



# Summarizing And Analyzing Restoration And Conservation Initiatives Post-Tsunami In The Indonesia Technical Report



# **Technical Report Summarizing And Analyzing Restoration And Conservation Initiatives Post-Tsunami In The Indonesia**

**By Woro Yuniati and Ben Brown**

## **Overview:**

The Ecosystems and Livelihoods Group 2 Asia (ELG2) of IUCN (The International Union for the Conservation of Nature) in Sri Lanka commissioned members of Mangrove Action Project - Indonesia to help consolidate and share the lessons learned in the course of carrying out various post-tsunami restoration activities in the various tsunami affected countries in Indonesia, primarily the province of Aceh but also in North Sumatera Province. This paper specifically researches and provides input on the following focus areas;

- 1.0** Identification and description of *coastal-specific* issues arising out of environmentally insensitive post-tsunami response;
- 2.0** Case studies on 3 major organizations/agencies involved in restoration and conservation work post-tsunami which;
  - 2.1** List all major relevant initiatives/projects carried out by each agency in Indonesia and gives basic information on each initiative (e.g. type of activity, duration, scope, geographical area; progress to date; budget of initiative)
  - 2.2** List the objectives and planned outputs of this work;
- 3.0** Provision of a thoughtful and thorough analyses on the successes and failures of the restoration and conservation work carried out by these 3 agencies, looking at aspects such as:
  - 3.1** General Observations,
  - 3.2** How have organizational goals and objectives for coastal rehabilitation been achieved/not achieved?
  - 3.3** What the gaps and problems were?
  - 3.4** Suggestions for improvement?
  - 3.5** Gender aspects of environmental degradation arising out of tsunami rehabilitation (e.g. different impacts on the livelihoods of women and men).

## **1.0 Identification and description of locale-specific issues arising out of environmentally insensitive post-tsunami response.**

### **1.1 Greenbelt Considerations**

#### *1.1.1 The question of greenbelt?*

On March 7-8, 2005, the FAO held a regional coordination workshop on the rehabilitation of tsunami-affected forest ecosystems in Bangkok. Qualified staff from government agencies and international organizations in Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand were present. Several international and regional organizations with an interest in mangroves, coastal vegetation management and coastal forest ecosystems (e.g. ADB, ATREE, CIFOR, ISME, ITTO, IUCN, IUFRO, MAP, MSSRF, UNDP, UNEP, UNESCO, WWF, ICRAF etc.) were asked to present as well to lay the groundwork for further work and collaboration.<sup>1</sup> The meeting was called to present country strategies and new directions related to the topic of post-tsunami coastal rehabilitation.

What was notable during presentations of each national government representative (from forestry and planning agencies), was the call for development of *coastal greenbelts* in areas at high risk of tsunami. In every case but one, these tsunami-affected countries had developed strategies, including legislation for the development of coastal greenbelts consisting of mangrove forests, beach forests and other coastal vegetation, exclusive of other economic and social infrastructure (housing, tourism developments, aquaculture, roads, etc). The issue of how to exclude previously existing communities from a coastal greenbelt was an admitted challenge, and certainly Thailand and other nations did not always hold to their policy in terms of excluding tourism development in the greenbelt area, but by and large, all of the countries present were determined to develop coastal greenbelts for various reasons (i.e. protection against tsunami [questionable in terms of effectiveness], protection against regular and major storm events, fisheries enhancement, other ecological services and development of coastal livelihoods).

Indonesia's concept of a greenbelt, however, differed from the other governments in attendance, in that their vision for a coastal greenbelt, at the time, *included* aquaculture ponds along with coastal vegetation. Many participants commented on the inappropriateness of this, as the main consideration of development of a greenbelt was to act as a structural barrier to storm events. The large-scale development of shrimp ponds in mangrove area was considered one of the causes for increased extent of damage caused by the tsunami in the first place and certainly not a barrier to storms and waves.

#### *1.1.2 Greenbelt laws in Indonesia<sup>2</sup>*

Coastal greenbelt laws have existed in Indonesia since the 1980's, put into place at the height of aquaculture development known as the "Blue Revolution." Early laws on coastal greenbelt protection included No. KB.555/264/Kpts/4/1984 and No. 082/Kpts-

II/1984, 30 April 1984 by the Ministries of Agriculture and Forestry. These laws recommending a 200 meter greenbelt in mangrove areas. These laws were designed to both legitimize mangrove forest protection and as a practical recommendation to regional government agencies.

Forestry Department No. 507/IV-BPHH/1990 was a stronger law which required Forestry Departments to maintain 200 meter greenbelt along ALL mangrove forested coastlines as well as a 50 meter greenbelt along river banks (presumably coastlines and riverbanks which presently or historically exhibited natural mangrove growth).

Presidential decree No. 32, 1990 was put forth to protect coastal areas from human activities which disturb critical coastal functions. This original law provided mangrove protection “proportional to the coastal dimensions extending landward at least 100 meters above the highest tide mark.” This law would indeed provide adequate protection for mangroves were it adopted by lesser governments and implemented due to its inclusion of the entire mangrove ecosystem, from seaward edge to terrestrial interface.

In clarification of this law however, the agency for Protected Areas Management (BKSDA) refined the concept of coastal greenbelts by providing a formula for calculation of appropriate greenbelt width. This formula requires agencies to multiply the average difference between highest and lowest tides times 130 to determine a meter width for the greenbelt.

Ex: Tide Differential = 2.0 meters = 2.0 m x 130 = 260 meter greenbelt.

This formula actually reduces the amount of mangrove forest protection again, to a coastal greenbelt, not taking into consideration importance the back mangrove forest in terms of conservation and ecological resilience.

### *1.1.3 The shortcomings of greenbelt thinking and Indonesian greenbelts with regards to mangrove forests.*

Coastal mangrove forests are confined to within the inter-tidal zone. They exist as a continuum of plant communities from their interface with terrestrial ecosystems, seaward until somewhere around the lower inter-tidal (approximately mean low neap tide). The intention of the development of a coastal greenbelt is conservation, but conservation of mangrove ecosystems requires more than intention. The mangrove ecosystem functions as a whole, with important freshwater inputs from the land entering into the system from the back mangal, joining eventually with the sea. In between, a series of tidal channels act as a network for exchange of tidal waters and drainage of freshwater. This, and many other factors of water movement, drainage, interstitial water (in the space between substrate material i.e. rock, sand, silt etc) provide a critical flux which gives rise to the stability and resilience of a mangrove ecosystem.

Protection of the seaward mangroves alone, without protection the mid and back

mangal, the terrestrial interface and especially fresh surface and ground inputs, will harm the entire system.

Coastal Greenbelt laws in Indonesia, even when they are on the books, are seldom enforced. Fishermen measure the width of this sparse greenbelt in North Sumatera, which hardly serves an eco-barrier to storm events (Top). Inside of this sparse Greenbelt lies a 40 hectare abandoned shrimp pond. (Bottom) Neither the Greenbelt nor the pond complex provide ecological or economic services to local communities.



## 1.2 Infrastructure Development and Hydrology

The tsunami caused severe damage to the fisheries infrastructure in many parts of Aceh and especially in populated centers. Facilities along bays, coasts and rivers were destroyed and required rebuilding. Major ports (PPI), such as the port in Meulaboh was planned for construction. Other examples of infrastructure in the coastal and river/estuarine areas include water supply, fish market, fish landing and auction places (TPI), fuel, roads, retaining walls, wharfs, ice factories, aquaculture ponds etc.



The importance of hydrology to maintaining mangrove health can not be understated. Developments which disturb normal hydrology into and out of the mangrove are sure to threaten the health of the mangrove area. Below are a list of some developments which may impact mangrove hydrology and resultant health.

*1.2.1 Roads* – USAID as well as BRR, and ADB sponsored the development of coastal roads in much of Aceh after the tsunami for transportation and shipping infrastructure. Roads can alter or even cut off surface water flows from the uplands to mangrove areas. Considerations such as bridges or adequate culverts (large enough to facilitate heavy run-off without clogging of woody debris) where natural surface water flows into mangrove systems exist (or where historical flows existed). Bridges and culverts need to be adequate to allow for a sufficient tidal prism to be maintained. Tidal prisms are essentially volumes of tidal water moving through a point in a creek which act to flush the creek of sediment as a self-cleaning mechanism. When the tidal prism is reduced, creeks risk closing and mangrove forests are at risk of drying out.

*1.2.2 Aquaculture* –

The tsunami has caused great geomorphological change along most coastal areas in Aceh. The waves excavated extensive lagoons behind beaches, destroying large areas of ricefields and coconut plantations with great economic impact. According to ADB studies, it is estimated that the number of coastal coconut trees is currently 25% of pre-tsunami levels.<sup>3</sup>



Mangrove area in North Sumatera drying up due to pond development in back mangal

ADB goes on to suggest that innovative use of newly formed lagoons include aquaculture which may be feasible and prior studies and surveys are elemental to determine levels, freshwater intrusion, drainage possibilities, etc. Ownership issues will also need to be resolved. Aquaculture areas in the most impacted areas of Aceh have little potential for restoration due to the elevation of the lagoon base (which is below high tide mark, making pond drainage difficult and expensive).

Previous practices of aquaculture development targeted mangrove areas for reasons of water exchange and minimal land ownership issues. Future aquaculture development should not only take place outside of the mangrove forest, but should not impact on water flows in and out of existing or rehabilitated mangroves. Dike walls which block freshwater flows into mangroves, and trenches which divert freshwater and tidal flows in mangrove areas should not be developed. In reality, however, not only are numerous coastal aquaculture ponds being restored across Aceh, but numerous mangrove rehabilitation projects are taking place directly in both destroyed and in tact aquaculture ponds.

*1.2.3 Channelization* – Oftentimes rivers are straightened in order to rush flood waters away development. Channelization also has the potential to rob mangroves of natural tidal exchange vis-à-vis meandering tidal creeks.

*1.2.4 Housing Development* – This can affect mangroves in a variety of ways such as; 1) timber felled from mangrove areas for building material, 2) mangrove clearing and direct development in mangrove areas, 3) diking of back mangrove to “prevent” saltwater intrusion into settlement areas, 4) excessive felling of timber from uplands causing decreased absorption of water into aquifers and exacerbated runoff which shortens overall residence time of freshwater in creeks and rivers. Felling of upland timber also increases erosion which may clog tidal creeks. This point is elaborated upon in 1.3.

*1.2.5 Agriculture* – Oftentimes farmers build dike walls in Indonesia to “protect” crops such as rice or coconut from salt water influx. Rising sea level is causing an increase in this behavior. In reality, these dike walls block freshwater flows into mangroves, which may die-off and actually increase saltwater infiltration. Salt water easily penetrates these dike walls anyway through the ground and also through numerous crab holes.



