Resilience, Rights and Resources: Two years of recovery In coastal zone Aceh

Rehabilitating mangroves in the West Coast of Aceh

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Background

Almost 70 percent of Aceh's population live along the coast or close to the coast, suggesting a strong livelihood dependence on coastal and marine resource use. Rehabilitating mangrove forest along the coast of Aceh in the aftermath of the tsunami would therefore appear to be a natural reaction especially when considering that there is some evidence that mangrove forests have demonstrated an ability to provide some protection from the impact of tsunami, as nature's protection for the coastal regions from the large waves. As highlighted by various media, one demonstrable example was the case of the Island of Simeuleu on the West coast of Aceh which was close to the epicentre of the Dec 26 tsunami. The death toll on this particular island was significantly lower than elsewhere simply because the intact mangroves surrounding the island acted to buffer much of the force of the wave. Such observations brought an overwhelming response from the government in the region to encourage coastal communities to re-plant and rehabilitate mangroves forests along exposed coastlines. The Government of Indonesia has set a five year planting target for mangrove cover of 164 840 ha (BAPPENAS, 2005) in the tsunami devastated Aceh, supported by various international donor agencies and NGOs.

While many applaud the greening agenda, concern has been expressed that issues related to the replanting strategies, which includes workforce training and supervision, maintenance of seedlings, and increased public awareness about coastal land use are not being adequately addressed (Smith, 2006). Furthermore there is a need for better understanding of the relationship between these ecosystems and the communities that rely on them. Understanding the use pattern, will enable relevant authorities to develop specific coastal management policies related to the sustainable use of the mangrove rehabilitated areas.

Mangroves dominate undisturbed natural shorelines of many parts of Aceh. In general, channels within tropical mangrove forests are known to support communities of phytoplankton, zooplankton and fish, however quantifying the utilization of mangroves by fishes remains elusive (Faunce and Serafy, 2006). Nevertheless the ecosystem services provided by mangrove forests is directly linked to community livelihood and, as mangrove forests are know to play a special role as nursery habitat for juveniles of fish whose adults occupy coral reefs, sea grass beds and the pelagic zone (Kathiresam and Bingham, 2001), this includes providing direct benefits for the fishing community. Ecosystem benefits also extend offshore. Mangroves trap sediments and provide a suitable environment for the processing of nutrients from river systems, important services for the maintenance of suitable water quality for sea grass beds and coral reefs growing offshore (UNEP-WCMC, 2006). Mangroves trees are an important source of wood which local people use to construct their houses and fishing equipment.

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Condition of the mangroves pre and post tsunami

A global survey by FAO in 2002 indicated that 1,324 000 hectares of mangrove in Indonesia were lost to deforestation and land conversion activities from 1980 to 2000, equivalent to a loss of 31 percent of the total mangrove area in the span of two decades. Of the total, 1.5 to 1.8 million hectares was described as being in a critical condition. In 2000, Wetlands International noted a similar trend in Aceh Province describing 30,000 ha of mangroves as being in good condition but around 286,000 ha of mangroves as being in fair condition. Another 25,000 ha were perceived to be in poor condition (Meldrilzam et al. 2005).

In Aceh Province of Indonesia, the pre-tsunami development of economic activities in coastal areas, which largely revolved around aquaculture, led to the loss of large areas of mangrove forest (Budidarsono et al., 2006 and Pushparajah, 2005). This has subsequently been described as concurrently destroying one of the most effective barriers to ocean forces (Smith, 2006) as well as the loss of the high value role of mangroves as nursery grounds for coastal fisheries (Wilkinson, 2006). The weakened coastline was perhaps more vulnerable than it might otherwise have been, to the powerful tsunami wave which swept clean an almost 800km coastal strip of Aceh in December 2004.

Besides the conversion of mangrove land into fish ponds (*tambak*), the extraction of mangrove for both household and commercial purposes is also the cause of mangrove forest degradation in Aceh. At the household level, mangroves are generally used for house construction and firewood. Commercially, in Aceh, mangroves are usually exploited to produce charcoal and wood which then is exported to Malaysia and Singapore (Sharma 2005).

