131 (half-life 8 days), caesium-134 (half-life 2 years) and caesium-137 (half-life 30 years) have been measured in the marine environment; although immediate discharge areas may also have a few other mostly short-lived radionuclides such as strontium-90 and plutonium isotopes.

Radioactive elements can be absorbed by phytoplankton, zooplankton, kelp, and other marine life and then be transmitted up the food chain, to fish, elasmobranchs and marine mammals. This accumulation is unlikely to cause serious harm to these species, although may result in ulcers, lesions and reproductive abnormalities in future generations.

**Mass mortality or escapement of aquaculture stock species:** natural disasters and technological disasters can lead to mass mortality of aquaculture stock, or contamination rendering stock unfit for human consumption.

In addition infrastructure damage resulting from natural disasters can lead to escapement of aquaculture stock and potential cumulative ecosystem impacts on wild populations, such as the introduction of invasive species or genetic alterations of wild stocks.

**Short term reduction in fishing effort:** Natural disasters can result in large-scale destruction to fisheries, both in terms of physical damage (to boats, gear, harbors) and human capacity. From an environmental stock perspective, this is likely to lead to a reduction in fishing capacity and effort, with consequential positive effects on fish stocks in the immediate short term.

Exclusion zones implemented in response to technological disasters, e.g. surrounding pollutant spills or contamination sources, will benefit existing (surviving) stocks based on cessation of fishing effort in these areas.

**Short term reduction in market demand:** The possible tainting or contamination of seafood products from technological disasters may render products unfit for human consumption. International and national legislation requires testing of seafood and sets acceptable limits for specific contaminant e.g. Becquerel per kg for radionuclides. Government bodies may implement stricter limits immediately after a technological disaster to mitigate any impacts on market confidence. The overall effect will be a reduction in effort that may extend beyond the implemented exclusion zones.

Post natural disasters, decreased consumption of seafood may occur on account of a religiously motivated hesitation by the public, as fish are perceived to have fed on human corpses washed to sea (Jernelov, 2005).

**Reduced ability to source feed for aquaculture:** the issues described above (fish mortality, displacement, contamination, reduced fishing effort and reduced demand) could lead to insecurities or uncertainty in sourcing feed from wild sources for

aquaculture stocks. Impacts to infrastructure, processing, and transport networks could also affect delivery of such supplies/provisions.

**Overexploitation of wild stocks:** The relief efforts that follow natural disasters including provision/ replacement of vessels and fishing gear leading to resumption of fishing activity can, without careful management, return fishing capacity to over exploitive levels which can impact stock resources in the medium-long term. However, to some extent this may be mitigated by the lower catching efficiency of inexperienced new fishers.

Public sector presence and normal monitoring, control and surveillance (MCS) activities in militarized zones are often minimal. This may result in high levels of illegal, unregulated and unreported (IUU) fishing, with potential consequences in terms of resource depletion.

### Endangered, threatened and protected (ETP) species

**Physical and behavior impacts on ETP species including direct mortality, or displacement:** species classified as ETP vary based on location but typically include marine mammals (dolphins, whales, seals, dugongs, otters), elasmobranchs (sharks and rays), reptiles (turtles, sea snakes, crocodiles), as well as some fish species. These typically large predators have significant trophic interactions in structuring communities and play critical roles in maintaining the integrity of the marine ecosystem and associated food webs.

Natural disasters can result in direct mortality through removal from the sea and/or destruction of breeding centers and conservation projects. Perhaps more critically the destruction of key habitats (e.g. seagrass, coral reefs, mangroves) can lead to displacement and population declines.

As described for fish and shellfish stocks, technological disasters can lead to lethal and sub-lethal effects through ingestion of oil or radionuclide contaminated prey, as well as behavior impacts such as interference with thermo insulation leading to stress and in some cases mortality.

### Habitats

**Destruction or modification of habitats:** seagrass and coral reefs can be impacted by siltation and sand sedimentation as a result of natural disasters, as well as dislocation/removal of actual seagrass, mangrove and coral reef habitats.

Debris swept from land into the marine environment can cause further damage and prevent recovery and re-growth where tidal action and wave pounding cause continual damage. Destruction of river dams or hydrographic changes due to debris and rubble may change the suitability of habitats that support aquaculture developments.

Technological disasters can lead to collection of radioactive or oil contaminants in marine, brackish and freshwater sediments, further exposing bottom-dwelling fish, shellfish and other benthic organisms to higher levels of contaminants than those in the waters above.

### Ecosystem

**Abandoned, lost or discarded fishing gear (ALDFG):** ALDFG following natural disasters can have wider ecosystem impacts including the effect of ghost fishing i.e. continued catching of target and non-target species (such as turtles, seabirds and marine mammals); alterations to the benthic environment; navigational hazards; beach debris/litter; introduction of synthetic material into the marine food web; and introduction of alien species transported by ALDFG. In general, gillnets and pots/traps are most likely to ghost fish while other gear, such as trawls and longlines, are more likely to cause entanglement of marine organisms, including protected species, and habitat damage (Macfadyen *et al.*, 2009).

**Salinity, turbidity and contamination driven changes in water quality:** natural disasters can impact water quality by saltwater intrusion into surface water bodies; salinity changes in freshwater ecosystems due to saltwater intrusion; flooding of septic tanks with subsequent contamination of ground and surface water; increased water turbidity; and mobilization of contaminated sediments or soils. Changes in water quality are most likely to cause lethal/sub lethal impacts to aquaculture species, as well as species targeted in freshwater fisheries.

**Disposal of contaminated or spoiled fish and shellfish:** power cuts, infrastructure damage, cessation of normal operations, and/or disruptions to marketing networks caused by natural disasters may lead to spoilage of stored catch. Technological disasters could contaminate stored catch through on-land pollution such as chemical spills or nuclear fallout. Inefficient disposal may lead to contaminated/soiled seafood re-entering food supplies; in addition untreated rotting seafood can cause fly infestations and subsequent health risks.

### 1.2.2 Indirect impacts

**Environmental impacts of damaged infrastructure and assets:** damage to fisheries and aquaculture related infrastructure and vessels caused by natural disasters can lead to environmental pollution and contamination e.g. leakages of oil from fishing vessel oil stores; and release of harmful greenhouse gases from refrigerants used in fish cold stores.

**Loss of human capacity:** reduced organizational and human capacity for sound environmental management may lead to weakening of environmental practices in, and controls over, the fisheries and aquaculture sectors. This may also lead to a strong focus in response situations on economic and social objectives in the re-building process and the need for rapid action without due regard to environmental planning and management procedures.

## 1.3 OPPORTUNITIES FOR IMPROVED ENVIRONMENTAL CONSIDERATIONS IN FISHERIES AND AQUACULTURE MANAGEMENT RESPONSES

A range of opportunities are available for improving the environmental considerations in post disaster responses in fisheries and aquaculture sectors. Many of these opportunities can be cross referenced with other thematic areas of fisheries and aquaculture (see Section 2.3 on linkages and other background papers), and relate to ensuring that the environmental impacts and risks of disasters discussed in Section 1.3 above, are minimised. Additional environmental opportunities are summarized below.

**Improved stock assessments.** To ensure the long-term sustainability of fishery resources, it is essential that exploited stocks be regularly assessed and that the results of these assessments be incorporated into the fisheries management process. “The severity of the situation has been recognized globally and in particular by the United Nations General Assembly, which in 2003 endorsed a global strategy for improving information on status and trends in capture fisheries”. (FAO, 2010)

**Improved fishing capacity assessment & management.** Managing and reducing excess levels of fishing capacity is one of the greatest challenges facing fisheries policy makers and managers (see FAO, 2008). Based on best policy and management, and underpinned by a precautionary approach, re-building a fishing fleet can take place so that fishing capacity better matches fishing opportunities. This may imply both the re-introduction of fewer vessels than were previously operating in the fishery, as well as the provision of different types of vessels, and may need to be accompanied by other aspects of post disaster responses focused on the creation of alternative livelihood opportunities.

**Introduction of lower impact and more selective fishing gear.** With appropriate expertise and financial assistance, lost or damaged gear can be replaced with more

selective gears that have lower habitat impacts and lower rates of bycatch. A high level of stakeholder consultation is typically required to ensure that such techniques are both appropriate and can be adapted to local conditions.

**Reduced green house gas (GHG) emissions through efficient engineering.** Introducing changes to vessel design and equipment as part of the ‘building back’ approach can provide improvements in GHG emissions while also generating operating efficiency and improved revenues. Opportunities exist with refining hull shapes, introducing different motors or the addition of a gearbox. Even simple changes such as correctly sizing and installing a propeller and stern gear can dramatically increase fuel efficiency. Furthermore, and with respect to power generation for onshore infrastructure, solar power is an increasingly viable alternative for remote sites and should be encouraged over the use of generators (except for heavy cooling load requirements such as in cold rooms and ice plants).

**Improved use of feeds in aquaculture.** Many aquaculture industries depend on low value fish as feed, including the use of bycatch/trash fish. This can lead to competition with use of fish as direct food for humans (directly as smaller lower value fish, or in fish products e.g. fish sauce). Opportunity exists when re-building aquaculture industries to improve feed management practices to reduce the use of trash fish/fish meal in feeds.

**Responsible sourcing of seed and broodstock for aquaculture.** A key activity in rehabilitating aquaculture production is to ensure that the rehabilitated small scale hatcheries, nurseries and seed collecting activities are restored with sustainable management as a key principle. Many smaller scale producers may rely on the collection of larvae or seed from the wild, which can have negative impacts on the environment. Opportunity exists for improved policies that address the issues of certification and the development of incentives for environmentally friendly sourcing of seed and production (FAO, 2005).

**Undertaking Environmental Impact Assessments (EIA) prior to re-development.** EIAs, or alternatively Rapid Environmental Impact Assessment (REA) in disaster situations, are key to improving linkages between sustainable environmental management and disaster responses. REAs may be appropriate where capacity for full EIAs is lacking based on personnel and/or time. REA identifies, frames and prioritizes environmental issues in such a way as to allow the negative impacts to be minimized or avoided during the immediate response to a disaster. EIA is undertaken on a project or plan basis and is defined 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” (International Association for Impact Assessment, 1999). For example an EIA of an aquaculture development will assess the potential wider ecosystem impacts informing appropriate siting, size, species and carrying capacity.

## 2 A review of best practice and lessons learnt from supporting environmental management of fisheries and aquaculture in emergency responses

### 2.1 REVIEW OF PREVIOUS RESPONSES

A series of case studies of environmental focused responses associated with the fisheries and aquaculture sectors are provided below in relation to the Indian Ocean tsunami in December 2004, the Gulf Deepwater Horizon oil spill in April-July 2010, the MT Hebei Spirit oil spill in South Korea in December 2007, and the Japanese tsunami and Fukushima nuclear disaster in March 2011.

#### Indian Ocean tsunami

##### Case study: Waste clean-up partnership in Thailand

In January 2005, Thai government agencies initiated rapid assessments of the impacts on most of the natural resources in the affected provinces. In particular, the Department of Marine and Coastal Resources of the Ministry of Natural Resources and Environment (MONRE), together with Thai universities and the private sector, commenced impact assessments on coral reefs, sea grasses and mangroves.

These impact assessments found that debris transported into the sea by the receding tidal waves represented a significant threat to the marine ecosystem and it was recognised that rapid removal would prevent further irreparable damages. In the months after the tsunami, the Department of Marine and Coastal Resources of MONRE in close collaboration with the Department of National Parks, Wildlife and Plant Conservation of MONRE, and many actors from the private sector conducted regular clean-up operations of the beaches and the coral reefs starting with Phuket and Phi Phi Islands, two major tourist destinations. The Department of Marine and Coastal Resources set out to clean-up of all affected coral reefs and beaches by the end of March, just before the onset of the monsoon season. This timescale of three months demonstrates the importance and priority given to these clean-up operations to promote protection of the marine ecosystems, particularly those linked with tourism.

To complete the clean-up operations in all affected reefs by the end of March, stakeholders across a range of sectors worked together in co-ordinating and carrying out the physical diver-led retrieval of debris. For Phi Phi islands, for example, the stakeholders included:

- Government agencies: MONRE (coordination, diving team and equipment); Tourism Authority of Thailand (public relations); Thai Navy (diving teams and equipment, boats to transport debris).
- Local authorities: District administration (trucks to transport debris to disposal sites).
- Private sector: Thai Airways (transport Bangkok – Krabi); Krabi Tourism Association (transport of participants by ferry); Diving Association (diving team and diving equipment).
- International and government donors: United Nations (provision of equipment for clean-up).
- NGOs and civil society: Wildlife Thailand Fund (WTF) (volunteers).

### Case study: Waste clean-up partnership in Thailand (cont.)



FIGURE

**Large and small debris being lifted to the surface by diver teams to prevent further damage to the coral reefs**

Patong, Phuket Province, Thailand (15 January 2005).  
 © Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment.  
 Source: UNEP, 2005

#### Lessons learnt

Private and public stakeholders working together in a coordinated approach allowed successful management of diver teams and equipment.

The efficient clean-up process minimised further risk to recovering coral reef systems.

Focus on tourism related islands/reef systems encourages the recovery of tourist related businesses, however other locations should not be overlooked to ensure protection of marine ecosystem and recovery of habitats supporting fisheries in other locations.

### Case study: tsunami impacts to turtles and inappropriate implementation of shelterbelts

The tsunami affected a number of Turtle Conservation Projects destroying nest protection area, associated infrastructure and turtle hatcheries based on beaches around the Indian Ocean. For example, in Thailand the Turtle Conservation Project in Phang Nga Province lost two project staff and the project camp was totally destroyed. The associated breeding/conservation centre was destroyed and 2,000 turtles lost. The Phuket Marine Biological Centre lost 18 breeding Olive Ridley turtles (UNEP, 2005).