20 km dike wall between mangroves and coconut plantations in Riau, Sumatera

*1.2.6 Retaining Walls/Break Walls* – Coastal retaining walls can affect mangroves by altering oceanic currents and especially recruitment of beach sediment which is transferred and deposited in calmer areas where mangrove forests both form and thrive.

*1.2.7 Wharfs* – Small amounts of mangroves are oftentimes cleared for wharfs and jetties. These need to be constructed using a valid, third party Environmental Impact Assessment considering changes in hydrology to adjacent mangroves and other coastal ecosystems.

*1.2.7 Port Construction* – As mangroves exist in calmer, low energy coastal systems, conflict with port development is common. The Ministry of Fisheries and Oceans is in a phase of promoting port development, much of which targets mangrove areas for conversion. Again, valid third party Environmental Impact Assessments need to be enforced during all port development projects, which will surely impact directly (destruction of trees) and indirectly (hydrological disturbance, pollution) on adjacent mangroves.

### 1.3 Upland Deforestation

Deforestation of the uplands in post-tsunami times may increase due to increased need for timber for housing development as well as clearing for agriculture lands as coastal and fishing livelihood opportunities decrease (due to destruction of boats, loss of fishing gear, habitat destruction). Deforestation causes increased water runoff and decreased infiltration of water into aquifers. This creates erratic flows of water into rivers, and resultantly into the mangrove area. Tidal creeks in mangroves remain open due to freshwater inflow as well as the tidal prism (see 1.2.1). When freshwater river flows are erratic (flowing out to sea quickly in the rainy season and drying up earlier in the dry season) you run the risk of tidal creeks closing up. Upland erosion can also be responsible for closing of tidal creeks by increasing the silt load in the creek.

Linking coastal rehabilitation to conservation of upland forests and rehabilitation of upper watershed, especially riparian (riverside) vegetation is important for the overall health of the mangrove.

### 1.4 Sea level rise, spatial planning and mangroves

The tsunami drastically changed coastal landscapes and coastal geomorphology. In response to this change, BRR and BAPPEDA undertook extensive land use planning activities. These plans, however, failed to take into account sea level rise projections in relation to mangrove habitat requirements. As sea levels rise, mangroves will need to migrate inland. Mangroves are well suited to this migration, although the rate of near future sea level rise may be unprecedented. Where sea level rise becomes a major issue with regards to inland migration of mangroves, is where other land uses; such as roads, towns, housing, aquaculture, agriculture, etc. are currently existing or are planned for development behind mangrove areas.

If mangroves are indeed valued and desired by Sumatrans in the future, communities and governments will need to incorporate mangrove migration buffers into their spatial plans.

### 1.5 Institutions Registered with BRR Involved in Mangrove Rehabilitation

Stephen Hill is Director of UNESCO's Regional Bureau for Science in Jakarta. He has assumed the dual role of Resident Co-coordinator of the United Nations and Co-coordinator of Humanitarian Relief in Aceh on a number of occasions. Below he discusses his experiences as they related to NGO involvement in mangrove rehabilitation (also discussed in the Part B of this report on Suggested Practices).

“A total of 164 NGOs arrived in Aceh, some well experienced in emergency relief, like Oxfam, World Vision, Care International and the International Red Cross; these moved quickly into the role of implementing 'arms' of UN programs, delivering food, tents and so on. Others were literally falling over each other in an uncoordinated way. The UN, as an international agency, is not constitutionally mandated to co-ordinate NGOs. This is the task of government, which in this case was still reeling from the shock and magnitude of the response needed.”



Looking specifically at the example of mangrove rehabilitation;

“...having committed funds to activities for which they had technical competence, a number of the large NGOs then moved into areas in which they lacked competence. Planting mangroves along the coast to mitigate against another potential tsunami became a popular movement, even though there is still limited evidence of how to do this. Relatively wealthy agencies therefore moved into mangrove replanting operations. However, without their own technical experts, their mode of operation was to fund local communities to do the job: people without any experience or technical knowledge who were unsupervised by experts. This often resulted in failure, perhaps simply because there had never been mangroves in that particular location and mangroves were extremely unlikely to find it habitable in the future.”

Over the next two pages is a list of 76 NGO's registered with BRR that ran activities on mangrove rehabilitation. This does not include the various government agencies, such as the Forestry Department or BP-DAS (Watershed Management Agency), nor the countless community based organizations (CBO's) that also implemented mangrove rehabilitation

No	Lembaga/ Instansi
1	Aceh Partnership Foundation (APF)
2	Alisei
3	Asian Development Bank
4	ATLAS Logistique
5	BPDAS Krueng Aceh
6	Campus Professional and Scientific Group, Banda Aceh
7	CARE
8	Caritas Czech Republic
9	CDI
10	Citra Desa
11	Conservation International Indonesia
12	DAI (Development Alternative, Inc)
13	Diakonie
14	Dinas Kehutanan Provinsi NAD
15	Fasilitator Masyarakat Dusun Ujung Blang, Desa Lam Ujung, Kec. Baitussalam, Kab. Aceh Besar
16	Fasilitator Masyarakat Dusun Ule Jalan, Desa Lam Ujung, Kec. Baitussalam, Kab. Aceh Besar
17	FIG - Indonesia
18	Fauna Flora International
19	German Agro Action
20	GTZ
21	IDEP
22	IMC (International Medical Corps)
23	IOM
24	Islamic Relief
25	Jaringan Aliansi Ekonomi Pendidikan dan Lingkungan Hidup, JADUP, Bireuen
26	Jaringan Informasi dan Komunikasi Masyarakat Tsunami (JIKMTs)
27	JRC
28	Kelompok Masyarakat Dusun Deungah, Desa Lam Ujung, Kec. Baitussalam, Kab. Aceh Besar
29	Kelompok Masyarakat Dusun Junglong, Desa Lam Ujung, Kec. Baitussalam, Kab. Aceh Besar
30	Kelompok Masyarakat Kec. Muara Tiga
31	Kelompok Masyarakat Kec. Pulo Aceh, Kab. Aceh Besar
32	Kelompok Tani Alafan Bahari
33	Kelompok Tani Pantai Sibinuang
34	Kelompok Tani Penghijauan Pantai, Samotalindung

No	Lembaga/ Instansi
35	KOICA
36	KSM TUANKU, Banda Aceh
37	LEM Ingin Makmur, Kec. Samatiga, Aceh Barat
38	LEM Karya Mandiri Desa Suak Panteubreuh, Kec. Samatiga, Aceh Barat
39	Lembaga Ekonomi Masyarakat (LEM) Maju Bersama, Kec. Samatiga, Aceh Barat
40	Lembaga Informasi - Masyarakat Independen - LIMID
41	Lembaga Pembela Lingkungan dan HAM - Lhokseumawe
42	Lembaga Pengelola Sumber daya Terumbu Karang - LPS - TK Sawo, Nias
43	Lembaga Pengembangan Pesisir, Pulau - pulau Kecil dan Laut - Nias
44	Lhok Nga Community Group
45	Mapayah
46	Mercy Corps
47	Norwegian Red Cross
48	OXFAM
49	PCI (Project Concern International)
50	Pusat Pengembangan Ekonomi Kehutanan BRR NAD - Nias
51	Pusat Pengembangan Potensi Pesisir dan Lautan (P4L)
52	Satker - BRR Pengembangan Pesisir dan Lingkungan Hidup
53	Satker - BRR SDKP 2006 - Program ADB
54	Satker BRR - ADB ETESP Fisheries
55	UNDP
56	Unit Kegiatan Mahasiswa Minat Profesi, Fak. Kedokteran Hewan Unsyiah
57	USAID
58	Wetlands International - Indonesia Programme
59	World Wild Fund
60	Yayasan Bangkit Simeulue (YBS)
61	Yayasan Dian Desa, Desa Gapui, Kec. Lhoong, Kab. Aceh Besar
62	Yayasan Gajah Sumatera
63	Yayasan Hijau Semesta
64	Yayasan Hikmah, Desa layeun, Kec. Leupung, Kab. Aceh Besar
65	Yayasan Holi' Ana'a - Nias
66	Yayasan Karya Besama, Yasma Banda Aceh
67	Yayasan Lahan Ekosistem basah / LEBAH
68	Yayasan Manjago Vano, Simeulue
69	Yayasan Panglima Laot
70	Yayasan Peduli Lingkungan
71	Yayasan Peduli Sabang
72	Yayasan Pekat Indonesia, Nagan
73	Yayasan Pembela Petani dan Nelayan, Meulaboh
74	Yayasan Pusat Gerakan dan Advokasi Rakyat (PUGAR)
75	Yayasan Simeulue Lestari
76	Yayasan Leuser International

**2.0 Case studies on 3 major organizations/agencies involved in restoration and conservation work post-tsunami;**

2.1 List all major relevant initiatives/projects carried out by each agency in Indonesia and gives basic information on each coastal rehabilitation initiative (e.g. type of activity, duration, scope, geographical area; progress to date; budget of initiative)

<b>Initiative/ Agency</b>	<b>Australian Red Cross – Simeulue Island<sup>4</sup></b>	<b>BRR – Fisheries Forum – Aceh Barat<sup>5</sup></b>	<b>Wetlands International<sup>6</sup></b>
Activities	Mangrove planting, sustainable livelihoods	Village Development, Capture Fisheries, Aquaculture, Infrastructure, Coastal Resource Rehabilitation, Service Recovery and Provision,	a) restoration and protection of target coastal areas to provide protection from natural disasters and supporting alternative livelihoods for coastal and near coastal communities b) providing long-term payments for protection and maintenance of replanting sites from co-funding generated through the carbon market and c) diversifying livelihood alternatives increasing incomes and improving marketing d) improved governance of coastal areas
Duration	2005-2008	2005-Awal 2008	2006-Dec 2008
Scope	7 Villages – Approx 50 Total Hectares for restoration Livelihoods with 3500 villagers	11 Districts/Cities in the Regency	56 Sites in Green Coast Phase I Double Check
Geographical Area	NE to Central Northern Coast of Simeulue Island	All of Aceh, and Nias Island, North Sumatera	Districts – Aceh Barat, Aceh Barat Daya Aceh Besar, Aceh, ., Aceh Jaya, Aceh Singkil, Aceh Tamiang, Aceh Timur, Aceh Utara, Bireuen, Nagan Raya, Nias, Nias Selatan, Pidie, Simeulue  Cities – Banda Aceh, Langsa, Lhokseumawe, Sabang,
Progress to Date	Project complete. 50% survivorship after one year at one site, total mortality at 3 other sites. Recommendations for Ecological Mangrove Restoration not realized	Passed Ministry of Finance targets, 60% success by own admission. Project finished	All rehabilitation will be complete by Dec 2008. Monitoring to take place until 3 years after planting in each site.
Budget of Initiative	\$114,4937 Mangrove rehab only	\$1,300,000 from Annual Budget alone (additional from NGOs) Mangrove and Coastal Forests <sup>8</sup>	Green Coast Phase I - \$10,065,910 Green Coast Phase II – \$495,000 Mangrove and Coastal Forests

## 2.2 List the objectives and planned outputs of this coastal rehabilitation work;

An eight-page questionnaire was developed to assist MAP-Indonesia field staff in collecting detailed information from coastal rehabilitation project officers at five organizations and agencies; Australia Red Cross (ARC), Agency for Reconstruction and Rehabilitation of Aceh and Nias (BRR), Forestry Department (DKP), USAID – Environmental Service Program (USAID-ESP) and Wetlands International - Indonesia Programme (WI-IP). The questionnaire was developed to uncover the processes each organization/agency used to identify, plan, implement and monitor mangrove rehabilitation activities, with an emphasis on determining to what extent local communities were involved. The questionnaire is attached in English in template form. Completed questionnaires are attached in Bahasa Indonesia and can be translated upon request. Each organization was also allowed to elaborate on the questionnaire, and these notes were recorded by MAP-Indonesia field staff and are part of a field report which include reconstructed notes from the interviews, as well as notes from rehabilitation site visits.