The majority of Aceh's mangrove forests can be found on the east coast where the coastline is more suitable for mangrove growth (Pushparajah, 2005). Nevertheless mangroves do occur on the west coast providing important goods and services for the people who live nearby. The west coast of Aceh was exposed to much more devastation as a result of the tsunami compared to the east coast. Depending on the location, from 30 to 100 percent of mangroves along the west coast was destroyed (table 1). A few of the community leaders did agree that some areas of mangrove prior to the tsunami on the west coast were already reduced as a result of destructive practises including clearing mangrove trees to accommodate shrimp and fish ponds. Nevertheless according to the local community, in most areas the front-line mangrove species and coastal forests were uprooted or snapped when the waves of the tsunami hit. The southern parts of Aceh were also subject to the 8.7 on Richter scale earthquake which struck after the tsunami in March 2005. Singkil, a district on the southwest coast of Aceh and its sub-district of Pulau Banyak suffered massive infrastructure and environmental damage. The earthquake caused the land to drop by around 50 cm in places, effectively resulting in sea level rise for coastal mangroves and as a result the seaward trees have died.

In areas where the wave dominated community members described that in some instances previous mangrove areas are now open coastline and many mangrove trees left standing after the wave itself have subsequently died. The soil around many *Nypa* forests and paddy fields located close to the coastal areas were washed away. In places these areas are now inundated to a greater extent either as freshwater wetlands as a result of the soil removal or are part of the inter-tidal zone.

Figure 1. Some of the mangrove trees survived the tsunami wave but subsequently are dying

Table 1. Extent of damage on mangrove forest along the west coast of Aceh

Area	District	Extent of damage
Calang	Aceh Jaya	100 % of mangrove trees were destroyed or have subsequently died.
Samatiga	Aceh Barat	Approximately 50 % of the mangrove trees were uprooted. Whatever trees left standing have mostly broken tops. Tangled parts of broken trees were lodged in the damaged *tambak* ponds. Extensive damage to *Nypa* species
Pulau Tuangku	Aceh Singkil	Approximately 70 % of trees damaged. The front-line *Rhizophora* was extensively damaged. The mangroves left standing are now dead.
Pulau Bangkaru	Aceh Singkil	30 to 40 % of the trees were destroyed. Some of the broken and tangled parts of the mangrove trees are lodged on the sandy beach of the island, threatening the nesting areas of its famous leatherback turtles
Other smaller islands around Pulau Banyak	Aceh Singkil	Depending on the site and distance from the sea, up to 100 % of the mangrove trees died subsequent to the earthquake.
Suak Bagong	Aceh Selatan	Minimum damage

Source: Source: Field observation by WorldFish team; Notes from community focus group discussion and key informant interviews in Samatiga (21-28 July 2006) and Pulau Banyak (3-5 August 2006), West Coast Aceh.

Research Methodology

Primary data were collected through a reconnaissance survey, focus group discussions (FGD) and key informant interviews. Secondary data included a review of literatures and assembling village profiles, maps, statistical reports and reports of previous assessments and surveys. The fieldwork was carried out between July and August 2006.

The thirteen study sites on the West Coast were chosen to cover a range of conditions including tsunami affected areas and on-going mangrove rehabilitation sites. The study sites are broadly clustered into Setia Bakti sub-district of Aceh Jaya (1 village), Samatiga sub-district of Aceh Barat (7 villages) and Pulau Banyak sub-district of Aceh Singkil (4 villages) (see figure 2).

The condition of mangroves in other intermediate west coast districts of Aceh were observed and recorded by the study team, during the reconnaissance survey.

Key Findings

- A community analysis of the use pattern indicated that the dominant pre-tsunami use of mangroves along the west coast of Aceh was for subsistence purposes (table 2).
- Before tsunami, rolling cigarettes using young *Nypa* leaves was one of the major secondary livelihood activities for many households in the study communities earning them up to US$220 from a one-hectare harvest of *Nypa* leaves.
- The main types of fish caught in the near-shore coastal fishery of the study sites along the west coast, are snapper, grouper and anchovy.
- Households with farming land tend to use most of the catch for self consumption while households involved in labouring have the tendency to sell their high-priced catch and consume the cheaper fish.