In Sri Lanka two out of four turtle hatcheries were destroyed and nest protection areas were heavily damaged and research huts destroyed; tourism programs and habitat assessment surveys were also temporarily stopped.

In India the Andaman and Nicobar Islands were the worst affected in terms of impacts to turtles. Many turtle nesting beaches were washed away, with the islands suffering significant shoreline alteration and subsidence. Debris on remaining (and newly formed) beaches also hindered turtles returning to breed.

Post tsunami donations and funds promoted the recovery of turtle conservation projects, employment of new staff and the re-construction of facilities.

In India the World Bank funded an Emergency Tsunami Reconstruction Project (ETRP) in the southern state of Tamil Nadu. One of the measures implemented was the raising of 'bio-shield' shelterbelts on the beaches with the objective of reducing the force, depth and velocity of any future tsunamis therefore lessening damage to property and reducing loss of life (Forbes and Broadhead, 2008) and therefore protecting coastal fishing communities. In this case plantations primarily of *Casuarina*, an exotic fast growing species, covered over one third of the entire Tamil Nadu coast, and were established up to the high tide line. Their presence up to the high tide line eliminated large stretches of sea turtle nesting habitat, most notably for the Olive Ridley species.

A study by the MS Swaminathan Research Foundation (MSSRF) on the efficacy of shelterbelts in tsunami impact mitigation found that *Casuarina* plantations very close to the high tide line can cause coastline erosion. The Students' Sea Turtle Conservation Network (SSTCN) subsequently began to lobby the World Bank, the Government and Forest Department to remove *Casuarina* in the 50m closest to the high tide line.

### Case study: tsunami impacts to turtles and inappropriate implementation of shelterbelts (cont.)

In September 2008 the Government passed an order to remove the *Casuarina* trees from the beaches to allow restoration of turtle breeding habitat. By 2009 the removal had been completed and early indications are that Olive Ridley turtles are returning to nest.



**FIGURE**  
**Removal of Casuarina trees to allow re-establishment of turtle nesting beaches**  
 Source: SSTCN, 2009

#### Lessons learnt

Environmental Impact Assessments (EIA) should be undertaken by relevant scientific bodies/consultants prior to funding shelterbelt projects.

Shelterbelt projects should be independently monitored during implementation to ensure compliance with any consenting conditions.

### Case study: undertaking resource stock assessments post tsunami

The Food and Agriculture Organization (FAO) assisted the Ministry of Fisheries and Aquatic Resources in Sri Lanka to implement a project funded by the Canadian International Development Agency (CIDA) to enhance the capacity of the National Aquatic Resources Research and Development Agency (NARA) for undertaking marine resource surveys and stock assessment in respect of selected fish resources i.e. Chank, sea cucumber, lobster, Marine ornamental fish and shrimp in the coastal waters of Sri Lanka. This project was complemented by the component of the IFAD funded Post Tsunami Rehabilitation and Management Programme on support to conduct resource surveys and stock assessments and the promotion of participatory fisheries management for selected fisheries / resources in the Tsunami affected districts. Therefore the above two projects were implemented as a joint programme. This programme assisted the effort of the government to build and maintain a coastal fisheries resource information base for development planning purposes and to ensure sustainable use of resources. (CENARA, undated).

#### Lessons learnt

Supporting the development of skills for conducting resource surveys and stock assessments.

Upgrading logistics, capacities and facilities in the conduct of resources surveys and fish stock assessments activities.

Strengthening and maintaining the knowledge base on coastal fish resources.

Introduction of participatory management of coastal fisheries resources.

## Oil spills

### Case study: Deepwater Horizon oil spill – fishery closures based on chemical analysis of fish and shellfish

The Gulf of Mexico is a very productive fishery, comprising the majority of domestic shrimp (60 percent) and oyster (70 percent) production (Louisiana Seafood Promotion & Marketing Board 2010). During the BP Deepwater Horizon oil spill, > 200 million gallons of oil poured into the Gulf of Mexico, followed by 1.8 million gallons of dispersants intended to break down the oil into droplets (Repanich 2010).

The U.S. Food and Drug Administration (FDA) is the agency responsible for determining seafood safety in this area. In response to the oil spill, the FDA, working with the states and the National Oceanic and Atmospheric Administration (NOAA), initially closed approximately 37 percent of the Gulf of Mexico (225 290 km<sup>2</sup>) to commercial and recreational fishing (NOAA 2010). Reopening of these areas was conducted on a rolling basis, using a two-phase testing regime consisting of organoleptic testing, in which experts sniff pieces of seafood for oil taint, and chemical analysis for polycyclic aromatic hydrocarbons (PAHs) (FDA 2010). PAHs are found in crude oil and have the potential to accumulate in aquatic organisms, presenting a health risk via ingestion of contaminated seafood (Yender *et al.*, 2002). Crustaceans and mollusks, such as shrimp, crab, and oysters, are especially likely to be contaminated because of reduced rates of biological clearance of PAHs in these species (Law *et al.*, 2002). The FDA tested for the presence of 13 PAHs selected on the basis of known carcinogenicity or other health effects, including stunted growth, anemia, and kidney disease. The FDA also calculated allowable thresholds [levels of concern (LOCs)] for PAHs in each specific type of Gulf seafood.

The fishery closures were implemented (and re-opened) on a zonal basis established through evidence of PAH levels by species and area. This process encouraged fisheries participation and buy-in to the closures, therefore promoting compliance.

The FDA allowed most Gulf fisheries to reopen during summer-autumn 2010 based on measured PAHs in seafood below the LOCs, although public confidence in Gulf seafood was slow to rebuild (Marcus, 2011).

Rotlin-Ellman *et al.*, (2012) evaluated the FDA risk assessment and found the adequacy of the policy decision to resume commercial fishing hinged on the accuracy of FDA's assumptions in calculating the LOCs and on the rigor of the seafood monitoring program.

Rotlin-Ellman *et al.*, (2012) found that the LOCs set by FDA significantly underestimated the risk from seafood contaminants to sensitive populations by failing to a) account for the increased vulnerability of pregnant women; b) use appropriate seafood consumption rates; c) include all relevant health end points; and d) incorporate health-protective estimates of exposure duration and acceptable risk.

#### Lessons learnt:

Where fishery closures are necessary a transparent scientific based approach, clear communication and zonal closures (as opposed to blanket bans) encourage industry buy-in and cooperation.

When possible appropriate risk assessment methods should be used with due regard of vulnerable populations such as pregnant women and children.

### Case study: Deepwater Horizon oil spill – fishers commissioned to assist clean-up

During the oil cleanup efforts in the wake of BP's disaster in April 2010, fishermen, who could no longer fish because the fishing areas were closed, were hired by BP to help with the clean-up process as part of BP's Vessels of Opportunity (VoO) programme. As part of VoO, BP contracted over 5 000 commercial and charter fishing vessels; on average 3 000 vessels were in operation daily, 85 percent of which were fishing vessels. BP introduced a policy to prioritize local owner/operated commercial and charter vessels and their crews (BP, 2010). The main activities undertaken by VoO vessels included supporting skimming operations, tending and maintaining booms, collecting sheen and light oil in shallower waters, finding and removing tar balls from the water, and transporting supplies, personnel and wildlife.

It was common at that time to see fishing boats stocked with oil booms where normally they would hang fishing nets (see figure below). Those who accepted the job with BP's VoO were asked to sign a document waiving them of their rights to sue the company for any damages at a later date (Blumenfeld, 2011).

FIGURE  
Fishing vessels stocked with oil booms.



Source: Blumenfeld, 2011

#### Lessons learnt:

Use of existing assets already on-site to help minimize environmental impacts efficiently.

Promotion of stewardship of the sea and environment for those that work directly with marine resources.

Buy-in and support of fishers with environmental issues and need for closures.

### Case study: Hebei Spirit – fishers assist mass clean-up procedure

A collision between a barge and an oil tanker caused the release of an estimated 12 547 tons of light crude oil into the Yellow Sea off the west coast of the Republic of Korea on December 7, 2007. More than 150 km of coastline were affected. The Korean Ministry of Maritime Affairs and Fisheries (MOMAF) and the Korean Coast Guard (KCG) led the response and acted quickly to coordinate clean up procedures at sea and on land.

The majority of beaches were cleaned, a result of strong coordination, considerable effort of personnel from the KCG, MOMAF, Korean Maritime Police, the Navy, the Army, and significant participation of volunteers from the private sector and the general public. Due to the deployment of oil booms very quickly after the spill, many sensitive areas were protected. Fishermen were highly active in clean-up programmes at sea and on land, with entire fishing communities and supply chains involved.

Between 20 000 and 40 000 people per day participated in the clean-up process (Joint UNEP/OCHA Environment Unit, 2008).

Given the speed of the clean up and the quick actions of authorities, the prospect for the rehabilitation of the affected area is considered good (Joint UNEP/OCHA Environment Unit, 2008). A monitoring programme was implemented to investigate medium and long-term environmental impacts related to the spill.

FIGURE  
Coordinated onshore clean up procedures utilizing volunteers



(Source: Moller, 2007)

#### Lessons learnt

A beach cleaning operation of the scale described above demands very thorough and dynamic coordination and management to prioritize areas for clean up and manage personnel, including the logistical details.

Fast action and speedy, prioritised clean up procedures maximise chances of rehabilitation.

## Japan tsunami and Fukushima nuclear disaster

### Case study: Disposal of spoiled fish from processing plants damaged in the tsunami

The Japanese tsunami in 2011 destroyed numerous large fish-processing factories along coastal cities. Fish and shellfish stored within these damaged factories began to spoil and the rotten seafood attracted swarms of flies; which in itself posed a potential health risk. The problem was then two-fold: dispose of the spoiled seafood and eradication of the swarms of flies using insecticides.

In the weeks after the tsunami, city officials decided to bury the dead fish, but with high summer temperatures this did not detract swarms of flies. The city then petitioned the Ministry of Environment and Iwate prefecture on whether they could suspend a law banning the disposal of fish in the ocean. In mid-June, the government let the prefecture dump approximately 5 800 tons of rotting seafood 50 nautical miles off shore (Wakabayashi, 2011).

#### Lessons learnt:

The need for the establishment of waste disposal systems and post disaster waste guidelines

Development of composting/soil enrichment programs in coordination with solid waste management initiatives should be considered

### Case study: Radioactive contamination of fish and shellfish resources during Fukushima nuclear disaster

The Fukushima nuclear disaster (11 March 2011) resulted in the release of radioactive material from containment tanks/vessels as a consequence of deliberate venting to reduce gaseous pressure, deliberate discharge of coolant water into the sea, and associated uncontrolled events.

A range of scientific organizations and NGOs sampled fish and other marine components for evidence of radioactive contamination. A fishing ban was implemented within a 30km radius around the area.

The need to understand the amount, type, and fate of radioactive materials released prompted a group of scientists from the U.S., Japan, and Europe to organize the first multi-disciplinary, multi-institutional research cruise in the northwestern Pacific. A group of 17 researchers and technicians spent two weeks aboard the University of Hawaii research vessel R/V Kaimikai-O-Kanaloa examining many of the physical, chemical, and biological characteristics of the ocean that either determine the fate of radioactivity in the water or that are potentially affected by radiation in the marine environment (Woods Hole Oceanographic Institution, 2012).

Contamination levels of marine life sampled during the cruise were well below levels of concern for humans and the organisms themselves, however the researchers said, radioactive materials accumulating on the seafloor might pose a long-term threat to the marine ecosystem.

Weiss (2011) reported Bq/kg levels for seawater immediately adjacent to Fukushima and investigated levels in fish and shellfish. For key commercial species of cod, pollock, seabass, mackerel, herring, anchovy, sardine, dory, and tuna radionuclide levels progressively increased until June, after which they were measured at a consistently low level of <15 Bq/kg. Maximum cesium activity values were recorded at 144 Bq/kg (for anchovy), 240 Bq/kg (cod), 270 Bq/kg (mackerel) and 670 Bq/kg (seabass). Bottom dwelling species of flatfish had significantly higher levels with maximum levels reaching 1 610 Bq/kg (flounder).

### Case study: Radioactive contamination of fish and shellfish resources during Fukushima nuclear disaster (cont.)

To mitigate any potential concern over contaminated fish (and other food) products, Japan's Radiation Council approved the Japanese health ministry's proposal for stricter limits on radioactive caesium found in food. The limit of 500 Becquerel per kilogram (Bq/kg) was reduced to 100 Bq/kg for vegetables, grains, meat, eggs and fish sold in Japan as of 1 April 2011. This limit is one-tenth of the acceptable level in the United States (1 200 Bq/kg). In April 2011 the EU changed its default limit of 1 250 Bq/kg for most foods from Japan to align itself with the stricter (pre-April) limit of 500 Bq/kg. The need and motivation for such drastic changes has since been questioned.

In addition Japan introduced a limit for radioactive iodine in seafood of 2 000 Bq/kg (to match limits in place for vegetables).

#### Lessons learnt:

Potential for clear communication of limits to improve public perception of seafood consumption post technological disaster.

## 2.2 KEY REQUIREMENTS FOR IDENTIFYING ENVIRONMENTAL MANAGEMENT NEEDS FOR FISHERIES AND AQUACULTURE OPERATIONS POST DISASTER

Environmental considerations are often not at the forefront of management or decision making immediately after a disaster has occurred, despite there being some very credible reasons why this should be the case. Until recently, post-disaster needs assessments were being carried out primarily to identify immediate and life-saving needs without strategic regard of how decisions might affect the environment, or the opportunities that exist to build back in a more sustainable, environmentally manner.

After a disaster, environmental management needs for fisheries and aquaculture operations can be identified by undertaking an Environmental Needs Assessment (ENA). This can be as part of a wider ENA (covering other non-fish related environmental aspects), or included within a wider fisheries and aquaculture needs assessment.