The questionnaire for the Australian Red Cross – Simeulue, was filled in by MAP-Indonesia staff after having already completed an assessment of coastal rehabilitation efforts in 2007. Additional questionnaires were compiled for the BRR, WI-IP, DKP and USAID-ESP. Of these, ARC-Simeulue, BRR and WI-IP have been selected for case study presentations. These organizations were considered representative as their initiatives ranged in size from small (ARC) to large scale (BRR and WI-IP), and their level of experience from no previous experience (ARC, BRR) with coastal rehabilitation to extensive experience (WI-IP).

The questionnaire for the Provincial Forestry Department (DKP) was inadequately completed by DKP officials but as DKP worked closely with BRR insight to DKP rehabilitation efforts are also possible. USAID-ESP was primarily involved in rehabilitation of beach forest community, (primarily *Casuarina* spp), riparian (riverbank) vegetation, and economically useful trees (fruit and timber) within villages which comprised 99% of their reforestation efforts, while mangrove planting comprised only 1%. Their program area was located along the high energy Western coast of Aceh with a low historical coverage of mangroves. By planting species appropriate to the region, USAID-ESP experienced a high degree of success averaging 90% survivorship of planted vegetation. Numerous other agencies not interviewed, attempted to plant mangroves even in high energy systems such as the West coast of mainland Sumatera and South coasts of Simeulue and Nias Islands and experienced near total mortality of seedlings.

After interviews and completion of questionnaires by WI-IP, BRR and USAID-ESP, MAP-Indonesia field staff paid independent visits to sample field sites for purposes of verification. MAP-Indonesia has also spent significant time in Simeulue Island for verification of ARC, DKP and WI-IP rehabilitation projects on Simeulue.

### 2.2.1 WI-IP

Agency/Organization	<b>Wetlands International – Indonesia Program</b>
Staff Interviewed	Eko Budi (Team Leader WI-IP, Aceh) Kus, Urip, Nas, Anto (Facilitators)
Date and Time	October 22, 2008 9.00-12.00 WIB

#### *Overview*

Wetlands International's - Indonesia Program is based in Bogor, West Java. WI was a highly visible player in the post-tsunami reconstruction and rehabilitation period, and was part of several larger umbrella efforts including FAO's Regional Coordination Effort<sup>ix</sup>, the Green Coast Program<sup>x</sup>, and was recommended by BRR to coordinate NGO post-tsunami efforts of mangrove rehabilitation as part of the Green Coast Program.

Wetlands International used a rapid assessment approach to identifying mangrove rehabilitation as a necessary activity. They considered their own staff adequate for all project phases including identification, planning, implementation and monitoring, as they have a wealth of experience in rehabilitation of wetlands including coastal wetlands. They did, however, access additional information from UNEP and the forestry department. For implementation, experts from Wetlands International not residing in Aceh were called in to assist.

#### *Project Planning and Implementation*

A stakeholder mapping process was used to identify participants which fell into three groups; 1) community groups previously involved in mangrove conservation, 2) fish farmers unaware of the need to conserve mangroves and 3) individuals newly interested in mangrove conservation.

Funds for mangrove rehabilitation were already in place from the onset of project identification.

In terms of community involvement, communities were involved in planning and implementation. After 3 months of awareness building under the supervision of a facilitator, community groups were formed. An emphasis was placed on capacity building of community groups through trainings. Community groups were also facilitated during the actual implementation of nursery rearing, planting and post-planting maintenance.

During site identification, efforts were made to determine ownership/use status of planted areas and to resolve these issues to ensure long-term success of the plantings.

Planning tools such as LFA matrix and multi-stakeholder discussions were used. Most project cycle phases were utilized in the development of this project. The project underwent appraisal as well, and was selected based on criteria of cost, chance of success, impact and cohesiveness with organizational mission and vision. The project was altered during the appraisal process.

WI's goals and objectives for coastal rehabilitation were the most progressive of the three focus agencies, reflecting their experience, mission and vision. This included not only rehabilitation and development of livelihoods, but longer term mechanisms for mangrove protection and improved governance of coastal areas.

With regards to mangrove rehabilitation, WI had the measurable objective of 75% of mangrove seedlings planted surviving (to a period of 3 months) with an emphasis on community maintenance of planted material.

No significant implementational risks were identified in project planning. Discussions with communities included use and value of mangroves, and land status of intended rehabilitation sites. It was assumed that problems along the way could be resolved through community consultation. Examples of creative problem solving include settling land ownership conflicts and overcoming grazing on mangrove seedlings by livestock. Some difficulties existed in community members and organizations interested solely in material gains from reconstruction activities.

WI's program underwent internal evaluation, from a WI team of evaluators from Bogor.

#### *Technical Considerations*

WI did not consult with external experts in implementing mangrove rehabilitation. Resources consulted included a technical manual for mangrove rehabilitation published by WI and IUCN, as well as old WI reports. WI undertook studies of previous condition of mangroves and habitat. They did not report any instances of seismic uplift in rehabilitation sites [although several sites had experienced seismic uplift, at least on Simeulue Island]. WI reports taking hydrological measurements before planting as well as other forms of assessment (substrate type) Special technical considerations taken include the following;

1. Planting site is within tidal range.
2. Planting sites not located on high energy coasts
3. Water source for planted material from tidal waters.
4. Salinity does not exceed 30‰ [they mean 30 ppt]. Especially for *Nypa fruticans* and *Avicennia* spp.
5. The nursery should be located in the tidal zone, without high tide inundating the polybag in order to avoid loss by washing away.

All projects involved rearing seedlings in nurseries, planting by communities and maintenance by communities. *Rhizophora* propagules for the project were sourced from Sigil, Eastern Aceh (*Aceh Timur*), with *Avicennia* fruit coming from as far as Java. Propagules were reared in nurseries by communities subsequent to WI nursery management trainings. Transportation of propagules took place at night to maintain good condition of propagules [unlikely for seedlings coming all the way from Java, a 3-7 day trip by truck depending on weather]. Technical assistance was provided by WI, to communities, as well as small grants to pay for seedlings. To ensure maintenance, contracts were signed with Community Groups (KUB) formed by the project, who were

provided with small grants (approx \$300 per group member) to initiate savings and loans if at least 75% of their mangrove seedlings survived after a period of 3 months. If less than 75% of the mangrove seedlings survived, the loans would have to be paid back. These savings and loan grants spurred the development of various enterprises such as fish farms, agriculture, livestock, purchase of fishing equipment, home industries (fried crackers and tempeh making) and general stores.

Mangroves seedlings were to be planted at spacings of 2m x 2m (Green Coast objectives) but were actually planted at spacings of 1 x 1 meter, 50cm x 50 cm and 50cm x 75 cm “based on species requirements.” Fencing was built around many planting locations to ward off livestock. This solution to livestock grazing was chosen over developing livestock pens due to lack of community acceptance of increased labor in gathering feed.

*Monitoring and Evaluation*

Control of the activity, monitoring and evaluation were all undertaken. 50% of planted seedlings were monitored, data is with WI - Indonesia Program in Bogor. Monitoring protocol was in place before project implementation and baseline data including substrate condition, water sources, indicator vegetation and animals [presumably livestock], were collected. Data was gathered into a GIS system. All data collecting was undertaken by WI staff. Monitoring is to be undertaken every three months for a period of 3 years, by WI staff together with communities. WI developed participatory monitoring practices with local community during the process of developing local legislation for protection of rehabilitation areas.

WI-IP staff indicate that over 90% of planted mangroves in Aceh Jaya are currently surviving and growing well, and in some areas 99-100%. Data reported to BRR indicates 10-99% survivorship at various sites (of various areas) across Aceh and Nias.

*Documentation and Dissemination*

Dissemination of lessons learned, a number of documents were produced including technical manuals, books and a web site. Reports and other documents have been uploaded to the BRR website. Books were also distributed at seminars as well as amongst participant communities

BRR and WI-IP distributed the technical restoration manual adapted by WI-IP entitled “Technical Manual For Planting Mangroves Together With Communities,” Khazali, M. WI-IP Bogor-BRR NAD/Nias. 2005. This manual was distributed to NGO’s and agencies involved in coastal reforestation/afforestation projects.

2.2.2

Agency/Organization	<b>Agency of Reconstruction and Rehabilitation for Aceh and Nias (BRR) - Deputy of Economy and Labor</b>
Staff Interviewed	Erlinda / Assistant Manager program of mangrove planting program
Date and Time	October 15, 2008 11.00-12.30 WIB



### *Overview*

The Agency of Reconstruction and Rehabilitation for Aceh and Nias (BRR) played the role of the Indonesian government's main coordinating body for all post-tsunami activities in affected regions. In terms of coastal rehabilitation, the BRR played both a facilitating/coordinating role as well as an implementational role. As coordinators, all other agencies, NGO's, iNGO's and CBO's were to report to BRR in terms of planning, implementation and monitoring results of coastal rehabilitation efforts. BRR, with no previous technical experience in coastal rehabilitation, passed on the brunt of the coordination work to the Green Coast Program, spearheaded in Indonesia by Wetlands International and WWF, with other Green Coast members in subsidiary roles. BRR also implemented its own coastal rehabilitation projects (coastal forest and mangrove forest rehabilitation), largely through the Forestry Department but also with other agencies such as BP-DAS (Watershed Management Agency). A special task force was set up in the Forestry Department known locally as Satker Pesisir (Satuan Kerja Pesisir or Coastal Work Group) which facilitated all of the mangrove rehabilitation on the ground for BRR up until early 2008. According to BRR officers, when Satker disbanded, much of the data and reports on their activities was lost.