- Much of the farm land close to the coastal areas was destroyed by the flood water of the tsunami meaning that many of those who were previously farmers have now turned to an active involvement in fishing for both subsistence and commercial purposes. In addition there are open sea fishers who have yet to receive aid in the form of boats which will allow them to fish in the sea who are now exploiting mangrove areas.
- In all the study sites there has been an increase in mud crabs after tsunami. Local communities believe this is because pre-tsunami the crabs lived in the inner layers of the mangrove forest, which has now accumulated debris and silt, forcing the crabs to move out.
- According to the locals, the increase in the number of prawns within the surviving mangrove ecosystem is a result of the destroyed shrimp ponds and an increase in plankton – an essential food for shrimp - in the mangrove areas.
- Accordingly many fears the increase in the number of fish, crabs and prawns will not last because (i) eventually the young fish and other aquatic species will need healthy mangroves to survive and (ii) continued intense fishing amidst the surviving mangrove ecosystem will quickly deplete stocks.

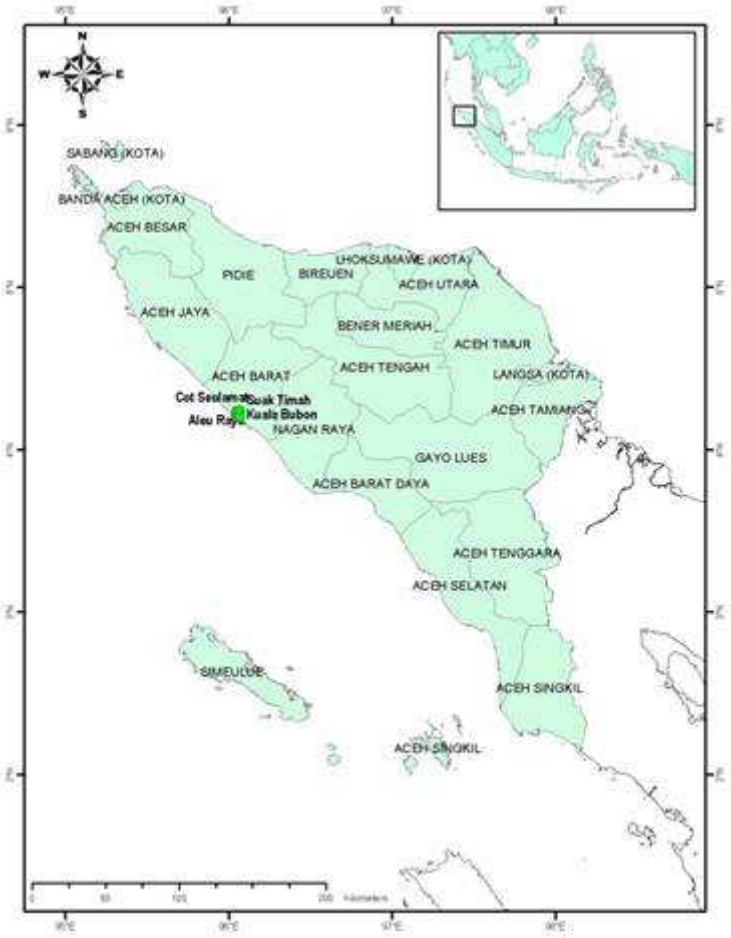

Figure 2. Location of the mangrove study sites in three districts of the west coast of Aceh province, Indonesia

Figure 3. Rolling cigarettes using young *Nypa* leaves- a major secondary livelihood

Table 2. Community's perspective on the type of mangroves and associated species and its uses in the west coast of Aceh

Binomial name	Local name	Key description	Uses
Nypa fruticans	*Nipah*	grows in soft mud and slow moving tidal and river waters; the leaves can extend up to 9 meter in height; trunk branches and each branch ends with a bunch of fronds; fruits are white translucent and hard jelly-like	tobacco wrapper, straw brooms, fruit used in making dessert, roof thatch, weave baskets and covers
Rhizophora spp.	*Bakau*	Grows to 25m tall; stilt roots that emerge in arches from the lower trunk; sturdy prop roots arch above the ground to 2m	fish attracting device, fuel wood, Charcoal, building material
Sonneratia sp.	*Langade*	tall straight trees; 15-20 m tall; with many branches	Fence, processed log, frame for the *bagan* boat
Sonneratia alba	*Berambang*	Grows up to 15m tall; fruits are large nearly 4 cm, green in color and edible; lots of brunches and leaves; leaf size larger than the leaves of *Avicennia* species	produce wooden crushers, fruit as delicacy
Avicennia	*Api-api*	Grows up to 25; fruits are small; small leaves; hard trunk; many branches	Fence, building material, collect honey, boat building material (prow/bow of the boat)
Avicennia marina	*Meri*	inner bark is reddish; skin of the bark is yellowish; 1-3 m tall; fruits are big; shape of the leaves are similar to the leaves of *Rhizopora* species; broad branches; lots of leaves	bark used to strengthen fishing net,
Pandanus	*Pandan*	small to medium-sized trees	floor mat
Metroxylon sagu	*Rumbia*	grows up to 15 m high; large pinnate leaves; ascending stems	sago starch

Source: Community focus group discussions and key informant interviews in Samatiga (21-28 July 2006) and Pulau Banyak (3-5 August 2006), west coast of Aceh.