UNEP (2008) have developed a practical guide for implementing environmental needs assessments in post-disaster situations. Three separate, but inter-related phases, are designed to focus attention on different levels and needs while promoting streamlined information gathering. In relation to fisheries and aquaculture the three phases can be summarized as follows:

### Phase I – Pre-disaster baseline

Gathering as much reliable information on the actual situation immediately before the disaster, as well as during lead up events to the disaster, is important for understanding the baseline situation and therefore interpreting attribution of impacts to the disaster. Many different sources of information can be utilized including:

- Environmental profiles of stocks, habitats and ETP species;
- Aquaculture, fisheries and wildlife management plans;
- Previous environment-related assessments;
- Specific databases e.g. fisheries landings, aquaculture production on a national/regional scale; and
- Local knowledge on natural resources' management.

### Phase II – Situation analysis and site assessment

Based on the information gathered, a risk mapping exercise can be carried out to highlight key areas of concern or likely impact. This is preceded by targeted on-the-

ground data collection, observation and verification. To assess the scale and severity of the situation three broad approaches are recommended by UNEP (2008):

- Further data gathering which may take the form of background research and desk studies, combined with some interviews of key government and non-governmental actors in country;
- Preliminary risk analysis supplemented by on-site assessments, which would include direct observations; and
- Stakeholders' consultations with representatives of the affected community/industry.

### **Phase III – Stakeholder engagement and consultation**

Engaging with a broad range of people – from decision-makers in line ministries to actual practitioners who have a direct dependency on certain natural resources – is a fundamental part of the ENA process. Some consultation will naturally occur during the site assessment work, but given the importance of making sure that peoples' own voices and experiences are recorded, and their immediate (and longer-term) needs identified, special attention is given to this phase of work. Consultations are also an essential opportunity to ensure that all members of the affected society have an opportunity to contribute to the early recovery process, while at the same time ensuring that cross-cutting issues such as gender are properly addressed.

Throughout all three phases structured analysis and transparent recording of information is recommended.

Overall an ENA should aim to provide:

1. Comprehensive environmental damage assessments; and
2. The basis for developing environmental rehabilitation plans for affected natural resources.

In the short-medium term, the focus of environmental management of aquaculture and fisheries is likely to be on allowing key natural environments, such as water quality, coral reefs, mangroves and fishery resources, time to recover from the impact of the disaster. In the longer term, development of rehabilitation management plans involving all stakeholders can ensure sustainable long term management of these resources.

## **2.3 LINKAGES THAT SUPPORT GOOD ENVIRONMENTAL PRACTICE IN EMERGENCY RESPONSE**

A description of the linkages that support for good environmental response and capacity has with other services provided to fisheries and aquaculture sector in emergency response is described below in Table 1.

**TABLE 1**  
**Linkages between environmental considerations/management and other support provided across fisheries and aquaculture**

Areas of Support provided to fisheries sector in emergencies	Linkages between environmental considerations/management and other support provided	What are the implications for planning? (what considerations should be made)
Food and nutrition security	<p>Level of contaminants within seafood products as a result of oil or radionuclide pollution that are considered safe for human consumption.</p> <p>Responsible disposal of contaminated or spoiled seafood products ensuring re-entry to consumer supply chains does not occur.</p>	<p>Decisions on appropriate threshold limits for radionuclides and oil contaminants, including any necessary provision for vulnerable groups (e.g. children and pregnant women). For example: use of Codex Alimentarius or limits set on a national basis.</p> <p>Development of waste management/ disposal plans for contaminates/spoiled seafood products.</p>
Vessel repair/replacement	Replacement vessels match the capacity necessary for sustainable harvesting of resources.	<p>Registration and licensing of vessels to record total capacity.</p> <p>Ensure inappropriate donations (of vessels) are not accepted.</p>
Provision / repair of fishing gear	Reintroduced fishing gear designed to minimise environmental impacts where possible e.g. lower catches of juveniles, reduced habitat impacts, bycatch reduction measures.	Collaborative approach between fishermen, managers and gear manufactures to improve design of gear or introduce environmental design aspects.
Provision / repair of infrastructure – e.g. landing sites / market facilities / aquaculture facilities	Environmental Impact Assessments are undertaken prior to re-building of infrastructure to avoid further environmental degradation.	Development of rapid EIA process for post disaster situations.
Post harvest activities and marketing	Comprehensive recording of landings by species, including artisanal/subsistence fisheries.	Development of recording protocols and databases.
Fisheries and aquaculture policy and management	Ensuring that pre or post-disaster policy and management supports sustainable fisheries and aquaculture and minimisation of wider ecosystem impacts.	Provision for environmental considerations to be built into national and local, as well as strategic and specific policy and management.

### 3. Review of existing standards and guidelines relevant to environmental policy and management capacity in the context of emergency response

This section provides a review of key standards and guidelines applicable to environmental policy and management in fisheries and aquaculture. This includes relevant standards highlighted in all other thematic papers, as well as additional environmentally focused standards.

The standards and guidelines are reported under four headings: fisheries, aquaculture, environmental, food quality and safety and general emergency response guidelines.

#### 3.1 FISHERIES

The **FAO Code of Conduct for Responsible Fisheries (CCRF)** was adopted in 1995 to promote long-term sustainable fisheries. The CCRF sets out principles and international standards of behavior for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. It actually covers both fisheries and aquaculture, but Section 3.1.2 below discusses the aquaculture-specific guidelines associated with the CCRF as well as other aquaculture standards and guidelines. The CCRF recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all those concerned with the fishery sector. The FAO has published 27 **technical guidelines** to support implementation of the code. A number of these relate to the ecosystem approach to fisheries (see next paragraph) or to aquaculture (see Section 3.1.2), but others with perhaps most relevance to this background paper and the emergency response guidelines include:

- Fisheries management. 4. Marine protected areas and fisheries.
- Fisheries management. 3. Managing fishing capacity.
- Inland Fisheries. 1. Rehabilitation of inland waters for fisheries.
- Implementation of the International Plan of Action to deter, prevent and eliminate, illegal, unreported and unregulated fishing.
- Fisheries management. 1. Conservation and management of sharks.
- Indicators for sustainable development of marine capture fisheries.
- Fishing operations. 1. Vessel monitoring systems.
- Fisheries management.
- Inland fisheries.
- Integration of Fisheries into coastal area management.

The CCRF makes recommendations on the marking of fishing gear (Paragraph 8.2.4 of CCRF), prohibiting destructive fishing practices (8.4.2), reduction and recording of discards and bycatch (8.4.3, 8.4.5); promotion and adoption of appropriate technology, taking into account economic conditions, for the best use and care of the retained catch (8.4.4); minimizing the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear (8.4.6) all of which occur in disasters. The CCRF also highlights the need for research on the environmental and social impacts of fishing gear and, in

particular, on the impact of such gear on biodiversity and coastal fishing communities (8.4.8). The Code also encourages research and promotes the use of selective gears so as to minimize waste (8.5.1) and recommends that fishers should cooperate in the development of selective fishing gear and methods including the drawing up of laws and regulations (8.5.2).

The **Ecosystem Approach to Fisheries (EAF) Fisheries management 2. The ecosystem approach to fisheries. FAO Technical Guidelines for Responsible Fisheries No.4 Suppl.2** (published in 2003), provides a practical set of guidelines for implementing EAF including a range of management measures, approaches and processes. A series of expert workshops have studied the development and use of indicators for EAF relevant to ecological well-being, human well-being and ability to achieve (FAO 2010) and provide additional guidance. Other FAO technical Guidelines include.

- Fisheries management. 2. The ecosystem approach to fisheries. 2.2 The human dimensions of the ecosystem approach to fisheries.
- Fisheries management. 2. The ecosystem approach to fisheries. 2.1 Best practices in ecosystem modeling for informing an ecosystem approach to fisheries.

Fletcher *et al.*, (2012) provide a set of **technical guidelines based on the outcomes of the Report of a Workshop on a Toolbox for the Ecosystem Approach to Fisheries (EAF)**, held in Rome, Italy, 26-29 February 2008. The Technical Document is consistent with the newly drafted interactive web-based version of the EAF Toolbox which is located on the **FAO EAFNet website**. The development of the EAF toolbox website and technical guidelines document was conceived as a method to support the overall implementation of EAF, particularly for those in developing countries. It focuses on the planning processes required to develop and implement an EAF based Fishery Management Plan by breaking this process down using a stepwise but comprehensive approach along with a description of various options to complete each of these steps. The technical guide is supported by a series of web-based EAF Tool Fact Sheets (which are located on the EAF Toolbox website) that provide the details on the variety of tools that are now available to assist complete this management planning process.

**FAO International Plans of Action (IPOAs)** are voluntary instruments elaborated within the framework of the CCRF and apply to all States and entities and to all fishers. Four IPOAs have been developed to date: IPOA-Seabirds; IPOA-Sharks; IPOA-Capacity; and IPOA-IUU. The FAO website provides technical notes in some cases (e.g. on seabirds) on developing national plans of action, as well as full details on the IPOAs.

**United Nations Convention on the Law of the Sea (UNCLOS)** defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The convention introduces a number of provisions including exclusive economic zones, continental shelf jurisdiction protection of the marine environment, scientific research, and settlement of disputes.

**Regional Fishery Bodies (RFBs)** are a mechanism through which States or organizations that are parties to an international fishery agreement or arrangement work together towards the conservation, management and/or development of fisheries. There are RFBs worldwide covering the following regions: global and trans-ocean (4), Pacific Ocean (12), Mediterranean, Black Sea and connecting waters (1), Indian Ocean (5), Atlantic Ocean (14) and Inland waters (7). 20 of these RFBs have a management mandate and 22 have an advisory (scientific and/or management) mandate. These RFBs have published and agreed Resolutions (binding on members) or Recommendations (voluntary but advisable), many of which cover environmental issues related to improved stock management.

In addition to the internationally recognised policy and management standards and guidelines highlighted above, there are also other frameworks and documentation that may be of benefit in emergency situations because of their focus on environmental issues. For example, the **Marine Stewardship Council** runs a fishery certification program and seafood ecolabel which recognises and rewards sustainable fishing. The MSC has developed standards for sustainable fishing based around three main principles: sustainable fish stocks; minimising environmental/ecosystems impacts; and effective governance and management. Each principle is assessed against a number of very specific performance indicators. The MSC framework complies with the CCRF and its guidelines on eco-labelling, and can be used a useful framework for benchmarking the performance of particular fisheries against best policy and management practice. Another example relates to policy and management on climate change, where standards and methodologies exist to assess Green House Gas emissions from fisheries, which can underpin related management efforts to reduce such emissions. For example the **British Standards Institute PAS 2050 Life Cycle** standard is an internationally applicable standard that provides a method for assessing the life cycle greenhouse gas (GHG) emissions of goods and services (jointly referred to as “products”). It can be used by organizations of all sizes and types, in any location, to assess the climate change impact of the products they offer.

**ICES-FAO Working Group on Fishing Technology and Fish Behavior (WGFTFB)** (FAO, 2009-2012). The directive of the WGFTFB is to initiate and review investigations of scientists and technologists concerned with all aspects of the design, planning and testing of fishing gears used in abundance estimation, selective fishing gears used in by catch and discard reduction; and environmentally benign fishing gears and methods used to reduce impact on bottom habitats and other non-target ecosystem components. Areas of focus also include behavioral, statistical and capture topics.

WGFTFB activities focus on all measurements and observations pertaining to both scientific and commercial fishing gears, design and statistical methods and operations including benthic impacts, vessels and behavior of fish in relation to fishing operations.

**Coordinating Working Party on Fishery Statistics (CWP)** (FAO, 2010-2012) provides a mechanism to coordinate fishery statistical programmes of regional fishery bodies and other inter-governmental organizations with a remit for fishery statistics. Its main function is to continually review fishery statistics requirements for research, policy-making and management; agree on standard concepts, definitions, classifications and methodologies for the collection and collation of fishery statistics; make proposals for the coordination and streamlining of statistical activities among relevant intergovernmental organizations.

The CWP has produced a Handbook of Fishery Statistical Standards and Chapter M of this handbook is related entirely to Fishing Gear Classification (FAO, 2012).

The International Standard Statistical Classification of Fishing Gear (ISSCFG) was adopted during the 10th Session of the CWP (Madrid, 22-29 July 1980). This classification was initially designed to improve the compilation of harmonized catch and effort data in fish stock assessment exercises, it is commonly used in fisheries technology and the training of fishermen. It has been used in particular for reference in works dealing with the theory and construction of gear and for the preparation of specialized catalogues on artisanal and industrial fishing methods.

## 3.2 AQUACULTURE

**Aquaculture development (FAO Technical Guidelines for Responsible Fisheries No.5)** is a technical guidelines document prepared by FAO in support of the CCRF (FAO, 1997) providing a framework for responsible aquaculture development including good aquaculture feed manufacturing practice. Other technical guidelines and related supplements of relevance to environmental issues include:

- Aquaculture development. 6. Use of wild fishery resources for capture-based aquaculture
- Aquaculture development. 5. Use of wild fish as feed in aquaculture
- Aquaculture development. 4. Ecosystem approach to aquaculture.
- Aquaculture development. 3. Genetic resource management.
- Aquaculture development. 2. Health management for responsible movement of live aquatic animals.
- Aquaculture development. 1. Good aquaculture feed manufacturing practice.

In **Fisheries and Aquaculture Technical Paper No. 527**, Philipps *et al.*, (2009) provide a **compilation, review and synthesis of existing Environmental Impact Assessment (EIA)** and environmental monitoring procedures and practices in aquaculture in the Asia-Pacific region, the largest aquaculture-producing region in the world. This review gives special consideration to four areas related to EIA and monitoring in aquaculture including: (1) the requirements (2) the practice (3) the effectiveness and (4) suggestions for improvements.