The specific mangrove rehabilitation project discussed during this interview and case study was a 100 hectare plot in Lambaro Village, Kuta Alam Regency of Metropolitan Banda Aceh. One million propagules were planted in this initiative in 2007. Many of the propagules are surviving at a planting density of 20cm – 1 meter, with heights of 50cm – 1 meter. Nearly all seedlings are of the species *Rhizophora mucronata*.

### *Project Planning and Implementation*

BRR utilized a multi-stakeholder discussion process to identify program participants who are predominantly coastal communities directly. BRR utilized external experts for project identification, planning, appraisal, training and implementation but not for monitoring and evaluation. Budget for activities were in place before project identification, coming primarily from APBN (National Government Annual Budget also referred to as on-budget) as well as Asian Development Bank fisheries budgets and funds from other iNGO's. The Ministry of Finance, in its report on BRR mangrove rehabilitation activities said that BRR out-performed their budgeted expectations. BRR was allocated approximately US\$1.3 million of APBN funds for rehabilitation work.

No formal planning processes were utilized, but workgroups were formed consisting of staff from "Department of Finance" as well as Forestry Department. Coastal communities themselves had no role in planning. Site specific planning was undertaken by an extension officer from the forestry department in conjunction with Fisheries Department staff, who comprised the Satker Pesisir team.

No significant risks were associated with mangrove rehabilitation, as the areas planted were "former mangrove areas planted with propagules that have high levels of resilience."

The mechanism used for planting involved local communities submitting proposals to BRR, reviewed by the Forestry Department with BRR providing financial and technical support vis-à-vis the Forestry Department. Projects underwent appraisal as well by the Satker team, and were selected based on criteria of cost, chance of success, impact and cohesiveness with organizational mission and vision. Planting projects were not altered during the appraisal process.

#### *Technical Considerations*

In terms of technical consideration, BRR and the Forestry Department stuck to an old system of mangrove rehabilitation in paying fisherfolk from Aceh Timur 200 rupiah to collect propagules and an additional 35-45 rupiah per propagule to local communities for planting. Numerous propagules died on the side of the road after collection and placement in polybags by communities due to lack of coordination with collectors.

Propagules were also provided by contractors, some of whom procured stock from mainland Sumatera, Java and as far as Bali and Lombok. As an example, 1,000,000 propagules were planted in this way in an area of 100 hectares in Banda Aceh. Propagules were chosen to reduce handling and cost. No external technical assistance was sought beside Forestry Department personnel and local community. Propagules were planted at 1 meter spacing with an actual range of 20cm – 1 meter spacing noted in the field.

Hydrological measurements were reportedly taken, such as tidal data and substrate composition, but no mapping of the tidal zone was undertaken. No records were available for inspection as Satker records are no longer accessible.

#### *Monitoring and Evaluation*

Some baseline data was collected on previous condition of mangrove area planted. It was reported that *Rhizophora mucronata* and *R. apiculata* grew in the area and was destroyed both due to tsunami damage and human disturbances. There was supposed to be monitoring of BRR rehabilitation activities, of the following three areas

- 1) Determine the extent of areas, including mangroves and coastal forests, that are undergoing rehabilitation.
- 2) Determine the types of plants planted in the rehabilitation areas.
- 3) Determine the percent of plants growing and surviving in the rehabilitation areas.

However, according to the interviewed officers of BRR, ***There was no monitoring or maintenance plan for the BRR/Dept of Forestry effort.*** Control of mangrove planting (rudimentary checks of whether or not the planting occurred, not to be mistaken with monitoring) was carried out by Department of Forestry. The project is considered satisfactorily completed. Although no monitoring data is currently available, BRR officials stated that 60% of overall planted materials had survived. It must be said, that although officers interviewed claimed no monitoring took place, BRR reports do exist with survivorship percentages for some project sites in most districts in Aceh and Nias

Island. MAP-Indonesia followed up with a field visits to select sites the day after the interview, the results of which appear in the next section.

#### *Documentation and Dissemination*

Preparation of a report on coastal rehabilitation (Rehabilitasi Hutan Mangrove Dan Hutan Pantai Di Kawasan Pesisir NAD) and an Atlas. No clear dissemination plan. A final report and photos were prepared, but this could not be presented as it was packed away. No dissemination plans for the report.

#### *Special Questions for BRR*

As a coordinating body, BRR was responsible for dissemination of information on mangrove rehabilitation to over 70 non-government organizations and numerous agencies working in Aceh. Larger coordination efforts, such as the FAO planned on using the BRR as a dissemination point of regional information in and out of Aceh. As a coordinating body, the following questions were placed to BRR to determine their role as a clearing house for information.

- 1) Q: *Did BRR have access to a methods on mangrove rehabilitation?*  
A: Yes, field staff had the technical manual put together by the Forestry Department
- 2) Q: *Did BRR disseminate information on mangrove rehabilitation methods?*  
A: No, the method was only used by us in our own mangrove rehabilitation program.
- 3) Q: *Do other organizations' mangrove rehabilitation efforts synergize with national and provincial goals for coastal planning?*  
A: BRR, as an extension of the government, has the goal of coordinating programs undertaken by other organizations and agencies in Aceh, but in practice not all of these organizations coordinate with BRR so that monitoring by BRR of other organizations activities does not, by and large, take place.
- 4) Q: *Did the BRR (or Forestry Department) hold mangrove rehabilitation trainings for other stakeholders? If so, is there a training curriculum?*  
A: No trainings were held.
- 5) Q: *Have you ever heard of the concept of a coastal greenbelt?*  
A: Yes, but the BRR policies and programs are not connected to this program? [Here they are referring, presumably, to the Green Coast Program]
- 6) Q: *What activities are allowed or not allowed in a coastal greenbelt? Pick all that apply; reforestation, aquaculture development, infrastructure development, human settlements.*  
The BRR is not involved in the policy of coastal greenbelts regarding zoning. This is set by the national government.

### 2.2.3

Agency/Organization	<b>Australian Red Cross – Simeulue Island Program</b>
Staff Interviewed	Paul Drossou – Head of Office, Melissa Bentivoglio, Livelihoods Officer
Date and Time	June 15, 2007

#### *Overview*

The Australian Red Cross was purely on a short to medium - term disaster relief mission in Aceh and Nias. They maintained a head office in Banda Aceh with support and supervision from Melbourne and Dubai (International Federation of Red Cross). This specific mangrove rehabilitation project took place on the island of Simeulue, where ARC was delegated 7 villages stretching from Sinabang to Teluk Dalam along the North East and central Northern coast. This northern coast was home to relatively undisturbed mangroves, especially in the Teluk Dalam region. Most mangrove habitats were disturbed by seismic uplift which took place both during the tsunami as well as the March 2005 Nias-Simeulue centered earthquake. ARC had no previous experience in mangrove rehabilitation, but ran programs on Health, Water & Sanitation and Livelihoods. Mangrove rehabilitation took place under supervision by the livelihoods division.

#### *Project Planning and Implementation*

The need for mangrove rehabilitation was identified by local communities from four of seven villages working with ARC. Communities were interested in restoring mangroves to improve fishing livelihoods and protect their villages from the effects of storms and waves. The livelihood's team was delegated the task of organizing and implementing mangrove rehabilitation. A pair of external consultants were called from Bogor, but after two "field days" dressed in formal clothes without a trip into the mangroves, were excused from duty. One ARC livelihood staff was previously trained in terrestrial forestry and provided technical instruction.

A logical framework matrix was used to plan the logistics of the project. No provisions for hydrological investigations were made. The LFA matrix has been made available by ARC. In the LFA matrix, the risk of mortality was identified. Monitoring of seedling survival was proposed in order to assess success and alter the program if significant failure was noted. After preparation of the LFA matrix, funds were requested from ARC-Melbourne. No changes to the program were made during project appraisal.

#### *Technical Considerations*

No provisions were made for tidal range, hydrological needs, or species selection. Seedlings, all of the genus *Rhizophora*, were brought in from Teluk Dalam - Simeulue Island and North Sumatera. The condition of seedlings was often poor, especially those from North Sumatera. Seedlings were either held in nurseries or planted directly. After noting that polybag removal was causing mortality, seedlings were planted with polybags still attached. Seedlings were planted in rows at 1 meter spacing without attention paid to tidal zone limits. 55,000 mangroves were planted in the four areas.

A bamboo fence was erected in one of four planting sites and a wire fence in second site where it was feared that trampling and grazing by water buffalo would damage seedlings. Two sites, Teluk Dalam and Linggi villages, experienced overlap with the Watershed Management Agency (BP-DAS), who also were engaged in mangrove rehabilitation as part of the BRR program. As ARC was designated to work in Teluk Dalam and Linggi villages by BRR, and was in contact with BRR, this overlap brings up questions of lack of coordination on behalf of BRR.

#### *Monitoring and Evaluation*

Baseline data was collected but disregarded the counting of naturally occurring seedlings in the planting area. Follow-up monitoring occurred as little as two weeks and as late as 9 months after planting activities. Monitoring revealed that 1% survivorship was experienced at two sites, with 75% survivorship at a third and 65% survivorship at a fourth site. All sites proved worrisome, however, as mortality increased each week away from planting. Water buffalo, which out-number humans on the island, were chosen as the main culprit for the low survivorship of seedlings.

Monitoring results as well as planning documents and reports were sent to MAP-Indonesia and a contract offered for assessment of the rehabilitation effort. Two MAP-Indonesia field technicians undertook a week long assessment, followed up by a workshop for communities on ecological mangrove rehabilitation, livelihoods and community based coastal governance. During this process, the team made several important discoveries;

- The North Coast of the island had experienced between 25 cm – 100 cm of seismic uplift due to the tsunami and subsequent earthquake.
- The tidal range of the North Coast of Simeulue measured between 75-80cm.
- Some of the mangrove forests on the island had been lifted entirely out of the tidal zone.
- Half of the mangroves planted at each restoration site were planted entirely outside of the tidal zone. Because all planted material were *Rhizophora* spp. an even greater majority of propagules and seedlings were planted entirely outside of their normal range of tidal requirements.
- Water buffalo were certainly not the main reason behind the demise of planted seedlings.

