Experiences in boat-building in tsunami-affected countries

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The FAO has since 2005 been assisting in the reconstruction and rehabilitation of fishing communities affected by the December 2004 tsunami. This article describes experiences and lessons from boat building activities in three affected countries – Indonesia, Sri Lanka and Maldives.

Indonesia

On account of the scale of the tsunami's havoc in Indonesia and the remoteness of the worst-affected areas, accurate figures of boats lost and damaged are difficult to obtain. But it is reckoned that in Aceh/ Nias, some 7 600 boats were lost and an additional 5 000 sustained damage. Some 6 500 new boats were supposed to have been built under a rebuilding programme but the data is subject to revision. The post-tsunami boat-building programme in Indonesia has probably been the largest ever undertaken. A number of boat builders themselves perished in the tsunami, adding to the magnitude of the problem.

Fishing Vessel Regulations, Standards and Quality

There are no regulations in Indonesia (or Aceh province), applicable to the construction and safety of small fishing vessels. Most fishing vessels are lightly built wooden vessels and scantlings; they do not follow any recognised standard.

During the early part of the reconstruction effort, it became apparent that some of the boats financed through NGOs and local institutions were sub-standard in quality, or even unsafe. The quality of boat-building during reconstruction has suffered for several reasons:

- Boats built to a price rather then to a standard.
- Boat-builders handling large orders in a short time.
- In-experienced boat-builders claiming expertise they did not possess, to capitalise on high demand for boats.
- NGOs and other institutions not adequately monitoring their own boat-building programmes.

Many of the failings in boat quality have been of the most basic type such as:

- Poorly selected timber, including sapwood and split wood.
- Thin planking, large frame spacing and small keel timbers.
- Sub-standard frame joints with unsuitable arrangement of fastenings.
- Fastenings causing numerous splits in planks.
- Inadequate through-hull fittings and pipe work.
- Use of plain steel fastenings.

Some of the effects of these basic problems are:

- New boats may have a short life. Consequently, an additional boat replacement programme might be needed in future.
- New boats require significant maintenance – in particular, to keep the hull watertight. This means time is lost at sea.
- Some completed boats are not being used by the intended beneficiaries for a number of reasons – including the perception that they are substandard or unsafe. FAO has

This article has been assembled from the experiences of FAO staff and consultants in the tsunami-affected region up to January 2006. It was presented at the Workshop on Post-Tsunami Revival of Fisheries Sector and Rehabilitation of Fishing Communities, Mahabalipuram, 6 - 7 February 2006. Since that time the situation has continued to change and develop and FAO has gained further insights and lessons from its activities in the field and has continued to provide further training and technical assistance and delivered improved fishing vessels to communities affected by the tsunami.

Examples of defective construction in post-tsunami boats from Aceh province, Indonesia.

advised that unsafe boats should not be handed over to beneficiaries and should instead be modified or broken up.

As the building of boats proceeded it became obvious that remedial activities would be needed to improve boat quality, such as:

- Training of boatbuilders and boat inspectors.
- Development of good-practice guidelines.
- Development of draft regulations for minimum construction standards.
- Work with NGOs and others to raise awareness of quality and provide technical assistance.

The FAO has developed and published "good practice" boat-building guides (for wooden boats) to enable the monitoring of programmes by NGOs and other institutions. Draft regulations on "minimum standards" of construction are now under development. In building back better, the goal is not simply to re-establish livelihoods by providing low-quality boats; a balance has to be found between responding to needs and building back better.

Boat production (especially in large numbers) is a technical exercise, which should be managed by experienced professionals. Unfortunately, some NGOs have treated boats simply as items to buy and distribute. They do not have the capability to assess the type or quality of the boats they are distributing.

Boat-building training

Following an assessment of boat-building activities in mid-2005, FAO laid a high emphasis in its activities on training and improved quality. FAO boat-building training was conducted on the eastern and western coasts of Aceh to improve skills over a large area; the trainees included 42 boat-builders and three government boat inspectors. Many of the trainees who attended the boat-building courses proved to be excellent craftsmen. Training aimed

at improving the quality, safety and life expectancy of boats.

The training courses brought boat-builders from various places together and created an informal network with one another and with the FAO.

Boat Design and Changes

With its partner boatyards, FAO has introduced improved construction practices such as:

- Careful selection of timber.
- Use of galvanized fastenings.
- Improved construction techniques.
- Use of primers and bedding compound.
- New keel assembly consisting of dead wood and a shaft log.
- Simplified frame construction utilising scarf joint.
- Improved safety in design wherever possible while conforming to local style.

These will improve the life expectancy of boats at a small additional cost. In discussions regarding changes in boat design, some common themes were:

- Additional weight is considered bad by fishermen and in particular with regard to smaller boats.
- Speed is highly valued. Boats slower than competitors' boats are unpopular.
- Increased life expectancy is not necessarily a clear and immediate advantage.