Chapter 10 of **FAO Fisheries Technical Paper No. 402** (FAO/NACA, 2000) provides guidance on the important issue of import risk analysis in aquaculture. This issue is also covered in **FAO Fisheries and Aquaculture Technical Paper No. 519** (Arthur *et al.*, 2009) with each chapter providing pointers to existing guidelines/standards.

**FAO Technical Guidelines on zoning and carrying capacity** (related to the implementation of the Ecosystems Approach to Aquaculture – EAA) are in preparation (and should be issued in 2013).

**Technical Guidelines on aquaculture certification** (FAO 2011b) provide guidance for the development, organization and implementation of credible aquaculture certification schemes (see below).

The **International Principles for Responsible Shrimp Farming** (FAO, NACA, UNEP, WB and WWF, 2006) provide guidance for implementing the CCRF and Aquaculture Development technical guidelines, and have been adopted by the FAO's Committee on Fisheries (COFI). They consider technical, environmental, social and economic issues associated with shrimp farming and provide a basis for industry and government management to improve the overall sustainability of shrimp farming at national, regional and global levels.

The **ICES Code of Practice on the Introductions and Transfers of Marine Organisms 2003** was originally developed for marine aquaculture activities, but in recent years, by far the largest number of introductions has been for re-stocking or enhancement purposes but the same principles should apply. The Code follows the precautionary approach adopted from the FAO principles (FAO 1995) with the goal of reducing the spread of exotic species.

An **Aquatic Animal Health Code** is provided by the World Organisation for Animal Health (OIE) (2011). This Code sets out standards for the improvement of aquatic animal health and welfare and veterinary public health worldwide, including through standards for safe international trade in aquatic animals (amphibians, crustaceans, fish and molluscs) and their products. The health measures in the Aquatic Code should be used by the veterinary authorities of importing and exporting countries to provide for early detection, reporting and control of agents pathogenic to aquatic animals and, in the case of zoonotic diseases, for humans, and to prevent their transfer via international trade in aquatic animals and aquatic animal products, while avoiding unjustified sanitary barriers to trade.

The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) is an advisory body, established in 1969, that advises the United Nations (UN) system on the scientific aspects of marine environmental protection.

**GESAMP Environmental Quality Standards (EQSs)** for marine, freshwaters and sediments have been developed and although there are no global values many countries have their own standards which are used to assess pollution levels in the aquatic environment.

**The Global Aquaculture Alliance Best Aquaculture Practices (BAP)** standards address environmental and social responsibility, animal welfare, food safety and traceability in a voluntary certification program for aquaculture facilities. BAP certification defines the most important elements of responsible aquaculture and provides quantitative guidelines by which to evaluate adherence to those practices. Standards exist for salmon, shrimp, tilapia, and *Pangasius*.

The World Wildlife Organisation (WWF) has been working since 1994 on the development of **Aquaculture Dialogue standards**. Four of the eight sets of standards are now complete (on tilapia, abalone, bivalves, and catfish [*Pangasius*]). Standards for freshwater trout, salmon, shrimp, *Seriola* and cobia will also shortly be finalised.

Closely linked to the aquaculture dialogue standards highlighted above, are the **Aquaculture Stewardship Council (ASC) standards**, which are to be used in the certification of responsible aquaculture production. ASC has created a set of tools and supporting documentation to help farmers, supply chain actors and certification bodies, and the ASC standards themselves are based on the aquaculture dialogue standards.

### 3.3 ENVIRONMENTAL

**The Convention on Wetlands of International Importance, especially as Waterfowl Habitat** (the Ramsar Convention) is an international treaty for the conservation and sustainable utilization of wetlands. Types of wetlands covered in the convention include: lakes and rivers, swamps and marshes, wet grasslands and peatlands, oases, estuaries, deltas and tidal flats, near-shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans. Ramsar site designations may affect siting of fisheries and aquaculture developments and related infrastructure.

**United Nations Framework Convention on Climate Change (UNFCCC)** is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Kyoto Protocol is a protocol to the UNFCCC whereby signatory countries commit themselves to a reduction of four greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride) and two groups of gases (hydrofluorocarbons and perfluorocarbons).

**Environmental Needs Assessment in Post-Disaster Situations A Practical Guide for Implementation** (UNEP, 2008). This constitutes a practical guide for implementing environmental needs assessments in post-disaster situations. Three separate but inter-related phases are designed to focus attention on different levels and needs while promoting streamlined information gathering: (I) Pre-disaster baseline (II) Situation analysis and site assessment and (III) Stakeholder engagement and consultation.

**Handbook for Estimating the Socio-economic and Environmental Impacts of Disasters** (ECLAC, 2003) provides a methodology to assess the direct and indirect socio-economic impacts of disasters, and to identify the most affected areas and priority areas for recovery. It outlines the conceptual and general methodological aspects of estimating the asset damage, losses in the flows of goods and services, as well as any effects on the macroeconomy. It is perhaps more appropriate for economic-related assessments, with attention given to environmental or community needs.

**Guidelines for Rapid Environmental Impact Assessment (REA) in Disasters** (Kelly, 2005) provide a means to define and prioritize potential environmental impacts in disaster situations. It outlines a simple, consensus-based qualitative assessment process, involving narratives and rating tables, to identify and rank environmental issues and follow-up actions during a disaster. The REA is built around conducting simple analysis of information in the following areas:

- The general context of the disaster.
- Disaster related factors which may have an immediate impact on the environment.
- Possible immediate environmental impacts of disaster agents.
- Unmet basic needs of disaster survivors that could lead to adverse impact on the environment.
- Potential negative environmental consequences of relief operations.

The REA is designed for natural, technological or political disasters, and as a best practice tool for effective disaster assessment and management. The REA does not replace an EIA, but fills a gap until an EIA is appropriate.

**Principles of Environmental Impact Assessment Best Practice** have been developed by the International Association for Impact Assessment (IAIA, 1999) to present overall objectives of EIA, basic principles and operating principles. The IAIA have also developed a Tool Kit for Effective EIA Practice which discusses various methods within the EIA process.

The **Convention on Environmental Impact Assessment in a Transboundary Context** (Espoo 1991) is a United Nations Economic Commission for Europe (UNECE) convention. It requires signatory countries to carry out an environmental impact assessment of certain activities at an early stage of planning. It also lays down the general obligations to notify and consult on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries.

The US Environmental Protection Agency **Planning for Natural Disaster Debris** (2008) document recommends some helpful planning considerations when drafting or revising a disaster debris management plan. It describes steps a community can take to prepare for dealing with the debris created by natural disasters to speed recovery. It also describes ways that communities can reduce the burden on their solid waste management systems in the event of a natural disaster. It also provides advice for responding to marine debris contaminated with oil or hazardous substances.

The **International Convention for the Prevention of Pollution from Ships** (1973) as modified by the Protocol of 1978 (MARPOL 73/78) provides requirements for the prevention of pollution of the aquatic environment by fishing operations.

The **Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter**, 1972 and 1996 Protocol Thereto (London Convention) regulates the dumping of excavated or dredged material from ports.

The **Montreal Protocol to the Vienna Convention on Substances that Deplete the Ozone Layer** restricts the use of substances that impact the ozone layer in refrigeration equipment.

To add IAEA guidelines and handbooks on sampling, measuring and monitoring (awaiting copies to be sent).

### 3.4 FOOD QUALITY AND SAFETY

**Codex Alimentarius** are international standards governing food quality and safety, established in the Codex Alimentarius produced by the FAO/WHO Codex Alimentarius Commission. Member governments undertake to base national standards on those Codex Alimentarius standards (FAO/WHO, 2012) they have adopted and not to discriminate against imported products that meet the standard. For fish products the standards are set by the FAO/WHO Codex Committee on Fish and Fishery Products, which also produces guidelines, as codes of practice that accompany the standard. The

Codex code of practice for fish and fishery products (FAO/WHO, 2009) is relevant in an emergency context as it is intended for all those engaged in the handling, production, storage, distribution, export, import and sale of fish and fishery products. The Code will help in attaining safe and wholesome products that can be sold on national or international markets and meet the requirements of the Codex Standards.

**WTO Agreements** are international health-related trade restrictions are covered by two World Trade Organization (WTO) agreements that came into force in 1995. The first is the WTO Sanitary and Phytosanitary Agreement (the SPS Agreement) that covers health-related issues (WTO, 1995a). The other is the WTO Agreement on Technical Barriers to Trade (the TBT Agreement) that governs the technical requirements (WTO, 1995b). The agreements require that countries should not discriminate against products from countries with equivalent systems of food safety protection. The agreements also demand that all protection measures be based on science but accept that countries may have the need for specific measures to protect particular groups of consumers. The Codex Alimentarius is established as the arbitrator in cases of dispute.

**National food quality and safety regulations, building codes and environmental rules:** All emergency interventions relating to facilities and actions must take into account any national regulations that may be in force, governing all aspects of fish quality and safety including: hygiene and sanitation, construction of processing and storage facilities, markets and transport equipment. In situations where these are inadequate the first requirement must be to ensure that no unsound practices or construction are encouraged and that the general principles of the Codex Alimentarius are followed. The requirements for effective and sustainable rehabilitation emphasize the need for close coordination with local authorities on all aspects of planning and encourage the use of national architects to plan reconstruction.

**Managing Seafood Safety After an Oil Spill** (Yender *et al.*, 2002) provides methodologies for evaluating the likelihood that an oil spill will contaminate seafood, determining whether seafood actually has been contaminated, and assessing and communicating human health risk from eating contaminated seafood.

### 3.5 EMERGENCY RESPONSE GUIDELINES AND STANDARDS

**IMO/FAO guidance on managing seafood safety during and after oil spills** outlines oil response options (protection, clean-up, chemical analysis) and management strategies, procedures and restrictions for protecting seafood resources in the event of oil spills. IMO also has a range of manuals and guidance on oil pollution, chemical pollution, oil spill responses, and clean-up operations.

**The International Oil Pollution Compensation (IOPC) Fund** have guidelines on **compensation claims** in fishing, mariculture and fish processing, and also **Technical guidelines for assessing fisheries sector claims** with special reference to small-scale operations lacking evidence of earnings.

**The Consortium to Restore Shattered Livelihoods in Tsunami-Devastated Nations** (CONSRN) Strategic Framework was specifically developed for the post tsunami rehabilitation efforts in the Indian Ocean in 2004/2005, but it can apply to any natural rapid onset disaster and drought. It addresses a range of capacity-building issues that include policy and institutions, livelihood assets, and environmental and resources management. It contains six guidelines, summarized below (CONSRN, 2005).

- Improving policy and institutions, aimed to develop a responsive and well regulated policy and institutional environment for fisheries and aquaculture at national and local level; should involve communities and recognize the importance of local level needs in planning and regulation.
- Providing appropriate physical assets in a timely manner and equitable way to replace what have been lost while ensuring sustainable use of natural resources.

- Restoring the natural environment, while ensuring that coastal communities have equitable access to inputs and the natural resources.
- Providing appropriate financial support, to ensure that the right financial mechanisms are in place for those affected.
- Improving capacity in support of community livelihoods and responsible coastal resource management, in which everyone has a part or representation in decision making, so that the coastal systems are managed for the benefit of everyone in the community.
- Rebuilding of social assets, to ensure the development of communities and community organizations which are empowered to take part effectively in post-disaster planning and rehabilitation activities

**A Response Analysis Framework for Food and Nutrition Security Interventions at District Level** (FAO, 2011) provides a systematic guide that can be directly adopted for disaster needs and response analysis. The core principles include: consensus building among multiple stakeholders; transparency in decision making; accountability in implementation of response actions; joint planning, collaboration and coordination; sustainability through integration into routine planning/decision making processes; and replicability through simple methods and building on what exists. These are relevant and directly applicable to addressing the technical and planning issues related to emergency responses in aquaculture and fisheries.

## 4. Recommendations for best practice and indicators supporting environmental management of fisheries and aquaculture in emergency responses

### 4.1 OVERVIEW OF BROAD THEMES OF BEST PRACTICE FOR SUPPORTING ENVIRONMENTAL MANAGEMENT OF FISHERIES AND AQUACULTURE IN EMERGENCY RESPONSES

Statements of best practice (SBPs) for supporting environmental management of fisheries and aquaculture are presented below for the following environmental components:

- Fish and shellfish stocks and resources;
- Environmental monitoring and disposal of potentially contaminated resources;
- Habitats;
- Endangered, threatened and protected (ETP) species; and
- Ecosystem and wider environment.

For each of these components opportunity exists to improve preparedness before the occurrence of a disaster in order to maximize the resilience of both the resources themselves, and the appropriate management responses. While relevant throughout the SBPs, this has been incorporated into the first SBP and associated indicators.

### 4.2 BEST PRACTICE STATEMENTS Fish and shellfish stocks and resources

This section of the guidance focuses on SBPs and indicators for wild fish and shellfish resources i.e. those captured and sold for export or local consumption. It does not directly relate to aquaculture but is applicable to wild resources used in fishmeal.

#### **ENV 1: Preparedness and contingency planning for emergency response ensures that responses are effective and efficient.**

For environmental aspects, understanding the baseline conditions for stocks, habitats and protected species is vital for monitoring any changes resulting from the disaster itself and therefore informing the appropriate response to ensure continued sustainable harvesting of resources.

#### *Key indicators*

- Develop methodologies for and undertake regular monitoring and survey of key target species to inform stock structure, stock productivity and stock abundance.
- Routine monitoring and mapping of habitats pre and post disaster.
- Improved marking of fishing gear (pre-disaster and for all replacement gear).
- Develop mechanisms to include the emergency management of new incursions of invasive species into national and regional disaster management planning and national invasive species action plans.