After assessment and evaluation, the workshop and subsequent activities were planned to improve upon mangrove rehabilitation. Unfortunately, additional funds were not allocated by ARC to effectively improve upon failed rehabilitation efforts, due to the short-term nature of a disaster relief agency and the proximity between assessment/evaluation and project completion. Trials of human aided propagule distribution was attempted in two villages as a follow-up measure, but of inadequate scale to affect real change.

#### *Documentation and Dissemination*

Initial planning documents and monitoring data from the ARC are available from ARC upon request. The MAP-Indonesia assessment, as well as workshop proceedings can be requested from MAP-Indonesia ([seagrassroots@gmail.com](mailto:seagrassroots@gmail.com)) or online at [www.mangroveactionproject.org](http://www.mangroveactionproject.org)

**3.0 Provide a thoughtful and thorough analyses on the successes and failures of the restoration and conservation work carried out by these 3 agencies, looking at aspects such as: general observations, achievements, gaps and problems, suggestions for improvement and gender considerations.**

**3.1 General Observations**

Pak Hendra (Coordinator of Coastal Rehabilitation, USAID – Environmental Service Program, Banda Aceh) made the following observation with regards to post-tsunami coastal rehabilitation efforts. “Most organizations involved in mangrove and coastal restoration, did so without proper or accurate technical guidance, not paying attention to transportation of seedlings, appropriate planting locations which support healthy growth of various species, and not involving communities in planning, implementation or maintenance. The programs are looked upon as ‘one-off projects,’ with communities perceived merely as ‘labor’ and not long-term stakeholders with vested interests in the success of the program.”

It would be accurate to add that none of the government agencies and none of the short-term relief agencies had a vested interest in genuine coastal rehabilitation; that being rehabilitation of a functioning coastal ecosystem. Organizations with more experience, and longer-term presence in the region, such as Wetlands International or USAID-Environmental Service Program, paid significantly more attention to developing successful coastal rehabilitation programs to the best of their abilities; using science-based methods, genuine participation of local communities, and planning for long-term recovery. Nonetheless, specifically in the realm of mangrove rehabilitation, even Wetlands International largely ignored ecological considerations needed to rehabilitate ecological resilient coastal ecosystems.

The four sections below on achievements, gaps and problems, suggestions for improvement and gender considerations elaborate on the general observations made above.

**3.2 How have organizational goals and objectives for coastal rehabilitation been achieved/not achieved?**

*Project Planning and Implementation*

Wetlands International (WI-IP) and Australian Red Cross (ARC) succeeded in genuine community involvement in both planning and implementation. WI-IP, with a greater deal of experience in community based project management did a superior job of organizing, with a major focus on capacity building of community based organizations.

WI-IP’s scheme to augment mangrove rehabilitation with a strong sustainable livelihoods component was successful from the planning and implementation point of view. Even

successfully rehabilitated coastal ecosystems take significant time for benefits to contribute to the livelihoods of coastal dwellers. Fisheries collapses in many parts of Aceh and North Sumatera were significant, due to destruction coastal habitats and fishing equipment, increase in petrol prices, etc. Integrating rehabilitation and livelihood programs, in full coordination with communities should be considered essential practice.

Additional WI goals of mangrove protection and improved governance of coastal areas have yet to be evaluated in terms of success as this phase of the project comes to completion in December 2008.

### *Technical Considerations*

The planting of *Rhizophora* seedlings and propagules, and survivorship objectives has been achieved in some planting locations by Wetlands International (in some places 80-90% survivorship and good growth, 10-40% survivorship in others), few locations by Australia Red Cross (one location experiencing at least 65% survivorship after one year and reasonable growth, total mortality in two additional sites, no recent data on fourth site), and few locations by BRR (some locations experiencing reasonable growth, although too dense). Other BRR sites have experienced either total mortality and there are instances as well of fictitious reporting (i.e. significantly less area was planted than reported and survivorship numbers were also falsified).

Insignificant numbers of other mangrove species were planted and fewer have survived.

None of the agencies had initially taken into consideration the recruitment of natural propagules to areas.

None of the agencies have actively restored hydrology.

Australian Red Cross has attempted small-scale, human aided distribution of propagules at one of four previous rehabilitation sites (Lugu Village) and at one new site (Amaiteng Village). No data on the success of this attempt has been collected yet. Original ARC survivorship goals were not met in 3 of 4 sites. This was analyzed by a team from MAP-Indonesia and a new implementation plan, taking into account ecological methods for rehabilitation, was drafted. Unfortunately resources were not allocated to carry out this plan, and it can be said that ARC rehabilitation work on Simeulue Island failed in the end.

To say that BRR's planting of 1,000,000 seedlings near Banda Aceh was excessive is an understatement. The planting area looks like a rice field from a distance, with up to 5 propagules planted per square meter in some areas, reaching densities of 50,000 plants per hectare. If the trees survive and the community does not actively thin these plantings a stunted forest will result. Over-exuberance in planting at this location is likely due to proximity to Banda Aceh (easy access and ability to showcase the site).

Wetlands International, as a major actor in the Green Coast Program, has not met the first of the program's four major goals<sup>11</sup>, that being of *restoration of coastal ecosystems*.

“The Green Coast Program aims to rehabilitate the livelihoods of coastal communities through the restoration of coastal ecosystems. Marine and coastal ecosystems support a diversity of natural life, including birds, fish & seafood and provide other services for coastal

communities such as fuel wood and potential for eco-tourism. Coastal forests also form a natural barrier, a green belt, protecting against natural disasters such as storms and cyclones.” – GC Website

Taking the project at Lam Ujong village as a representative example; initially, in what WI-IP term the “Tsunami Response Phase,” WI-IP and local communities planted approximately 45 ha. with two mangrove species: *Rhizophora mucronata* and *Rhizophora apiculata*. The area was a mangrove forest in the 1990s, before conversion to fish ponds and salt pans. This first phase of response was not restoration of a functioning coastal ecosystem, but rather establishment of a *Rhizophora* plantation in and amongst fishponds and salt pans. During a second phase of rehabilitation, termed the “Recovery Phase,” WI-IP intended to plant various other species including *Avicennia* spp, *Bruguiera* spp, and *Ceriops* spp, primarily in ditches and canals along side the fish ponds and salt pans which were to be re-developed. Even the successful development of such a “silvafisheries” system, complete with monitored livelihood benefits would not mean that WI has met Green Coast program goals of restoration of coastal ecosystems. The resultant system is low in terms of ecological resilience and naturalness. *Rhizophora* mangroves planted at 1 meter spacing in rows within aquaculture ponds and various species of other mangroves along canal edges and on dike walls is not restoration of a coastal ecosystem but rather an attempt at silvaculture.

Wetlands had its own technical considerations when considering sites for planting. These consideration are briefly discussed below.

1. Planting site is within tidal range.

This is indeed an ultimately important parameter, especially as the tidal range shifted after the tsunami. There is no evidence that WI staff demarcated tidal ranges in their field sites, and there is evidence that plantings took place both below lowest low tide and above highest high tide.

2. Planting sites not located on high energy coasts

There are examples of planned WI mangrove planting projects on high energy sandy coasts, such as Gle Jong Village, Aceh Jaya where 70,000 seedlings were planned for planting, as well as the SE Coast of Simeulue Island. Further field investigation needs to be undertaken to assess if these plantings occurred and if so, were they in appropriate micro-habitats. No data is recorded for the Aceh Jaya site by WI or BRR. Data is recorded for the Southern Simeulue Sites by BRR, with 14 hectares planted and 70% survivorship, but site visits to this area show it to be predominantly high energy coast.

3. Water source for planted material from tidal waters.

Presumably this means planted seedlings should be in the tidal range. Otherwise this refers to material planted in nurseries, which should be watered by tidal waters. This is a vague consideration.

4. Salinity does not exceed 30%. Especially for *Nypa fruticans* and *Avicennia* spp.

This shows the lack of expertise of WI with mangroves. Presumably they mean 30 parts per thousand. Aside from this potential typographical error, lumping *Nypa*



*fruticans* together with *Avicennia* spp. is an odd combination. *Nypa* is dominant in the back mangrove and along riverbanks, while the most common *Avicennia* species in Aceh are found primarily at the lower mangrove, directly adjacent to the sea. *Nypa*, indeed thrives in nearly freshwater dominated environments, while *Avicennia* can withstand quite high salinities, even higher than average sea water (32 ppt).

5. The nursery should be located in the tidal zone, without high tide inundating the polybag in order to avoid loss by washing away.

OK. But again, too much focus on nursery building, and not enough on ecological mangrove rehabilitation techniques.

### *Monitoring and Evaluation*

#### Wetlands International

WI-IP is undertaking 3 years of monitoring at each site, carried out by staff and local community. Neither participatory nor scientific monitoring methods were provided, but are housed at WI-IP headquarters in Bogor. Data made available for sites near Banda Aceh correlate to actual numbers of hectares planted and survivorship. Total counts of mangroves planted and seedling survivorship 3 months after planting was conducted with all communities, most sites met goals of 75% survivorship of seedlings. Sites from further away experienced between 10-90% survivorship based on data submitted to BRR.

In terms of livelihoods, appropriate monitoring of livelihood ventures is part of the WI Indonesia program but no information was provided during interviews aside from the general success of many livelihood ventures.

#### Australia Red Cross

ARC conducted monitoring of all four rehabilitation sites, together with communities, utilizing total counts twice after planting. After monitoring, data revealed that survivorship was low in most areas. External evaluation was conducted to determine underlying causes. New implementation plans and monitoring plans were made and communities trained in ecological mangrove rehabilitation and scientific monitoring.

In terms of livelihoods, monitoring of livelihood ventures occurred and data is kept at ARC offices in Banda Aceh and Melbourne.

#### BRR

Although BRR officers stated that no monitoring took place, MAP-Indonesia uncovered a monitoring plan that stipulate all NGO's and agencies, including BRR themselves, would undertake monitoring for 2 years after implementation of mangrove rehabilitation. This data has found its way into several BRR reports.

BRR's own data from reports (where it existed) on total area planted and survivorship were not substantiated by findings in the field. The interview with BRR primarily discussed a single planting project of 1,000,000 seedlings in 100 hectares at Lambaro Skep Village, Kuta Alam District, Banda Aceh. Unfortunately when asked about monitoring data, MAP-Indonesia staff was told no monitoring took place. Even technical reports on the project were already packed away and inaccessible. The officer being interviewed was quite obviously not interested in being interviewed and was constantly

text messaging throughout the process. Field observations of this planting, however, do indicate that numerous seedlings were planted and many are surviving, albeit at extremely high densities and experiencing slow or even stunted growth rates.