The introduction of safe, appropriate and high-quality FRP boats in Aceh is considered an important development for the future. Numerous FRP boats have already been donated to Aceh both from within and outside Indonesia. This was apparently done without adequate demonstration or training in maintenance and repair. Result: some donated FRP boats have experienced problems with acceptance, quality and safety of operation. Regulations applicable to the construction of FRP vessels in Aceh do not exist.

Sri Lanka

The tsunami destroyed or damaged an estimated 24 000 craft. Early on it was decided that repairing damaged craft and engines would be the quickest and most cost-effective way of getting fishermen back fishing again. As a result, the Ministry of Fisheries and Aquatic Resources (MFAR) prepared a National Programme for Repair of Damaged Craft. Many boatyards were to participate in this programme. But the flood of orders from NGOs for new craft made many boatyards focus on new construction. It became apparent later that many craft regarded as "destroyed" were capable of repair.

The FAO did not get involved in boat-building in Sri Lanka; it facilitated boat and engine repair, and imported inboard and outboard engines.

There is no written scantling specification to monitor hull construction. In many cases the thickness of hull laminate was found to be so low that it would not have been accepted by any scantling rule. It was also noted that older boats generally had thicker laminate than newer boats. It was apparent that the quality of FRP boat-building and repairing was not being given sufficient priority in Sri Lanka.

In many cases the quality of repairs suffered because of repairs being carried out on the beach without adequate protection from sun, rain and humid air. Further, since the

cost of producing an FRP hull in Sri Lanka is mainly that of material cost (labour cost is low), there is a temptation to skimp on the thickness of the laminate in order to save money.

Monitoring the repair of boats in various districts, especially the harbour-based boats, became essential. FAO recruited three national consultant marine engineers and a marine mechanic to monitor the repair of craft and engines in the various districts.

Workers skilled in FRP were very few, and unskilled labour was recruited in some boatyards; the quality of construction may have suffered as a result.

The stability characteristics of certain classes of boats caused concern. Recommendations were made for design modifications to multi-day and 19-foot boats in order to satisfy stability requirements and allow for the safe loading of ice and gear.

Maldives

The Ministry of Fisheries, Agriculture and Marine Resources (MOFAMR) has undertaken to build 89 FRP boats of 4.5 meters (m) in length to replace wooden *bokura* craft damaged or lost in the tsunami. Drawings for the 4.5 m boat were prepared by FAO.

An FAO fiberglass expert prepared a manual on FRP boat-building and repairs. This contained details of the production process at Precision Marine (one of the boatyards) on Thulusdhoo, and the boat-building school at Alifushi. Subsequently he ran practical FRP training courses, including the construction of a 15 ft boat, as well as a FRP theory training course, which included safety, quality control, sequences and repair guidelines. Some 40 trainees, including both boat-builders and surveyors from MOFAMR, participated.

When planning a replacement scheme for ***masdhoni*** boats damaged by the tsunami, the MOFAMR decided to introduce a new 85 ft (26 m) model ***masdhoni*** that the average fisherman could afford. MOFAMR plans initially to build 20 of these boats, followed later by 30 more. Bids for building the boats have been received from established boatyards.

The Masdhoni of the Maldives. Some 50 Masdhonis, 85 ft long, are being built. Even 107 ft Masdhonis are under construction.

The development of the large FRP ***masdhoni*** in the Maldives has been extremely rapid. The first 70 ft FRP ***masdhoni*** was built in 1997; today, there are ***masdhonies*** of 107 ft under construction, with talk of still bigger boats. It is evident that Maldivian boat-builders are not afraid of venturing beyond the limits of their existing experience; however, there are considerable risks, and boats at times need structural modification after launching. In terms of skilled labour, the moulding of FRP hulls and decks is often undertaken by a team of Sri Lankan workers who specialise in this type of work.

The present FRP ***masdhonis*** are not built according to any scantling rules. Hull skin thickness appears adequate, but deck construction on many boats appears very weak. The Ministry of Transport and Civil Aviation is responsible for regulations on vessel safety, and has expressed the need for assistance in formulating safety regulations for fishing vessels. The development of boats over 30 m in length without reference to any guidelines or scantling rules for this size of vessel is a cause for concern.

Recommendations

1. Regulations concerning the safety of wooden and FRP fishing vessels are urgently required in the region. These should be locally appropriate and responsive to the needs and capacities of all groups of end users – the builders, vessel owners, fishers and officials.
2. Raising awareness of safety issues (including safety at sea and construction standards) among boat owners and operators, and among NGOs local and international, is vital.
3. Training and skills-upgrading for workers in the boat-building sector, for both timber and FRP boats, is essential.
4. Data collection and updating on needs and progress is critical for the goal of building back better. A single agency should be responsible for coordination. FAO performs this role in Indonesia, Sri Lanka and the Maldives.
5. The capacity of governments and ministries in relevant disciplines needs to be strengthened.