**ENV 2: Building back better for more sustainable harvesting of fish resources.**

Improved management of fish and shellfish resources ensures that fishing capacity and effort is responsive to fluctuations in stocks that may have been impacted by disasters.

**Key indicators**

- Developments of new/renewed precautionary harvest strategies on a species or multi-species basis with due regard to stock status assessments.
- Inclusion of harvest control rules and trigger/reference points, and the use of an appropriate and improved range and mix of input, output and technical management measures within the harvest strategy to ensure that fish catches do not exceed MSY.
- Consideration of key spawning and nursery grounds within harvest strategies, with precautionary areas and/or seasonal closures to promote recovery of both spawning habitats and species.

**ENV 3: Fishing capacity reflects the fishing opportunities available and the local conditions.**

Care is taken in post-disaster situations to guard against the provision of excessive numbers of vessels, engines and gear, which may lead to overcapacity and overfishing.

**Key indicators**

- Inventories made of all remaining vessels/gear/engines prior to any re-supply.
- Decision on number and type of vessels and gear is based on needs assessment and most current stock status assessments for key target species to prevent overfishing, including growth, recruitment or ecosystem overfishing.
- All vessels re-supplied to communities are licensed and registered.
- The types of vessel/engines/gears/ re-introduced and their respective fishing capacity (e.g. length, Gross Tonnage, kilowatts) carefully considered and recorded.
- Types and specification of gear (e.g. mesh sizes, materials) re-introduced ensure maximum selectivity.
- Combined inventories of existing and re-supplied vessels provide clear and accurate information on fleet composition on a local, regional and national basis; are updated periodically; and special attention is given to small vessels.

**ENV 4: Building back better for more transparent information and monitoring of fishery removals and associated effort**

Time series statistics on total anthropogenic removals and associated effort inform assessments of the scale of fisheries over time, and of the status of the species and populations upon which fisheries depend.

**Key indicators**

- Develop a system for recording catches of both landings for local consumption / sustenance and export reported by location, gear and catch per unit effort.
- Develop full reporting system to record all fishery removals incorporating information to describe level, size, age, sex and genetic structure of landings, discards, IUU, recreational, customary and incidental mortality of target stocks by location and method of capture.
- Support training to new and existing fishers and/or post harvest sector in recording protocols.
- Special attention focused on small scale/artisanal fisheries where majority of catch is for local consumption, as this is often overlooked.

## Environmental monitoring and disposal of potentially contaminated resources

This section of the guidance focuses on SBP for safe consumption or disposal of contaminated fish and shellfish, relating to both wild and aquaculture resources.

**ENV 5: Responsible disposal of stored catch (landed pre-disaster) that may be contaminated or otherwise unfit for human consumption or animal feed**

### Key indicators

- Safe disposal protocols and procedures are established and being used e.g. landfill, incineration, or other means as appropriate to type contamination.
- Appropriate testing completed of stored produce (Codex Alimentarius, its accompanying standards and/or national standards) to establish safety for human consumption or other feed sources.
- Quantity of catch disposal, location, date and reason, recorded and inventoried.

**ENV 6: Environmental monitoring is completed and on a spatial/zonal basis to support fishery/aquaculture closures where necessary.**

### Key indicators

- Risk analysis used to determine appropriate scale and frequency of monitoring dependant on type of contamination/ pollutant and related impacts on natural resources.
- Monitoring / testing completed of *in situ* resource (Codex Alimentarius, its accompanying standards and/or national standards) on an appropriate scale.
- Management measures such as zoned closures ensure both safety for consumption and resource sustainability.
- Appropriate treatment, or cull and disposal, of contaminated aquaculture resources.

## Habitats

This section of the guidance focuses on SBP for improved management and protection of marine habitats and is primarily focused on wild fisheries but is also relevant for aquaculture.

**ENV 7: Sensitive or vulnerable habitats are protected during any emergency response.**

The resumption of fishing or aquaculture practises is managed so as to protect both areas that may have been impacted during a disaster (and are likely to recover) and areas of particular importance, sensitivity or vulnerability e.g. seagrass beds, mangroves or coral reefs.

### Key indicators

- Re-introduced gear minimises potential impact to habitats, and re-placement of gear is accompanied by education on responsible fishing practises to minimise interaction with sensitive habitats
- Recovery plans identify key sensitive or vulnerable habitats and provide sufficient restrictions to promote recovery e.g. restrictions of demersal otter trawling, no take zones.

**ENV 8: Debris (from non-fishing/aquaculture sources) within the marine environment is recovered to minimize habitat interactions and promote the speedy resumption of fishing/aquaculture.**

Marine debris may impact sensitive habitats and damage fishing gear if snagged. Although noted that floating debris may act as FADs.

*Key indicators*

- Clean-up programmes post disasters are implemented to find and retrieve debris within the marine environment, which prevent fishing from resuming.

**Endangered, threatened and protected (ETP) species**

This section of the guidance focuses on SBP for improved management and protection of ETP species and is primarily focused on wild fisheries.

**ENV 9: Building back better – management for protecting ETP species is built into everyday practice.**

The resumption of fishing practises introduces or strengthens measures to protect ETP species.

*Key indicators*

- Re-introduced gear incorporates bycatch reduction devices, and provision of replacement fishing gear is accompanied by education on responsible fishing practises to minimise interaction with ETP species including education on ETP species identification.
- Codes of practice are developed to minimise ETP interactions and impacts e.g. practices to minimize the risk of dolphin capture in the purse seine fishery.

**Ecosystem and wider environment**

This section of the guidance focuses on SBP for improved management and protection of the ecosystem and wider environment, relating to environments across wild fisheries and aquaculture sites.

**ENV 10: Reductions of abandoned/lost/discarded fishing gear (ALDFG) following disasters.** Measures are taken to reduce ALDFG, and the significant and harmful environmental impacts that ALDFG can have in terms of ‘ghost fishing’ and the introduction of plastics and chemicals into the food chain.

*Key indicators*

- Technology (such as transponders) used to locate gear.
- Inventories and reporting of gear losses by stakeholders.
- Clean-up programmes post disasters are implemented to find and retrieve lost gear.

**ENV 11: Aquaculture rehabilitation takes place in the context of ecosystem functions and services with no degradation of these beyond their resilience capacity.** Well planned aquaculture development can avoid potentially serious negative environmental impacts. Approval for post disaster development is suitably precautionary in terms of its potential impact.

*Key indicators*

- Re-habilitation based on appropriately informed and justified zoning.
- Re-habilitation based on assessment of carrying capacities and suitable production systems.
- Re-habilitation based on Environmental Impact Assessments (EIAs).
- Re-habilitation based on risk analysis.
- Environmental rehabilitation measures raise long-term environmental awareness in affected communities.

**ENV 12: Energy conservation, reduction in greenhouse gas emissions, waste recycling and water conservation measures are introduced and promoted for adoption as part of the replacement of assets.**

Projects to demonstrate efficient energy use and conservation, and efficient use of water and conservation are prepared and established in selected co-operators's farms.

**Key indicators**

- Reduce carbon emissions in replacement vessels.
- Reduce carbon emissions in replacement gear.
- Reintroduction of aquaculture optimizes farm design so as to improve environmental performance and/or focuses on species with higher feed efficiency reducing carbon emissions in feed manufacture.
- Replacement/revised harbour infrastructure developments introduce specific areas for re-cycling and/or which are designed to reduce water requirements for cleaning.
- All replacement technology and infrastructure makes use of energy efficient equipment to generally reduce then environmental footprint of the sector.

**ENV 13: Replacement infrastructure conforms to national planning strategies and is based on Environmental Impact Assessments (EIAs).**

Infrastructure is replaced/re-built in accordance with environmental planning strategies and EIAs are undertaken as appropriate.

**Key indicators**

- Replacement infrastructure is professionally planned and complies with national environmental legislation applicable to the project.
- Replacement infrastructure is based on Environmental Impact Assessments (EIAs).
- EIA requirements are applicable to post-disaster situations e.g. reduced complexity and evaluation time.

**ENV 14: Invasive species introductions from aquariums and aquaculture are minimized.**

Contingency planning for the location of invasive species in aquariums and aquaculture can minimize risk of introductions in disaster situations; and in the event of introductions impact assessments and action plans should work towards managing the impacts posed by invasive species.

**Key indicators**

- Impact assessment and cost benefit analysis of eradication, containment or management options for dealing with the introduced species.
- Promote contingency planning when building back.

**ENV 15: Responsible cleanup of leakages from damaged onshore fisheries and aquaculture infrastructure minimizes environmental impacts.****Key indicators**

- Efficient and effective cleanup of fuel leakages from onshore storage.
- Removal/ replacement of refrigerants within cold/chill stores avoids escapement of gases that could contribute to global warming.



## 5. Key resources that should be available to the fisheries and aquaculture environmental planners and implementers in post-disaster situations

The standards and guidelines summarized in Section 3 will greatly inform environmental planners and implementers in post-disaster situations. More specific types of information that may be sought post disaster are outlined in Table 2; such data sources would inform environmental needs assessments and EIAs.

Other web resources that have been specifically useful for this review include:

- Relief website [www.reliefweb.org](http://www.reliefweb.org)
- UNEP online resource centre <http://postconflict.unep.ch/humanitarianaction/>

TABLE 2  
Types and sources of information (Source: adapted from UNEP, 2008)

Level	Type of Information
Online services	Maps History of site and previous disasters Sector specific databases Disaster response Information regarding risk mapping and analysis
Survey reports	Environmental impact assessments Other post disaster needs assessment linked reports Other cluster-related reports (demography, livelihoods, shelter, etc) Disaster preparedness and recovery strategies/ plans
Line ministries	Pre-disaster status reports on the environment Presence of sites of ecological importance Regulations governing access to natural resources Information concerning possible sourcing of shelter and construction materials Information on waste management systems, policies and practices
Secondary data	Pre-disaster environment baseline data collection Initial severity and impact information Initial environmental impact extrapolation
Communities	Former use of natural resources by community members Community level links with livelihood security before the disaster Governance issues Customary regulations governing access to natural resources Main immediate and longer term needs
Individual stakeholders and stakeholder groups (fishermen, fish farmers)	Former use of natural resources Links with livelihood security before the disaster Trends in fisheries and aquaculture activities in relation to natural resource use and management Main immediate and longer term needs



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## Appendix 1 – Type of disaster associated environmental impact

Type of Disaster	Associated Environmental Impact
Hurricane/Cyclone/ Typhoon	<ul style="list-style-type: none"> <li>• Loss of vegetation cover and wildlife habitat</li> <li>• Short-term heavy rains and flooding inland</li> <li>• Mud slides and soil erosion</li> <li>• Saltwater intrusion to underground fresh water reservoirs</li> <li>• Soil contamination from saline water</li> <li>• Damage to offshore coral reefs and natural coastal defence mechanisms</li> <li>• Waste (some of which may be hazardous) and debris accumulation</li> <li>• Secondary impacts by temporarily displaced people</li> <li>• Impacts associated with reconstruction and repair to damaged infrastructure (e.g. deforestation, quarrying, waste pollution)</li> </ul>
Tsunami	<ul style="list-style-type: none"> <li>• Ground water pollution through sewage overflow</li> <li>• Saline incursion and sewage contamination of groundwater reservoirs</li> <li>• Loss of productive fisheries and coastal forest/plantations</li> <li>• Destruction of coral reefs</li> <li>• Coastal erosion and/or beneficial deposition of sediment on beaches/small islands</li> <li>• Marine pollution from back flow of wave surge</li> <li>• Soil contamination</li> <li>• Loss of crops and seed banks</li> <li>• Waste accumulation – additional waste disposal sites required</li> <li>• Secondary impacts by temporarily displaced people</li> <li>• Impacts associated with reconstruction and repair to damaged infrastructure (e.g. deforestation, quarrying, waste pollution)</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>• Loss of productive systems, e.g. agriculture</li> <li>• Damage to natural landscapes and vegetation</li> <li>• Possible mass flooding if dam infrastructure weakened or destroyed</li> <li>• Waste accumulation – additional waste disposal sites required</li> <li>• Secondary impacts by temporarily displaced people</li> <li>• Impacts associated with reconstruction and repair to damaged infrastructure (e.g. deforestation, quarrying, waste pollution)</li> <li>• Damaged infrastructure as a possible secondary environmental threat, e.g. leakage from fuel storage facilities</li> </ul>
Flood	<ul style="list-style-type: none"> <li>• Ground water pollution through sewage overflow</li> <li>• Loss of crops, livestock and livelihood security</li> <li>• Excessive siltation may affect certain fish stocks</li> <li>• River bank damage from erosion</li> <li>• Water and soil contamination fertilizers used</li> <li>• Secondary impacts by temporarily displaced people</li> <li>• Beneficial sedimentation in floodplains or close to river banks</li> </ul>
Volcanic Eruption	<ul style="list-style-type: none"> <li>• Loss of productive landscape and crops being buried by ash and pumice</li> <li>• Forest fires as a result of molten lava</li> <li>• Secondary impacts by temporarily displaced people</li> <li>• Loss of wildlife following gas release</li> <li>• Secondary flooding should rivers or valleys be blocked by lava flow</li> <li>• Damaged infrastructure as a possible secondary environmental threat, e.g. leakage from fuel storage facilities Impacts associated with reconstruction and repair to damaged infrastructure (e.g. deforestation, quarrying, waste pollution)</li> </ul>