This specific planting of a 1,000,000 mangroves was not referred to in BRR's own publication; – "Mangrove and Coastal Forest Rehabilitation in Nanggroe Aceh Darussalam," which is a final report presenting data for all NGO and agency mangrove and coastal forest rehabilitation activities in each district.<sup>12</sup>

Another discrepancy can be seen in this same report (see excerpted table below), regarding data for Simeulue Island,

Tabel 4.28 Kegiatan Rehabilitasi Hutan Mangrove di Kabupaten Simeulue

No	Kecamatan	Desa	Jenis Tanaman	Luas (Ha)	Tahun Tanam	Persentase Tumbuh (%)	Pelaksana
1	Teupah Barat	Bunun, Awe, Seubai, La Anyon	<i>R. apiculata</i>	2	2006	70	WI-IP
2	Teupah Selatan	Ds. Kawat Ds. Gudang Labuan Bakti	<i>R. apiculata</i>	6	2006	t a d	WI-IP
		Pantai Ana Ao	<i>R. apiculata</i>	6	2006	70	WI-IP
		t a d	<i>R. mucronata</i> <i>R. apiculata</i>	25	2007	Pemeliharaan	BP DAS Krueng Aceh
3	Simeulue Timur	Lantik, Linggi	<i>R. mucronata</i> <i>R. apiculata</i>	100	2006	55	BP DAS Krueng Aceh
4	Teluk Dalam	t a d	<i>R. mucronata</i> <i>R. apiculata</i>	100	2006	56	BP DAS Krueng Aceh
				239			

Sumber: BP DAS Krueng Aceh, 2008 & WI-IP, 2008

t a d = tidak ada data

Key: Kecamatan = District, Desa = Village, Jenis Tanaman = Species, Luas (Ha) = Hectares Planted, Tahun Tanam = Year Planted, Persentase Tumbuh = Percent Growth [survivorship], Pelaksana = Implementing Organization.

MAP-Indonesia field staff are familiar with both sites 3 and 4 in the table above, from Linggi and Teluk Dalam. The Linggi site indeed hosts a sign claiming 100 hectares of mangroves planted, but in reality, only approximately one to two hectares were planted according to local villagers and direct site survey. All initial plantings died in during the first rehabilitation attempt, with reportedly 55 percent surviving after a second planting (which took place on land of less than one hectare). As for the Teluk Dalam site, a total of no more than 2 hectares was planted (confirmed by villagers and direct site survey). These plantings also experienced high mortality after the first planting and better survivorship after the second planting. At least half of all seedlings from both sites were planted well outside of the entire tidal range! While 55% and 56% survivorship may be accurate for this second planting within 3-6 months of planting, monitoring needs to take place over a longer period. False reporting of restoration coverage area is a major institutional issue that has been taking place for amongst Indonesian government agencies for decades. It is recommended that the Ministry of Finance would be the best institution to further investigate and resolve this issue, as it represents a significant drain on annual government budgets.

### 3.3 What the gaps and problems were?

### *Project Planning and Implementation*

One problem with planning that plagued all agencies interviewed was the inadequate identification of risks and assumptions. All of the project officers interviewed stated that no significant risks were identified during project planning, however Logical Framework Matrices were prepared with columns specifically for identification of risks at each level of planning (goals, objectives, outcomes and activities). All organizations were able to identify problems during and after implementation, inadequate anticipation of problems points to the need to planning assistance, perhaps a manual specifically for planning a mangrove rehabilitation project including step-by step preparation of an LFA matrix.

Proliferation of community based organizations supported by Wetlands International will be a challenge. In the post-tsunami reconstruction era, with so many NGO's and agencies providing money, food, houses, etc, communities can easily develop a mentality of becoming reliant on "hand-outs." This was discussed in all interviews and is a real phenomena which plagues disaster relief efforts, the seriousness of which depends on the scale of disaster aid as well as the pre-existing social capital of affected communities.

Cash for seedling production and planting, as is common practice with the Forestry Department and in this case BRR, seldom results in ownership and long-term stewardship of planted trees. This is contradicted by the BRR who state the reverse; that buy not paying communities to plant mangroves jeopardizes their ownership of the project. This is an underlying discrepancy between standard operating procedures of NGOs and government. NGO's in Indonesia, have a better track record of developing a sense of ownership by communities for reforestation projects.

The WI scheme, of providing small business loans without payback for exhibited success in mangrove maintenance (>75% at 3 months), is certainly not a long-term incentive for mangrove protection. We do not doubt that there is genuine interest amongst some coastal community members in protecting mangroves, but awareness programming can also be improved. Some fisherfolk interviewed about the mangrove rehabilitation effort in Banda Aceh had no idea of the importance of protecting mangrove and others complained that mangroves planted in ex-fishpond areas would inhibit them from fish farming. Continued participation and dialogue are the only solutions to these types of problems.

There were numerous instances in Aceh, of mangrove seedlings planted directly in aquaculture ponds. Many of these ponds would still have been in use had they not been damaged by the tsunami. Many of the ponds were planted by government agencies without community involvement. Even WI-IP projects had high incidence of planting in aquaculture ponds, which confused community members, perhaps those not involved in the planning process. Indeed, this simplified understanding of what a silvofisheries system is on behalf of the government as well as NGO's needs to be improved upon. Planting mangroves directly in ponds is not silvofisheries, it is likely bad for pond operations and certainly not a recommended method for the proliferation of mangroves in a healthy coastal ecosystem. Alternative silvofisheries methods exist which either do not disturb the hydrology of mangroves or simply augment a functional aquaculture pond. Improved distribution of information on appropriate silvofisheries methods is recommended.

### *Technical Considerations*

Most mangrove restoration projects fail completely, or rarely achieve their stated restoration goals (Field, 1999, Lewis, 1999, 2000). Most mangrove restoration is not ecological restoration, but silviculture. Ecological restoration emphasizes restoring the entire ecosystem, and all species within it. Silviculture aims for one or a few species for specific benefits, such as wood production, or storm shelter. An ecologically based restoration has a greater chance of long term success, as it re-creates a system with higher resilience.

One of the main goals of the Green Coast program is ecological rehabilitation of the coastal zone. Wetlands International carried out ecological assessments in rehabilitation sites, nonetheless ecological considerations appear to have played either minor or no role in rehabilitation planning and implementation. Although planting success was high in some project areas, rehabilitation of functioning coastal and mangrove ecology was seldom considered in project planning or implementation. None of the sites considered promotion of natural recruitment of volunteer species or hydrological requirements of various mangrove species for planting. Perhaps this was due to assessment that propagule limitation was a significant (a valid concern given the extent of tsunami destruction and the extent of previous destruction of mangrove habitats), but assessing propagule limitation is not mentioned in any plans or reports by any of the institutions. A minimal number of species were considered for mangrove planting, predominantly *Rhizophora* spp. and *Avicennia* spp. when at least 21-28 species exist in natural mangrove stands in the region.

Physical and social constraints existed, requiring rehabilitation efforts to take place within and adjacent to fish ponds. Nonetheless, attempts to identify and demonstrate rehabilitation of resilient, specious mangrove ecosystems would have been necessary to align with Green Coast goals of ecological rehabilitation.

As Wetlands International relies on its own staff and methods for then most part for planning and implementation, it would seem that either WI should recruit ecologists, adopt ecologically-based methodologies, or contract out for rehabilitation consultants with proven hydrological and ecological credentials. An example of the need for improved expertise comes from an assessment undertaken by WI-IP experts for CARE International on the Southeast coast of Simeulue Island. Sites investigated by WI consultants on high energy coastline did not traditionally support mangroves, nonetheless recommendations were made for multi-million dollar engineering works to create protected areas for mangrove afforestation, reportedly “to protect vulnerable coastline from effects of storms and waves.<sup>13</sup>” CARE International staff were disappointed with the results of this assessment (rightly so) and no follow-up work was commissioned.

### *BRR Identification of Gaps and Problems.*

The BRR, in their report on mangrove and coastal rehabilitation, report their own opinions about Gaps and Problems encountered during implementation. These are listed in the following table.

<p>“To this point mangrove and coastal forest rehabilitation has been underway since 2006. Success has been hindered by the following factors.” - BRR</p>	
<p>1. Rehabilitation activities implemented to close to the emergency were rushed and not well coordinated, resulting in low levels of seedling survivorship</p>	<p>6. Transferring understanding about silvofisheries methods to communities is still a short-coming, and the presence of mangroves planted in fishponds seem out of place to communities.</p>
<p>2. Several organizations that undertook rehabilitation did so only as side projects, so that attention and focus on the rehabilitation was less than optimal.</p>	<p>7. The quality of mangrove seedlings and coastal forest seedlings was low, especially those from outside of Aceh. Millions of seedlings arrived at nursery sites dead or damaged.</p>
<p>3. Many organizations, both national and international were bound by contracts to donor agencies and were forced to report success quickly, so that activities were carried out without thoughtful planning. There were, however, some NGO’s who were very focused in their efforts.</p>	<p>8. Poor choice of species which were not well suited for the rehabilitation areas, and lack of feasibility study at planting sites.</p>
<p>4. Instances of organizations which undertook mangrove rehabilitation without support from human resources who truly understood mangroves and coastal ecosystems. Their knowledge only extended to total area planted, total seedlings planted and cost but in terms of technical information, did not pay attention to site location, species selection and planting method.</p>	<p>9. Aquaculture pond development and rehabilitation was forced to sacrifice mangrove plants that were previously growing or planted in the pond areas.</p>
<p>5. Funds allocated to rehabilitation were not optimal, for instance funds to plant seedlings were available but not funds for maintenance. There are also instances of organizations who did not pay communities to plant seedlings and this had negative impacts on communities “sense of belonging.”</p>	<p>10. Not enough effort paid to protecting plants from grazing by livestock. Most plants grazed upon by water buffaloes and goats died.</p>

Some of the points raised above make sense, even if others require discussion, yet we will not go into detail here criticizing BRR’s comments, but offer the single comment that many of these problems should have been perceived beforehand. Too little of the mangrove rehabilitation planning took into consideration potential problems. It is all too easy to look back upon projects and find fault, and this is too often the case in Indonesia. The key of course is to learn from mistakes, preferably while the project is still being

implemented in order to initiate improvements. The focal point Part B of this report on suggested practices goes into greater detail on appropriate planning.