Conclusions

The major findings of the study were that despite the lesser area of mangroves on the West Coast of Aceh compared to the East Coast, the livelihoods of a number of coastal communities in the West Coast are strongly linked to the mangrove ecosystem. The tsunami which destroyed anywhere from 30 to 100 percent of the mangrove forest along the west coast of Aceh has directly or indirectly caused the loss of household income for nearly 50 percent of the surveyed coastal villagers.

Most mangrove rehabilitation programs are orientated toward land-conservation and are not necessarily linked with livelihood options or integrated resource management. In many cases mangroves are being planted on inundated agricultural land where pre-tsunami boundaries have now disappeared. Unless the boundaries of this privately owned land is re-mapped, property rights are likely to become an issue in the future, particularly when the economic value of mangrove trees and supported resources are high.

Looking toward the future there is lack of a clearly defined management plan for sustainable use of the rehabilitated mangroves. This raises concerns as rehabilitation will succeed only when conservation measures are balanced with local community needs to obtain sustainable benefits from the rehabilitated systems.

Recommendations

The key recommendations of this study are that a Mangrove Management Plan be formulated to include a systematic and comprehensive assessment of the extent of tsunami damage and identification of other areas in need of, and suitable for, mangrove restoration. It would consider the biological, social and economic factors likely to influence the future use of mangroves and develop a protocol for assessing the most appropriate species to be re-planted. Species selection or habitat enhancement must be based on post-tsunami habitat suitability, economic benefits, and long-term environmental and economic sustainability.

To date there has been little effort made to compile, and manage systematically, the post tsunami data related to coastal and marine resources. The development of a management plan would benefit from the development of a database facility to store baseline data that exists to date, and that will be collected as part of the development of a management plan. The preparation of highly accurate baseline maps on mangroves in the west coast of Aceh would be critical baseline tools for mapping land ownership and in making resource management decisions.

To help in eliciting community support for the development of a management plan the study proposes a network of capacity building centres along the coast. Such centers would provide an opportunity for professionals to have sustained engagement with local communities and would aim to ensure that education, social mobilization and adherence to regulations become a strong foundation for sustainable coastal livelihoods. This would include exploring options for providing alternative livelihoods to reduce pressure on rehabilitated resources.

KEY MESSAGE

A study of the mangrove condition pre and post tsunami and the socioeconomic role of mangrove forests in the coastal community livelihood in the West Coast of Aceh indicate that the community livelihoods were significantly linked to the mangrove ecosystem. However, most of the mangrove rehabilitation programs are conservation orientated (i.e. aiming to restore mangroves primarily for land conservation) and are not necessarily linked with livelihood options for local people or integrated resource management. This raises concerns as rehabilitation will succeed only when conservation measures are balanced with local community needs to obtain sustainable benefits from the rehabilitated systems. The rehabilitation efforts to a certain extent do involve the communities, but a more holistic and integrated approach needs to be adopted to ensure better management and sustainability of the rehabilitated mangrove forests.

World Agroforestry Centre (ICRAF) is one of 15 organizations under the CGIAR (Consultative Group on International Agricultural Research) umbrella. ICRAF aims to stimulate and conduct innovative research, development and capacity building to promote and support agroforestry for both human and environmental benefits. ICRAF has its headquarters in Kenya and six regional offices in the tropics and now cover 21 countries in Africa, Asia and Latin America.
The research bulletins are summary results of collaborative activities of ICRAF and partners in the "Recovery and Resilience of Livelihood and Natural Resources", mainly in West Aceh, after the Tsunami of 26th December 2004. These bulletins were prepared, first in Indonesian language, for a workshop in Meulaboh on 30 November 2006. The primary objective was to share relevant result findings and observations among government and non-government organisations and individuals involved in the post-tsunami recovery in West Aceh. The workshop and preceding research activities were supported by Ford Foundation Indonesia, EU Asia Pro-Eco Program and CGIAR.

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