Landslide	<ul style="list-style-type: none"> <li>• Damaged infrastructure as a possible secondary environmental threat, e.g. leakage from fuel storage facilities Secondary impacts by temporarily displaced people</li> <li>• Impacts associated with reconstruction and repair to damaged infrastructure (e.g. deforestation, quarrying, waste pollution)</li> </ul>
Drought	<ul style="list-style-type: none"> <li>• Loss of surface vegetation.</li> <li>• Loss of biodiversity</li> <li>• Forced human displacement.</li> <li>• Loss of livestock and other productive systems.</li> </ul>
Epidemic	<ul style="list-style-type: none"> <li>• Loss of biodiversity</li> <li>• Forced human displacement</li> <li>• Loss of productive economic systems</li> <li>• Introduction of new species</li> </ul>
Forest Fires	<ul style="list-style-type: none"> <li>• Loss of forest and wildlife habitat</li> <li>• Loss of biodiversity</li> <li>• Loss of ecosystem services</li> <li>• Loss of productive crops</li> <li>• Soil erosion</li> <li>• Secondary encroachment for settlement or agriculture</li> </ul>
Sand Storms	<ul style="list-style-type: none"> <li>• Loss of productive agricultural land</li> <li>• Loss of productive crops</li> <li>• Soil erosion</li> </ul>

Source: UNEP, 2008

## Acronyms

<b>ALDFG</b>	Abandoned, Lost, Discarded Fishing Gear
<b>ASC</b>	Aquaculture Stewardship Council
<b>BAP</b>	Best Aquaculture Practices
<b>Bq</b>	Becquerel
<b>CCRF</b>	Code of Conduct for Responsible Fisheries
<b>CIDA</b>	Canadian International Development Agency
<b>CONSRN</b>	Consortium to Restore Shattered Livelihoods in Tsunami-Devastated Nations
<b>CWP</b>	Coordinating Working Party on Fishery Statistics
<b>DRM</b>	Disaster Risk Management
<b>EAA</b>	Ecosystems Approach to Aquaculture
<b>EAF</b>	Ecosystems Approach to Fisheries
<b>EIA</b>	Environmental Impact Assessment
<b>EMMA</b>	Emergency Market Mapping and Assessment
<b>ENA</b>	Environmental Needs Assessment
<b>EQS</b>	Environmental Quality Standards
<b>ETP</b>	Endangered, threatened and protected species
<b>ETRP</b>	Emergency Tsunami Reconstruction Project
<b>EU</b>	European Union
<b>FAO</b>	Food and Agriculture Organisation (of the United Nations)
<b>FDA</b>	U.S. Food and Drug Administration
<b>FVR</b>	Fishing Vessel Registration
<b>GESAMP</b>	Group of Experts on the Scientific Aspects of Marine Environmental Protection
<b>HACCP</b>	Hazard Analysis and Critical Control Point
<b>HFA</b>	The Hyogo Framework for Action
<b>IAIA</b>	International Association for Impact Assessment
<b>IMO</b>	International Maritime Organisation
<b>IMP</b>	International Monetary Fund
<b>IOPC</b>	The International Oil Pollution Compensation (Fund)
<b>IPOA</b>	International Plan of Action
<b>ISSCFG</b>	International Standard Statistical Classification of Fishing Gear
<b>IUU</b>	Illegal, Unreported, and Unregulated (fishing)
<b>KCG</b>	Korean Coast Guard
<b>LEGS</b>	Livestock Emergency Guidelines and Standards
<b>LOC</b>	levels of concern
<b>MCS</b>	Monitoring Control and Surveillance
<b>MIFIRA</b>	Market Information for Food Insecurity Response Analysis
<b>MIS</b>	Management Information System
<b>MOMAF</b>	Ministry of Maritime Affairs and Fisheries (of Korea)
<b>MONRE</b>	Ministry of Natural Resources and Environment (of Thailand)

<b>MSSRF</b>	MS Swaminathan Research Foundation
<b>NARA</b>	National Aquatic Resources Research and Development Agency
<b>NGO</b>	Non Government Organisation
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>OIE</b>	World Organisation for Animal Health
<b>PAH</b>	polycyclic aromatic hydrocarbons
<b>ppb</b>	Parts per billion
<b>PRSP</b>	Poverty Reduction Strategy Paper
<b>RAF</b>	Response Analysis Framework
<b>REA</b>	Rapid Environmental Impact Assessment
<b>RFB</b>	Regional Fishery Body
<b>SBP</b>	Statement of Best Practice
<b>SSTCN</b>	Students' Sea Turtle Conservation Network
<b>UNCLOS</b>	United Nations Convention on the Law of the Sea
<b>UNDP</b>	United Nations Development Programme
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>UNEP</b>	United Nations Environment Programme
<b>UNFSA</b>	United Nations Fish Stocks Agreement
<b>VMS</b>	Vessel Monitoring System
<b>VoO</b>	Vessels of Opportunity
<b>WB</b>	World Bank
<b>WGFTFB</b>	Working Group on Fishing Technology and Fish Behavior
<b>WHO</b>	World Health Organisation
<b>WTF</b>	Wildlife Thailand Fund
<b>WTO</b>	World Trade Organisation
<b>WWF</b>	World Wildlife Fund

# Thematic background paper: Food and nutrition security in fisheries and aquaculture emergencies

by

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# 1. Background on the linkages between food and nutrition security and fisheries and aquaculture

Food and nutrition insecurity continue to plague a large proportion of the world's population. The number of people estimated to be undernourished was close to one billion, one sixth of the global population, in 2009 (FAO, 2011b). It is becoming increasingly recognized that food and nutrition security, in terms of supply of nutrients from foods, includes consideration to staple foods which supply energy, as well as non-staple foods: vegetables, animal-source foods (e.g. fish, fish products, meat and milk) and oils which supply essential nutrients, in particular vitamins and minerals (micronutrients). In the Scaling Up Nutrition (SUN) Framework and Roadmap: 1 000 Days Global Effort, the importance of essential fatty acids for brain development and cognition, affecting individual, national and global development, as well as fish being a rich source of essential fats has been highlighted (Siekman and Huffman, 2011). Recently, the Copenhagen Consensus 2012 Expert Panel which includes Nobel prize laureates in economics ranked “bundled micronutrients interventions to fight hunger and improve nutrition” as number one of 16 investments worthy of investment for global development (Copenhagen Consensus Center, 2012). Fish, in particular small fish – fresh and processed (e.g. dried in many African and Asian countries) – which are commonly consumed by the poor is an overlooked rich source of micronutrient (Thilsted, 2012).

In emergencies, the number of people suffering from food and nutrition insecurity can escalate in the short-term, and even result in more people being pushed in a state of chronic insecurity. This situation is particularly critical in fisheries and aquaculture emergencies, as rural population groups which depend on fisheries and live in coastal zones, close to rivers and lakes and in floodplains are characterized as living in areas prone to recurrent emergencies, poor and marginalized. However, the effects on food and nutrition security faced by population groups in fisheries and aquaculture emergencies are common for many other emergencies which affect the livelihoods of people who are dependent on agriculture, and thereby are adversely affected by a wide range of disasters and emergencies affecting agricultural production and resources.

*Food Security* is defined as “food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 1996). The Committee on World Food Security (CFS) recently recommended that the term “food security” be replaced by “*Food and Nutrition Security*”, defined as “Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life.” (CFS, 2012). Thus “food and nutrition security” encompasses food availability, food accessibility and food utilization, as well as the other pillars of good nutrition: care, health, water, sanitation and hygiene.

Achieving food and nutrition security for population groups dependent on fisheries and aquaculture which are poor, food insecure and vulnerable to multiple changes, for example, in demography, climate (sea level, increasingly frequent and extreme weather conditions) – under normal circumstances – is presently extremely hard to reach (Allison, 2011), and therefore to aim at this situation in emergencies is extremely challenging.

In general, as well as in emergencies, low-income countries are striving to attain the Millennium Development Goals (MDGs) (United Nations Millennium Declaration, 2000). It is well-recognised that with respect to MDG 1; reducing hunger is not only limited to adequacy of intake of staple foods to supply energy, but requires attention to food and nutrition security. This includes improving dietary diversity, with nutrient-rich foods to supply essential micronutrients. This approach is also necessary to meet the other MDGs related to nutrition and health: MDGs 4 and 5. With respect to MDG 1; reducing poverty, it is becoming increasingly clear that good nutrition and health, and importantly, nutrition for cognitive development in young children are essential prerequisites. In emergencies, with children and women bearing the brunt of food and nutrition insecurity, progress towards achieving the MDGs can rapidly be eroded. Ensuring that in addition to the staple food, animal-source foods are accessible – fish and fish products in population groups which consume fish – can help to abate this set-back.

The human right to food (Eide, 2002) is clearly embedded in the definition of food and nutrition security and allows advocates of human rights a potent vehicle to assert the obligation of states to fulfil this moral and legal human right under all circumstances – ensuring that individuals and households can execute the duty to feed themselves, as well as states upholding this right when individuals are unable to do so, as is the case in many emergencies. The human rights approach to food includes attention to the cultural acceptability of foods by the consumer; ensuring a diet which not only includes the staple, but also commonly consumed non-staple foods which complement the staple. Therefore, the right to food clearly gives a framework for the inclusion of fish and fish products in rations distributed in emergencies to population groups in which fish is a part of the everyday diet, as well as, focus to improving resources and opportunities for people to feed themselves – for example, through increased availability, accessibility and utilization of fish, post-emergency.

## 2. The role that fisheries and aquaculture plays in supporting food and nutrition security in emergency situations

Many of the world's rural poor live in areas with water and fisheries resources such as coastlines, floodplains, lakes, ponds, rivers and wetlands. They depend on a mixture of farming and fishing systems for their livelihoods; for example, the 160 million people living in the Ganges-Brahmaputra-Megna system. In coastal and small island populations, for example the Caribbean and Solomon Islands, for many, fishing is an important activity and the primary source of income. In Africa, large floodplains and lakes, together with dispersed wetlands, play a central role in supporting diversified rural livelihood strategies. In Zambia, for example, aquatic systems cover 20 percent of the land surface and support three million people, 25 percent of the population. Aquaculture is becoming an important production for many rural households, especially in Asia. It is estimated that 80 percent of the world's aquaculture take place in Asia and 70-80 percent stem from small-scale farming households. In addition, fisheries and aquaculture include many other activities on which the poor rely; for example, processing, transport and marketing (The WorldFish Center, 2012). In some countries, activities such as fish drying and sale in local markets are women's work. Thus fisheries and aquaculture are important elements in the livelihoods of population groups, including women who suffer disproportionately from food and nutrition insecurity. In these populations which are dependent on the multi-faceted dimensions of fisheries and aquaculture, emergencies in the sector can easily erode livelihoods, including income and food and nutrition security.

In emergency situations, depending on the suddenness of the onset and severity, the immediate focus in terms of food and nutrition security is ensuring adequate supply of energy through ready-to-eat foods, such as high-energy biscuit, and drinking water. In emergencies, The World Food Programme (WFP) with partners supply dry rations for home preparation and cooked food (wet rations) when people do not have the means to cook. The foods distributed include fortified blended foods (e.g. example, corn-soya blend), cereal, pulse, oil, sugar and salt. It is increasingly well-recognised that in addition to energy, attention should be paid to the supply of micronutrients, and a micronutrient powder (MNP; a mixture of vitamins and minerals) may be included in the ration, in particular for young children (WFP, 2002). Small amounts of animal-source foods; fish, including dried fish and meat are recommended to be included to increase dietary diversity and supply essential micronutrients (WHO, 2000).

Except for some specific cases of the provision of fish protein concentrate from Norway and Sweden in emergencies in some African countries (Haug, 2010; Linusson, 1975) and Bangladesh (Lindquist, 1979), in the past, there are very few examples of the use of fish, fish products and other aquatic foods in food rations in emergencies (canned fish in Aceh (see Case Studies)). In terms of long-term responses to fisheries and aquaculture emergencies, there are many examples of different types of support provided specifically to the fisheries and aquaculture sector to re-establish and even increase capture fisheries, fish production and productivity. These responses aim

at generating employment and income in the sector, with no direct links to food and nutrition security, for example, inclusion of activities to promote the accessibility and consumption of fish, in particular in vulnerable groups, such as pregnant and lactating women, young children, the sick and elderly.

### 3. Analysis of the threats to food and nutrition security

In general, severe threats to food and nutrition security include:

- Natural hazards (drought, floods, tsunamis, hurricanes/typhoons, earthquakes, volcanic eruptions, landslides);
- Trans-boundary plant pests and diseases (e.g. locusts, wheat rust);
- Trans-boundary animal diseases (e.g. African swine fever, foot-and-mouth disease, rift Valley fever);
- Fish diseases;
- Wild fires;
- Environmental conditions such as land degradation, desertification and water scarcity;
- Climate change, particularly the expected increase in the frequency and intensity of weather-related hazards;
- HIV/AIDS and related illnesses;
- Political, social, cultural, ethnic and religious unrests; and
- Volatility in agricultural commodity markets and soaring food prices.

In relation to fisheries and aquaculture emergencies, the following table gives an overview of the possible implications for food and nutrition security. Some of the implications are direct; the decrease/loss of access to fish, and thereby reduced fish consumption in households and communities with fish as an integral part of the everyday diet; many are indirect, with the disaster eroding livelihoods, income and the ability to purchase foods, including fish and fish products, as well as destroying human capacity, resources and infrastructure that are vital to ensuring that the other pillars of food and nutrition security can be adequately met.