Coming back to specific gaps and problems, The BRR/Forestry Department planting project in Lambaro Skep Village, Kuta Alam District, Banda Aceh was investigated by MAP-Indonesia field staff. The site planted was an aquaculture pond complex with intact cement dike walls surrounded by human settlements. No attempts to restore hydrology were made and hydrology in the area is disturbed by channels, dike walls and community settlements. One million seedlings were planted and, with survivors currently 50cm – 1 meter height. Spacing between plants ranged from 20 cm to 1 meter. Large sections of this planting effort are experience stunting due to sub-optimal hydrology and tight spacing. Local community on-hand during the site visit commented that it would have been better to rehabilitate the shrimp ponds to provide benefits for the community, rather than plant mangroves. This indicates a problem with awareness building and community participation.



BRR – Site at Lambaro Skep Village, Kuta Alam, Banda Aceh. Rhizophora seedlings planted so densely they appear like rice fields.



In tact dike walls inhibit natural water flows from land and sea as well as drainage.



Lamteh, Aceh Besar – A BRR site planted by an independent contractor. This site is experiencing near total mortality in 20 hectares (only 50 trees total surviving). A case of not doing their homework in terms of ecological requirements of the species.



A limited number of Forestry Department plantings are doing well in the same area.

### *Gaps and Problems with Planting Mangroves.*

Although our main suggestion is to promote natural seedling establishment and not become engaged straight off in nursery development and planting, in some cases, especially where propagules are limited (due to previous destruction of forests or significant disaster damage), mangrove propagules need to be either distributed into an area or planted. An excellent reference for nursery establishment and planting is the JICA manual<sup>14</sup> referred to on the next page. With regards to planting, it is essential to determine and mark out the extent of the tidal zone, and to make some attempt at understanding the individual requirements of various mangrove species in terms of tidal inundation tolerances, substrate depth and to some extent water salinity and substrate type.

When planting, either propagules or seedlings, plants should have some reasonable space between them. We recommend 4-8 meter spacing. This enables natural recruits to establish themselves in between planted propagules, promoting biodiversity and allowing for the correct species to be located in the correct space (when mother nature plants them, and they grow, they are in the right place). Planting with appropriate space is also more cost effective, lessens the likelihood of stunting due to competition, allows for small boat and foot traffic, provides future habitat for fish and birds (who like open water), decreases the risk of spread of disease amongst seedlings and decreases the risk of clogging up tidal creeks and channels.

From the Green Coastal Logical Framework matrix, we read the following as an indicator (benchmark) of success.

Rehabilitation of approximately 1,700 hectares of aquaculture ponds and surrounding areas with 4,250,000 mangrove seedlings (density 2 x 2 meter = 2,500 seedlings/ hectare) and 500 ha sandy beach with 312,500 beach trees through linking with alternative livelihoods for people in the target areas.

In the Logframe we note a 2 x 2 meter density, while in the field most mangrove seedlings have been planted at 20cm to 1m spacing. This seems to be a problem of both control and understanding on behalf of field coordinators during implementation. From the interview with WI staff, it was stated that mangroves seedlings were planted at spacings 1 x 1 meter, 50cm x 50 cm and 50cm x 75 cm “based on species requirements.” There is no real scientific basis for such a statement. In nature, mangrove seedlings are distributed in a process called *hydrochory*, massive amounts of propagules produced and distributed on the tides at a single time. Seedlings sometimes establish themselves densely, other times sparsely, depending upon various factors (tides, coastal morphology, sediment type, existence of large woody debris etc.) When planting, and not counting on hydrochory for natural revegetation, it is recommended to leave adequate spacing between planted seedlings to encourage some natural revegetation.

Additional problems with BRR and other government agency plantings occurred as a portion of the work was tendered out to contractors. During the post-tsunami recovery period, numerous contractors contacted MAP-Indonesia in search of propagules and seedlings in large numbers. Most of these contractors had no previous experience with coastal rehabilitation or reforestation in general. The majority were Jakarta-based general contractors. A final problem with these contractors, was the over-production of



seedlings. MAP-Indonesia was contacted in 2007 and offered to purchase 8 million remnant seedlings, due to overproduction from the tender process.

#### *Monitoring and Evaluation*

##### Wetlands International

Staff interviewed reported 90% success for mangrove plantings, and 99-100% success in many places. Data reported from WI to BRR substantiate some sites exhibiting 85-95% success, but also list success rates of 10, 20, 30 and 40% in numerous other sites. WI monitoring protocol and data are stored at WI-Indonesia Program headquarters in Bogor. Evaluation of the WI program was done internally, perhaps an in-depth external evaluation should be considered.



##### BRR

In BRR's final report on coastal rehabilitation efforts, they BRR's own projects have experienced between 10-80% success in some sites, no data is available in other sites, and some sites are still under "care," with no data available. What is worrisome is that raw data is now inaccessible and there seem to be no plans for continued monitoring. When the Satker work group disbanded, it seems most of their reports, information and data became inaccessible. This is a major setback to lesson learning.

##### Australia Red Cross

Initial monitoring, and external evaluation were well conducted. Building community capacity to become engaged in longer term monitoring of at least three years was only 50% implemented. Communities were trained in mangrove restoration monitoring and provided with monitoring curriculum, but insufficient resources were provided (staff support, funding) to ensure at least 3 years of monitoring.

No monitoring has been performed aside from the initial period of internal monitoring of seedling survivorship within a few months after planting.

#### *Dissemination and Documentation*

In terms of documentation, the major resource for coastal rehabilitation used in the period was a manual entitled "*Panduan Praktis Rehabilitasi Pantai, Sebuah Pengalaman Merehabilitasi Kawasan Pesisir*," ("Practical Manual on Coastal Rehabilitation, Experiences Rehabilitation Coastal Areas"). This book put out by Wetlands International and UNEP jumps right into nursery preparation for various species of mangroves and other coastal trees. The mangrove section is copied nearly verbatim from the JICA/Forestry Department Manual "Nursery Manual for Mangrove Species at Benoa Port in Bali, 1998" As these JICA books are still in print, perhaps it would have been better to simply reprint and distribute the JICA manual. Limited information is given in the

WI/UNEP book about site selection for rehabilitation, and no information about assessment of disturbances to mangrove or other coastal habitat, hydrological considerations, tidal measurements etc. In addition, no discussion takes place on social issues surrounding coastal rehabilitation.

In looking to the literature, there is indeed a dearth of user friendly instructional manuals on coastal rehabilitation. What information is available either exists in technical papers, or as manuals for seedling preparation and species identification. MAP-Indonesia has developed a manual on Ecological Mangrove Rehabilitation, but its completion and dissemination were too late to be useful in planning or implementation of most projects in Aceh. A gap still exists in terms of user friendly extension materials and methods for community based coastal rehabilitation. This was an issue raised at the FAO Coastal Rehabilitation Coordination meeting in Bangkok, 2005, but meaningful follow-up was not achieved.

We need to restore 150,000 hectares of mangrove area per year in order to keep up with current rates of destruction. Without proper dissemination of lessons learned, most mangrove rehabilitation projects will continue to fail into the future, wasting valuable resources which are needed to resolve a host of environmental issues. We can not afford to continue wasting time and money.

### 3.4 Suggestions for improvement?

Suggestions for the overall improvement of mangrove rehabilitation project management are made in the companion paper, “Part B - Best Practices Policy Brief - Post Disaster Restoration Planning.” Below are three short paragraphs of key suggestions for improvement to the three agencies reviewed in this case study as well as a few additional suggestions that have not been fit into the body of this review.

#### Wetlands International – Indonesia Program

Mangroves are a major wetland ecosystem, especially in Indonesia, yet Wetlands International still has more general expertise in other systems. One WI staff, when interviewed about coastal rehabilitation claimed that the *Casuarina* pine was a mangrove species. Other WI consultants recommended 6 million dollars worth of engineering alterations to force mangrove growth on the high energy SE coast of Simeulue Island. And the majority of WI’s rehabilitation efforts involved planting with little care given to hydrological and ecological requirements of the species planted, no care to hydrological rehabilitation, and no real attention paid to restoration of natural functioning coastal environments, although that is a major goal of both the organization and the Green Coast Program. Wetlands could use its considerable resources to improve their own capacity in understanding and demonstrating ecologically effective and cost effective mangrove rehabilitation.

#### BRR in Conjunction with Department of Forestry

The BRR was to play a coordinating and clearing house role for mangrove rehabilitation. The BRR, however, aside from lacking any experience with mangroves, was also overburdened with general coordination of the entire post-tsunami response. Early on, BRR officials passed the coordinating role to the Green Coast Program, spearheaded by

Wetlands International-IP and WWF. Through the Green Coast Project (funded by Oxfam-Novib), Wetlands International Indonesia Programme (WIIP) in cooperation with WWF Indonesia facilitated 31 local NGOs and 29 Independent-Community. Unfortunately, trainings and materials were nearly 100% focused on nursery development and mangrove planting. In the future, a more holistic approach to mangrove rehabilitation needs to be put in place, and organizations spearheaded coordination efforts need to be fluent in the language and management of ecologically based rehabilitation as well as community based coastal resource management. Regional resources; such as expertise, training materials, general mangrove information, awareness packages, as well as planning, implementational and monitoring assistance needs to be provided to this lead agency/organization.

The Indonesian Department of Forestry has never improved on its historically poor track record of mangrove rehabilitation. They lack technical capacity and also community organizing capacity. Most projects are poorly planned, planting one or two species of mangroves without regard to prior causes for deforestation, and without regard to ecological requirements. Monitoring is seldom carried out after initial control of the planting, and there are considerable discrepancies between reported total coverage area of restoration and survivorship and actual numbers. The Ministry of Finance should be made aware of this situation, as it represents a drain on the national annual budget (APBN) and an external evaluation of reforestation efforts ordered.

Australian Red Cross

Australian Red Cross should report their experiences regarding their setbacks in terms of planning and implementing mangrove rehabilitation to the International Confederation of Red Cross. The confederation should in turn assist in the provision of protocol for to all disaster relief efforts in tropical coastal areas. ARC appropriately undertook monitoring and engaged the assistance of external mid-term evaluators, but should have allocated resources to implement mangrove rehabilitation recommendations of the evaluation team in order to meet original benchmarks for success.

*BRR Recommendations*

The following table shows BRR’s own recommendations for future coastal and mangrove rehabilitation efforts.