ANALYSIS SUMMARY TABLE 1

#### Disaster Impacts on Food and Nutrition Security

Disaster Types	Impacts on fisheries and aquaculture resources and stakeholders	Implications for food and nutrition security
<b>Rapid Onset</b>		
Hurricanes /cyclones (FAO, 2011a)	Wash-off of capture and culture systems Full or partial damage of aquatic animals Salinization of freshwater systems and freshwater intrusion in saline systems Destruction/alteration of fish breeding and rearing ground (e.g. mangrove) Loss of fishing gear, boats Death (or injury) of productive household members (fishers, fish-farmers, traders)	Loss of livelihood assets, no other means to support one's family, resulting in poverty and hunger and long-term or short-term food and nutrition insecurity Low fish catch, low income, cannot support one's family Loss of systems, gears, boats and animals (in many cases, bought on credit from local money-lenders, with high interests) Sale of other valuable assets, homestead land to pay debts Moving out of fishing/aquaculture, low income in other employment due to inexperience and lack of skills Sale of assets to buy food and other essentials Receiving relief food; perhaps adequate energy, but insufficient micronutrients, essential fats and no animal protein Little income, priority given to staple, e.g. rice/maize, no money to buy animal-source foods, fruits or vegetables Migration to cities, begging and destitution

TABLE 1 (cont.)

Disaster Types	Impacts on fisheries and aquaculture resources and stakeholders	Implications for food and nutrition security
Tidal surges / tsunamis (Westlund <i>et al.</i> , 2007)	Wash-off of capture and culture systems Full or partial damage of aquatic animals Salinization of freshwater systems Permanent (or temporary) water-logging Destruction/alteration of fish breeding and rearing ground (e.g. mangrove) Loss of fishing gear, boats Death (or injury) of productive household members (fishers, fish-farmers, traders)	As above
Earthquakes (Westlund <i>et al.</i> , 2007)	Damage of capture and culture systems Disappearance of fishing grounds, fish breeding areas Death (or injury) of productive earning members (fishers, fish-farmers, fish traders)	As above
Volcanic eruptions	Damage of capture and culture systems and loss of aquatic animals Death (or injury) of productive household members (fishers, fish-farmers, traders) Sudden change in seawater temperature, detrimentally affecting fishing grounds and fish breeding areas Fish diversity under threat	Low or no fish catch, decline in income and fish for food As above
Floods (Government of Bangladesh, 2007; Sayama <i>et al.</i> , 2012)	Wash-off of capture and culture systems Full or partial damage of aquatic animals Freshwater intrusion in saline systems Loss of fishing gears Death of productive household members (fishers, fish-farmers, traders)	Detrimental effects can be short-term Deposition of silt can lead to bumper crops in following season (e.g. rice in Bangladesh), with possible improvement in food and nutrition security
Oil spills / chemical spills (Westlund <i>et al.</i> , 2007)	Fatal for natural and stocked animals Mass mortality of fish stocks Long-term impact on fishing ground, fish biology and recruitment Oil intrusion in fishing ground, culture system Fish biodiversity endangered Consumer unwillingness /refusal to buy contaminated fish Fall in fish price Sickness from eating polluted fish	Can have long-term disastrous effect on food and nutrition security
Nuclear leaks	Fatal injury to natural and stocked animals (physical injury) Mass mortality of fish stocks Long-term impact on valuable fishing ground, fish biology and recruitment (deformed fry/fingerlings) Contaminated fish – cannot be sold Extinction of fish species Fall in fish price Sickness from eating contaminated fish Death of earning members (fishers, fish-farmers, traders)	Very long-term disastrous effect on food and nutrition security
Slow Onset		
Drought (Westlund <i>et al.</i> , 2007)	Permanent/temporary disappearance of floodplains, wetlands Low water level in rivers and other water bodies Extinction of fish species Conflict with other water users – crop irrigation prioritized, no water for fish stocks in the inland waters Less or no supply of fry/fingerlings Aquaculture destroyed/reduced Very low freshwater supply from rivers to the sea, salinity increases (more than normal) in coastal rivers (can lead to death of fish)	Depending on severity and duration of drought, the impacts on food and nutrition security may vary  In terms of prolonged drought, the detrimental impacts on food and nutrition security can be irreversible

TABLE 1 (cont.)

Disaster Types	Impacts on fisheries and aquaculture resources and stakeholders	Implications for food and nutrition security
Fish Disease Outbreaks (ADB/NACA, 1991; Arthur <i>et al.</i> , 2002; FAO, 2011a; Siriwardena, 1997;)	Mass fish mortality Loss of natural and cultured fish stock Extinction of some/many fish species Trans-boundary pandemic	Depending on severity and duration; loss in livelihoods, income, and fish as food, leading to food and nutrition insecurity
Complex Emergencies		
Political turmoil (Westlund <i>et al.</i> , 2007)	Shortage/lack of movement of working force for fishing/aquaculture Volatile fish price and supply and price of inputs No/low trans-boundary fish movement	Can have long-term disastrous effect on food and nutrition security
Civil war, protracted emergencies (Westlund <i>et al.</i> , 2007)	Shortage/lack of movement of working force for fishing/aquaculture Volatile fish price and supply and price of inputs No/low trans-boundary fish movement Damage to capture and culture systems Death, arrest of productive household members (fishers, fish-farmers, traders)	Can have long-term disastrous effect on food and nutrition security
HIV/AIDS (Banda-Nyirenda <i>et al.</i> , 2009; Te Lintelo, 2008)	Shortage of working force for fishing/aquaculture Death of production household members (fishers, fish-farmers, traders)	Spiralling of food and nutrition insecurity for household members left behind (especially children), leading to increased poverty and destitution
Global recession, Volatility in fisheries and aquaculture commodities (fish seed, fertilizers, fish meal, chemicals, cage materials, boats, gears, fuel) markets and increase in fish prices (FEWS NET)	Reduced aid to low-income countries for fisheries development interventions Inability to purchase inputs for fish culture Reduced ability to purchase fish by the poor	Increased food and nutrition insecurity, especially among the poor



## 4. Analysis of the opportunities for improving the threats to food and nutrition security

With respect to opportunities to ensure food and nutrition security, different actions can be taken in some emergencies related to natural disasters, in the preparedness stage. Many rural families, dependent on agriculture are accustomed to storing the staple food, and some store oil. In communities in which processing of fish (drying, fermenting, smoking, salting, making fish sauce and fish paste) is practised, increased storage of processed fish can be done in peak production season, at household level. This can serve as a source of animal-source food in the event of an emergency. This requires that households understand and value the important role that processed fish can play in improving dietary diversity and nutrient supply, as well as have the capability and resources to store processed fish.

At national level, governments can take active measures to include fish and fish products in food aid rations. Dried and smoked fish can be sourced at country level or regionally, and be an integral part of a food ration of rice and vegetable oil, to improve dietary diversity and add essential nutrients to the diet. For many years, the issue of the inclusion of local foods in food rations has been discussed – in reference to the right to food, fulfilling all aspects of food and nutrition security (e.g. food preferences), as well as, stimulating local market and production. In addition, with respect to meeting the needs of malnourished children – the risk of increasing prevalence of malnourished children increases with an emergency – WHO recommendations call for a small amount of animal-source foods (including fish and fish products) being part of the rehabilitation diet of malnourished children, as these foods contain bioavailable minerals, important for growth, high-quality animal protein and no anti-nutrients or fibres (Michaelsen *et al.*, 2009). In spite of the multiple benefits of the use of fish and fish products in emergencies, there are no examples of the use of locally-sourced fish in food rations. This opportunity is well-suited for a country like Bangladesh which is prone to fisheries and aquaculture emergencies; dried fish is a commonly consumed food of the rural poor; and market possibilities exist for buying the amount required.

In the rehabilitation phase, targeted support to the fisheries and aquaculture sector has the potential to bring food and nutrition security to an improved level compared to pre-emergency. Post-emergencies, support to the fisheries and aquaculture sector is common (see Case Studies); however, without targeted interventions to directly improve the access and consumption of fish and fish products by the affected population. This could be done, for example, by providing food stamps for these foods to the most vulnerable households, and ensuring the sale of these foods at subsidized prices in local markets. Indirectly, this support has the potential to improve food and nutrition security through increased employment, income and food consumption in vulnerable population groups. In the long-term, it may also have the benefit of ensuring better livelihoods, through strengthening resilience and abating migration and destitution.

These opportunities are only relevant in poor population groups in which fish and fish products are part of the everyday diet and which are dependent, to a large extent, on fisheries and aquaculture for their livelihoods. For these people, it may be difficult to find other opportunities in other sectors (for example crop production, daily

agricultural labourer, and small-scale trade) for improving food and nutrition security. In addition, fish is an irreplaceable animal-source food (most frequently consumed, and though consumed in small amounts cannot be replaced by other less accessible animal-source foods) in the diets of these groups; increasing dietary diversity, supplying multiple essential nutrients: animal protein, fat and essential fatty acids, as well as, highly bioavailable vitamins and minerals (Thilsted, 2012).

## 5. Case studies

The following case studies draw on different types of disasters which have affected different population groups dependent on fisheries and aquaculture. They are purposely selected to briefly describe the responses which were carried out. These case studies were selected for presentation, as they all present opportunities which could have been adopted to target improvement in food and nutrition security, both in the short-term as well as long-term.

### **Case Study 1: Small-scale integrated aquaculture agriculture for HIV/AIDS affected households and consumption of fish in children with HIV/AIDS in Malawi**

The overlap of HIV/AIDS and food and nutrition insecurity in Sub-Saharan Africa is well described; insecure livelihoods and food and nutrition insecurity exacerbate the risk and vulnerability to HIV/AIDS; whereas HIV/AIDS can be a cause of fragile livelihoods and food and nutrition insecurity (Gillespie, 2006; The State of the World Fisheries and Aquaculture, 2006). HIV/AIDS has far-reaching detrimental effects on human and national capital through illness and death, psychosocial stress, reduced labour productivity, and destruction of education and inter-generational knowledge transfer, for example regarding sound agricultural practices.

In southern Malawi, World Vision Malawi and The WorldFish Center carried out a project in 2005-2006 on the adoption of integrated agriculture aquaculture (IAA) among households affected by HIV/AIDS. Aquaculture with tilapia in 700 ponds resulted in increased fish production, sale in the local markets, household income and fish consumption. Reference is made to the potential of small-scale aquaculture in improving food and nutrition security of the rural poor, as well as households affected by HIV/AIDS (Nagoli *et al.*, 2009). However, no evaluation of this project was carried out; and no continuation or expansion of the intervention. The reasons for this can be many; including lack of interventions which are location-specific, taking into consideration the capacity of vulnerable groups – productive household members who are sick, women, youth and orphans, as well as, lack of organisational and financial support to carry out appropriate interventions.

A small study with HIV/AIDS affected children (36) showed that a targeted rehabilitative nutritional approach, based on use of local foods, peer education, anthropometric and clinical monitoring in an area of high food and nutrition insecurity in rural Malawi resulted in increased dietary diversity ( $5.3 \pm 1.9$  to  $6.5 \pm 1.3$ ) and a 25 percent increase in the number children eating fish meals, after 6 months of the study (Buonomo *et al.*, 2012). In Zambia, food (“kapenta” (small fish, often old dried), porridge, fish powder and mushrooms) supplementation of people affected by HIV/AIDS has been reported to have a positive effect on reducing infections and wound healing. In addition, clinical trials with people on the effect of fish supplementation on antiretroviral therapy in patients are reported to have been carried out by the Kenneth Kaunda Children of Africa Foundation (KKCAF). The results have not been reported. Nevertheless, small-scale aquaculture should be considered as an opportunity for HIV/AIDS affected populations as an increase in the availability and accessibility of fish, coupled with multiple appropriate actions, for example, training in essential nutrition actions (Helen Keller International) for enabling improvements in food habits may have a positive effect on food (including fish) consumption of people suffering from HIV/AIDS.

### **Case Study 2: Malnourished Children in the Horn of Africa under the Current Drought Conditions**

The Horn of Africa includes the countries of Eritrea, Djibouti, Ethiopia and Somalia, with a population of 13 million people. In recent years, this area has experienced very low rainfall, with devastating consequences for the agricultural systems, mainly made up of small-holder farming families and pastoralists. This has resulted in very little food production, and famine was declared in 2011. As many times before in this area, attention was drawn to the emergency in the late stages; when many people, especially children faced death, due to hunger and starvation. People have flocked to refugee camps where feeding centres have been set up for malnourished children. Ready-to-used foods, such as “Plumpy’-Sup” (peanut-based) are given, to be fed in small amounts, as a supplement to the food ration. Other foods used are porridge from corn-soya blend, fortified with vitamins and minerals, and fortified biscuits (Medicin Sans Frontieres, 2011). No animal-source foods or products are included; even though the prevalence of child malnutrition is high, and the WHO recommends the use of a small amount of animal-source food in the rehabilitation diet of malnourished children (Michaelsen *et al.*, 2009).

### **Case Study 3: Hurricane Ivan Hits the Small Island, Grenada**

A category four storm, Hurricane Ivan hit Grenada (population 100,000) on 7<sup>th</sup> September 2004, damaging and destroying approximately 90 percent of houses, and leaving 50 percent of the population homeless. The fisheries sector which is important for the livelihoods and economy of the population was hit hard; 2,500 fulltime fishers, as well as fish vendors and exporters were directly affected.

The post-emergency response in the agricultural (including fisheries) sector was fairly well- coordinated with farmers receiving seeds, plants, chicks, feed, fertilizer, tools and building materials. Two hundred fishermen were given supplies, communication equipment, and financing for engine repairs. Also, improvements to infrastructure, such as ice making plants were done (Westlund *et al.*, 2007). The effect of this response in restoring food and nutrition security in this population group, or improving it beyond pre-Ivan level is unknown.

### **Case Study 4: Cyclone Sidr Hits the Bay of Bengal**

In Bangladesh, cyclones are the cause of repeated emergencies for the rural poor, especially in the coastal areas. The vital role that fish plays in the diet of this population group for dietary diversity and nutrient contribution gives a very good opportunity for the government and its partners to include fish and fish products in food rations, in emergencies.

Cyclone Sidr hit land on the Bay of Bengal coast of Bangladesh on 15<sup>th</sup> November 2007, causing deaths and extensive damage, and affecting an estimated 27 million people. In the aftermath of the cyclone, food rations were supplied consisting of flattened rice, pulses, molasses, rice, sugar, salt, rice, fortified biscuits, biscuits and potatoes (Government of Bangladesh, 2008).

Many people affected depended on fisheries and aquaculture, and this group was hit particularly hard by Cyclone Sidr. There was damage to a long stretch of coastline, ponds and other water bodies, loss of fish, prawn and shrimp stocks, boats, equipment and material. The Government of Bangladesh and many partners have been implementing rehabilitation programmes in the agriculture (including fisheries and aquaculture) sector – though slowly. For example, the USAID funded Cyclone Affected Aquaculture Rehabilitation Project (CAARP) provided an aquaculture rehabilitation package consisting of lime, fertilizer, feed, fish fingerlings, shrimp and prawn post-larvae, training and cash incentives in the five worst-hit districts, with the goal to quickly re-establish the affected fish, prawn and shrimp farms of poor people,

as well as provide training for enhancing the production beyond the pre-Sidr level (IDE). No targeted measures were taken for improving food and nutrition security.

#### **Case Study 5: Aceh Devastated by a Tsunami**

On 26<sup>th</sup> December 2004, Aceh was devastated by a *tsunami*. A significant proportion of Aceh's population depended on fisheries and aquaculture – coastal and marine fishing, production of shrimp post-larvae and shrimp for consumption, fish processing, marketing and trading.

Food rations provided by relief agencies largely consisted of rice, vegetable oil and canned fish – which was not liked, as people eat almost only fresh fish. As markets became functional fairly quickly, and foods such as vegetables and fresh fish became available; food vouchers and “cash for work” schemes (engaging people in clean up and reconstruction work) were implemented as emergencies measures and proved to be fairly successfully.

Much focus was placed on rehabilitation of the fisheries and aquaculture sector; for example boat building, replacement of equipment and tools, repair of fish ponds, and reconstruction of infrastructure for cold storage, and fish processing (e.g. drying, salting). The replacement of small fishing vessels was a popular activity as this was fairly easy and inexpensive and gave a quick, visible result.

The implementation of the post-tsunami interventions in Aceh has been studied and with respect to the fisheries and aquaculture sector, FAO and others have identified areas in which improvements could result in a more robust and vibrant sector, compared to pre-tsunami. These include guidelines on rehabilitation of coastal ponds and good boat-building standards; strengthening of communities through training, working capital and building cooperatives and fish processing groups (FAO/WFP, 2005).

The measures put in place: food vouchers and “cash for work”, the quick recovery of the local markets and the strong support to the aquaculture and fisheries sector provided an excellent opportunity – which was missed – to make fresh fish available and accessible to population groups in need.

#### **Case Study 6: The Deep Water Horizon oil spill in the Gulf of Mexico**

Following the oil spill from an explosion in a deep water oil rig in the Gulf of Mexico, in April 2010, and the temporary closure of fishing, there were grave concerns among many as to the direct effect on oyster beds, crab, shrimp, game fish, and commercial fish, as well as the many people dependent on the large fishing industry, including industries related to the processing (freezing and canning) of seafood. These people were affected due to loss of employment and income.

With respect to a possible effect on food and nutrition security, the state administration recorded an increase in the allocation of food stamps, and charity organisations in the number of people requesting food packages – perhaps proxy indicators for certain population groups experiencing different levels of food and nutrition insecurity. These increases were noted up to one year after the disaster, compared to the period before the oil spill (The Times-Picayune Greater New Orleans).



## 6. Best practice in addressing food security and nutrition issue in fisheries and aquaculture emergency response

The concepts and discussions in this report, though tailored for emergencies in fisheries and aquaculture build on the policies, strategies and interventions of global, regional and national agencies, in support of national actions to improve food and nutrition security. There is a wealth of literature on disaster risk management; mainly concentrated on early responses to emergencies, in particular natural disasters and refugees (e.g. FAO/IFAD/WFP, 2009; UNHCR 2007; WFP, 2002; WHO, 2002). In relation to emergencies in fisheries and aquaculture, FAO and partners have focussed on early warning systems and measures to rehabilitate and strengthen the sector.

In terms of meeting food and nutrient needs to improve food and nutrition security, this report builds on policies and strategies for undernourished population groups, in general, as well as measures which have been implemented in specific emergencies (see Case Studies).

Distribution of foods – meals, ready-to-eat-foods and rations of raw foods – builds on using a readily available (at international level, not local, national or regional) staple food, for example rice in Asia and maize in Africa, based on an amount to meet an average energy supply of 2 100 kilocalories per person per day. In addition to the staple food; pulse, vegetable oil, sugar, biscuit and salt are sometimes also distributed. For vulnerable groups – children, pregnant and lactating women, the sick and elderly – supplements such as MNP may be given, to be added to the food, in order to supply essential vitamins and minerals. Quite often, due to many different factors: lack of resources, limitation in infrastructure, management and logistics, the only food distributed is the staple food, and sometimes in small quantities. This may be crucial to ward off hunger and starvation, demonstrations, riots, social and political unrests and mass migration beyond national borders, but is grossly inadequate to ensure good nutrition and health.

Inclusion of nutrient-rich foods in food rations used in emergencies is recommended in many policy documents, but there is hardly any implementation of this. The strategies used for supplying essential nutrients are fortification, for example, corn-soya blend and biscuit fortified with vitamins and minerals, vegetable oil enriched with vitamin A, and iodized salt, as well as, supplementation of MNP. Even though there is growing awareness that inclusion of small amounts of animal-source foods in diets has multiple benefits in meeting nutrient requirements, there is no drive to include these foods in food rations for emergencies; two examples are given in the case studies – use of fish powder and canned fish. Some reasons for this may be that systems have been put in place – by governments, international agencies and the private sector to maintain large availability and huge stores of staple foods, especially maize and rice. Similar systems can be put in place for an animal-source food such as dried fish. For example, post-Sidr, dried small fish – which is a part of the everyday diet, well-liked and acceptable by all family members – could have been sourced locally from other areas of Bangladesh, and readily included in the food ration distributed.

This report focuses on meeting food and nutrient needs of population groups faced with disasters. However, there is a missed opportunity with respect to the role of fish and fish products which goes far beyond the supply of nutrients. Powerful arguments embedded in the right to food, attaining the MDGs and the definitions of “food security” and “food and nutrition security”, can be made use of to define an explicit role for fish and fish products in food rations, as well as putting powerful policies and strategies in place to ensure that these foods must be an essential component of food rations. An added benefit is that greater awareness and advocacy – at all levels – could reinforce the importance of fish as an irreplaceable animal-source food for the poor, in general.

These arguments have been used successfully by many stakeholders, including policy makers, multi-national and bilateral organisations, as well as the multi-national private companies which manufacture and sell supplements to promote large-scale interventions for the use of fortified foods and supplementations, in vulnerable population groups. However, there have been no similar actions to promote the widespread use of common nutrient-rich foods. This must begin with a strong policy statement, by FAO and partners, on concrete recommendations for using specific nutrient-rich foods in emergencies, as has been done in the Joint statement by the World Health Organization (WHO), the World Food Programme (WFP) and the United Nations Children’s Fund (UNICEF) (WHO/WFP/UNICEF, 2007): “*Preventing and controlling micronutrient deficiencies in populations affected by an emergency. Multiple vitamin and mineral supplements for pregnant and lactating women, and for children aged 6 to 59 months*” for MNP. With this statement in hand, the provision of MNP in emergencies has been made possible, through multiple actions by many stakeholders. A similar approach can be taken for the use of common, nutrient-rich foods and food products. Perhaps, an important missing link for the use of common, nutrient-rich foods and food products is the incentive which private companies have – in the case of MNP supplements – to manufacture and sell their products. However, as many of these foods and food products are marketed by the private sector, and good marketing channels are required to ensure their availability and accessibility in the desirable quantities and quality in an emergency, the government, private sector and other partners have an opportunity to develop, fund and implement comprehensive measures to overcome this barrier.

There is a growing awareness that the use of locally available nutrient-rich foods to make complementary foods for young children, as well as other vulnerable population groups in low-income countries has many advantages, compared to imported fortified foods and supplements. Many countries in Asia and African have developed local food products but there are no examples of large-scale utilization. Almost all the food products developed are based on plant-source foods, for example in the National Nutrition Programme, in Bangladesh, a supplemental packaged food “Pushti” (Nourishing) made of roasted, ground rice and pulse, molasses and vegetable oil was given to malnourished children and pregnant and lactating women.

Building on the evidence of the importance of animal-source foods for rehabilitation of malnourished children, growth and lactation, two complementary foods, “WinFoods” have been developed in Cambodia and Kenya and are currently being evaluated in young children, in comparison to corn-soya blend. In Cambodia, the WinFood consists of grounded rice (76 percent dry weight), two small common fish species, “trei changwa plieng” (*Esomus longimanus*) (6 percent), rich in iron and zinc; “trei sloeuk russey” (*Paralauca typus*) (6 percent), rich in essential fats; spider (*Haplopelma albostriatum*) (2 percent); oil (5 percent) and sugar (5 percent). The Kenyan WinFood consists of grounded maize, a common small fish, “dagaa” (*Rastrineobola argentea*), fermented amaranth leaves, termite, vegetable oil and sugar. These WinFoods are cooked with water to make a porridge (Roos *et al.*, 2010). Partnerships between the aquaculture

and fisheries and nutrition and health sectors have been developed to promote the sustainable management as well as increased production and productivity of nutrient-rich small fish in ponds and wetlands (Thilsted, 2012).

In feeding centres where foods are prepared and fed on-site, there is also good opportunity to include fish in a “one pot meal”, porridge or as a side dish to the staple food. In Bangladesh, in nutrition rehabilitation facilities run by NGOs “kichuree” (a mixed dish made with rice, lentil, potato, pumpkin, leafy vegetables, vegetable oil, onion and spices) is commonly used to feed undernourished children. Fish can readily be included in kichuree to improve the nutritional quality. In many countries, different fish products such as fish sauce, fish paste (Cambodia), fish flakes (Viet Nam), dried “mukene” (*Rastrineobola argentea*) and mukene powder (Uganda) are sold in local markets, in small quantities, at prices which are affordable by the poor, and these can be used to prepare meals. However, it must be ensured that these products meet high standards for food quality and safety.

Introduction and strengthening of pond polyculture of fish, including nutrient-rich small fish which are commonly consumed can be practised in many countries, post-emergency. This approach can have long-term impact on food and nutrition security, through increased income and fish consumption, as well as building up resilience. Small fish which can be harvested regularly, in small amounts, and consumed at household level may have a greater impact on food and nutrition security than large fish which are harvested and sold all at once, 5-7 months after stocking of fingerlings. This approach has been introduced in Bangladesh; Sundarbans, West Bengal; Terai, Nepal and will soon be launched in Cambodia. Interventions focused on agriculture nutrition linkages, using the framework of food availability, accessibility and utilization are being implemented. These include components of production and management of nutrient-rich fish in ponds and wetlands, homestead vegetable production, training on essential nutrition and hygiene actions developed by Helen Keller International (HKI) (Helen Keller International) and participatory approaches to promote increased consumption of nutrient-rich foods, in women, as well as, improved infant and young child feeding practices. Focus is placed on the initiation of complementary feeding at 6 months of age, and the use of nutrient-rich fish and vegetables (Thilsted, 2012; Personal communication, Thilsted 2012). These initiatives give governments and development partner organisations a good basis for financing and implementing large-scale interventions in many countries, in Africa and Asia, prone to disaster. The CGIAR Research Programs, in particular, Aquatic Agricultural Systems, Livestock and Fish and Agriculture for Nutrition and Health provide an excellent global platform for scaling up (CGIAR Consortium of International Agricultural Research Centers).

These general guidelines and recommendations for best practices underline the multiple benefits in support of improved food and nutrition security which can be realised by a strong, integrated focus on fish availability, accessibility and utilization, in all stages of fisheries and aquaculture emergencies.



## List of Acronyms

ADB	Asian Development Bank
CAARP	Cyclone Affected Aquaculture Rehabilitation Project
CFS	Committee on World Food Security
CGIAR	Consultative Group on International Agricultural Research
FAO	Food and Agriculture Organization of the United Nations
GAIN	Global Alliance for Improved Nutrition
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HKI	Helen Keller International
IAA	Integrated aquaculture agriculture
IUNS	International Union on Nutritional Sciences
KKCAF	Kenneth Kaunda Children of Africa Foundation
MDGs	Millennium Development Goals
MNP	Micronutrient powder
NACA	Network of Aquaculture Centres in Asia-Pacific
SCN/ACC	(United Nations) SubCommittee on Nutrition/Administration Committee on Coordination (presently: United Nations System Standing Committee on Nutrition (SCN))
SUN	Scaling Up Nutrition
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USAID	United States (of America) Agency for International Development
WFP	World Food Programme
WHO	World Health Organization



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## **Fisheries and aquaculture emergency response guidance**

### **Review recommendations for best practice**

**FAO Workshop  
15-16 March 2012, Rome**

These are the proceedings of the workshop on “Best practice in responding to emergencies in the fisheries and aquaculture sectors” was held from 15 to 16 March 2012 in Rome, Italy. The workshop is part of the consultative process through which guidance for the fisheries and aquaculture sector in emergency response is being developed and communicated. The workshop proceedings also contributed to improved understanding of FAO’s new strategic objective on building livelihoods resilient to threats and crises. The global focus of the meeting brought together a range of experts to provide advice on fisheries and aquaculture policy and management, post-harvest practices and trade, fishing operations, environment and of social development and vulnerable groups. The contributed technical background papers, which are included in the proceedings, will be useful to those preparing for or responding to disasters involving the fisheries and aquaculture sector. The workshop and contributed papers form the basis for the forthcoming publications on guidance in responding to emergencies in the fisheries and aquaculture sector.