BRR data as well as secondary data from mangrove and coastal rehabilitation projects over the last two years, carried out by national and international organizations reveals that there are still locations in need of rehabilitation. The following recommendations are based on lessons learned throughout the rehabilitation process - BRR	
1. There needs to be a deeper awareness building and organizing process at the village level that involves all village stakeholders before meaningful rehabilitation can begin.	3. Need village level maps of mangrove and coastal forest coverage for more accurate information.
2. Feasibility studies need to be prepared for each site including information on; suitable species for planting, surrounding	4. Rehabilitation should only take place in areas which have not yet undergone rehabilitation.

environmental conditions, potential for livestock disturbance and support from local communities for mangrove planting.	5. The need for site visits after rehabilitation in order to assess whether additional planting or maintenance is needed.
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BRR and the Forestry Department in this case are coming along in terms of their thinking process. There is clear mandate for improved community involvement, and also studies of environmental conditions, but they are still stuck on planting as the main intervention, and continued planting or maintenance at difficult sites rather than assessment of barriers to mangrove establishment and growth and rehabilitation based on ecological and hydrological considerations.

#### *Additional Suggestions*

- Cost-benefit analyses of alternative livelihood developments should be performed.
- More attention paid to proximity of natural propagule sources for natural reforestation. If sources are far away >5 km, collection of propagules and human assisted distribution by hand-release on rising tides should be considered. Multiple species should be used (ex. 3 *Rhizophora* species, 2 *Avicennia* species, 2 *Lumnitzera* species, 2 *Aegiceras* species, 4 *Bruguiera* species, 2 *Xylocarpus* species, 2 *Sonneratia* species, *Nypa fruticans*, *Scyphyphora hydrophyllacea*, *Pemphis acidula*, and *Heritiera littoralis*)
- Improved distribution of information on appropriate silvofisheries methods is recommended.
- A special study on gender considerations for coastal rehabilitation undertaken by experts should be considered.

#### 3.5 Gender aspects of environmental degradation arising out of tsunami rehabilitation (e.g. different impacts on the livelihoods of women and men).

It was a short-coming of the MAP-Indonesia prepared questionnaire, not to probe into issues of gender consideration, nor did field staff include gender considerations in interviews. Programmatically, gender considerations have not been specifically tied to coastal rehabilitation. Institutionally, many disaster relief agencies and other INGO's have strong gender-based aspects of their programs which were put into practice in day-to-day community organizing and especially livelihood programs. In Aceh, there is certainly a challenge in promoting inclusion of women in decision making on natural resource management, spatial planning, and conservation. A special study on gender considerations for coastal rehabilitation is also a recommendation of this paper.

The Green Coast Program placed special emphasis on capacity building and gender. Gender is understood as part of the wider context of power relations and inequities, land tenure and access to resources and services. Hence, the project took into account the specific roles, rights and responsibilities of men, women, boys and girls. According to WI-IP field staff, this was evidenced during settlement of land disputes, where women's groups held special focus discussions. It was also in evidence in the livelihoods segment of coastal rehabilitation.

Australia Red Cross also held special meetings with women in both mangrove rehabilitation planning as well as coastal livelihoods programs. Especially in terms of livelihoods, ARC worked through PKK groups (government development program for women), holding trainings on Non-Timber Forest Product production and marketing in each partner village, and following-up with support for small-scale livelihood development and cooperative forming. In terms of mangrove rehabilitation, 50% of the participants in the training held by MAP-Indonesia and ARC were women, who participated in all activities including learning Ecological Mangrove Rehabilitation, coastal mapping, non-timber forest product and fisheries processing, and coastal policy sessions.

The BRR and Forestry Department, already weak in terms of community organizing, had no special considerations for gender based programming.

In terms of differential impacts of rehabilitation on the livelihoods of men and women in Aceh, we offer to sketch out our thoughts on the matter, but it really deserves special investigation by a team with more experience on gender matters. As it stands, coastal livelihoods in Aceh differ greatly in populated areas and rural areas. Populated areas, before the tsunami, had a larger concentration of privatized coastal areas such as aquaculture ponds and salt pans. Aquaculture ponds are mostly managed by men, with women helping in times of harvest, processing (if any processing takes place) and sales. Salt pans are managed by men and women alike. As many aquaculture ponds and salt pans were destroyed by the tsunami, livelihoods of coastal communities (men and women alike) were drastically affected. Men also were involved in capture fisheries, in both populace and rural areas, with women again playing more of a processing and sales role. Tsunami damage to boats, fishing gear and coastal habitats, coupled with the rise in price of fuel and other necessities for fishing, has decreased fishing opportunities in post-tsunami coastal life. This places a heavier demand on inshore livelihood activities, which were realized as re-construction of housing and infrastructure and to some extent farming after the tsunami. An additional livelihood activity that is undertaken in rural areas is subsistence fisheries in coastal habitats such as mangrove forests, tide pools, beach, seagrass beds and mudflats. These activities were undertaken by men and women alike, but mostly fall to women and children in areas where men are involved in offshore fisheries. Coconut farming in coastal forest areas (dominated by Coconut, *Casuarina* spp. and *Cerbera manghas* as well as other beach species) was also a major livelihood in some areas, but 75% of coastally located coconut trees were destroyed by the tsunami. In these areas, communities asked for assistance in planting coconut and other directly useful trees.

Mangrove rehabilitation and coastal forest rehabilitation was desired by many communities in rural areas, where both subsistence fishing in mangroves takes place and where there is greater awareness of the value of mangrove ecosystems. In more populated areas, men and women alike are still often unaware of the value of mangrove ecosystems. Mangroves rehabilitation in many cases can be seen as detracting from coastal livelihoods as they can displace established aquaculture ponds and salt pans. This

view is shared by men and women alike. In populated areas there popular demand for rehabilitation activities only where the protective function of mangrove ecosystems has been demonstrated, either prior to or during the tsunami.

## GLOSSARY AND ABBREVIATIONS

**ADB** Asian Development Bank

**Afforestation** Creation of a mangrove forest ecosystem or plantation where previously none existed.

**Bappeda** Badan Perencanaan dan Pembangunan Daerah, *District Development Planning Agency*

**Bappenas** Badan Perencanaan dan Pembangunan Nasional, *National Development Planning Agency*

**Bapedalda** Badan Pengendalian Dampak Lingkungan Daerah, *Regional Environmental Impact Control Agency*

**BRR** Badan Rehabilitasi dan Rekonstruksi-Aceh-Nias, *Reconstruction and Rehabilitation Board of Aceh and Nias*

**BKSDA** Balai Konservasi Sumber Daya Alam, *Nature Resources Conservation Agency*

**BP-DAS** Balai Pengelola Daerah Aliran Sungai (di bawah DepHut), *River Basin Catchments Management Agency of Forestry Department*

**CBO** *Community Based Organization*

**CIFOR** Center for International Forestry

**CII** Care International Indonesia

**Coastal Greenbelt** The concept of protective vegetative cover along coastlines i.e. mangrove forests, beach forests etc, usually discussed in terms of thickness and complexity in scientific circles but only in terms of thickness in relation to policy.

**Control** Simply checking that a project was carried out or not (e.g. 100,000 mangrove seedlings planted)

**Dishut** Dinas Kehutanan, *Forestry Agency*

**DKP** Dinas Kelautan dan Perikanan (*Marine and Fishery Agency*)

**Evaluation** The process of analyzing the entire completed project to consider the successes and failures in order to improve future projects.

**GC** Green Coast for nature and people after the tsunami,” is a project funded by Oxfam (NOVIB) Netherlands over the period August 2005 to March 2007(1st phase) and then extended from April 2007 – Dec 2008 (2nd phase). The overall goal of the project is to recover and support local livelihoods in Tsunami-affected regions through the rehabilitation and sustainable management of coastal ecosystems. In Indonesia, the Project is jointly implemented by Wetlands International Indonesia Program in partnership with WWF-Indonesia.

**GPS** Global Positioning System

**GNRHL/Gerhan** Gerakan Nasional Rehabilitasi Hutan dan Lahan (*National Land and forest rehabilitation*) also known as *GERHAN*

**Hydrochory** massive amounts of propagules produced and distributed on the tides at a single time.

**ICRAF** International Center for Research on Agroforestry

**ISME** – International Society for Mangrove Ecosystems – Japan Based Network  
**ITTO** – International Tropical Timber Organization  
**IUCN** *International Union for the Conservation of Nature and Natural Resources*  
**Kab.** Kabupaten (*district*)  
**Kades** Kepala Desa (*head village*) in Aceh also known as *Kechik*  
**Kec.** Kecamatan (sub-district)  
**KUB** – Community Groups formed by WI-IP during rehabilitation and livelihood project  
**KK** Kepala Keluarga (house hold)  
**KSM** Kelompok Swadaya Masyarakat (**CBO**)  
**LSM** Lembaga Swadaya Masyarakat (*non government organization*)  
**MAP-Indonesia** Mangrove Action Project - Indonesia  
**Mangal** Mangrove Forest  
**Monitoring** The process of analyzing the current situation in a project, in order to improve the existing program.  
**MSSRF** - M.S. Swaminathan Research Foundation - India  
**NAD** Nangroe Aceh Darussalam  
**Natural Recruitment** The process by which naturally occurring propagules become distributed and established in the intertidal zone.  
**NGO** *Non Government Organization*  
**PBB** Perserikatan Bangsa-bangsa (*United Nations*)  
**PEMDA** Pemerintah Daerah (*District Government*)  
**Prop.** Propinsi (province)  
**Propagule** Fruit or seed from mangrove which is distributed on by oceanic tides and currents.  
**Propagule Limitation** When an area can not be expected to be colonized by natural sources of propagules. This occurs when healthy, fruit bearing mangroves are located to far away from the restoration site, when nearby mangroves have stopped producing and distributing adequate amounts of propagules, or when the propagules access to the restoration site is blocked (e.g. by the dike walls of a shrimp farm).  
**Rehabilitation**<sup>1</sup> Any activity which aims to convert a degraded system to a stable alternative use which is designed to meet a particular management objective”  
**Rehabilitation**<sup>2</sup> Is intended as an umbrella term that includes both restoration and creation”  
**Resilience** Ecological resilience is the ability of an ecosystem to withstand shocks while still maintaining its integrity. Social resilience is based on the ability of social systems to assist in maintaining the integrity of ecosystems, and managing various key factors to keep an ecosystem from crossing a threshold where it would become a new type of degraded system.  
**Restoration** Activities geared at transforming a damaged ecosystem into a previous natural state  
**Satker** satuan kerja, *work unit that implemented most of the mangrove rehab for BRR through the Forestry Department.*  
**Silvaculture** The planting of one or few tree species primarily for timber benefits  
**Silvafisheries** – Culture of fisheries products (fish, shellfish, crabs, prawns etc.) in conjunction with mangrove trees.

**Tidal Inundation** – The period and frequency by which the substrate in which mangroves grow are covered by oceanic tides.

**Tidal prisms** are essentially volumes of tidal water moving through a point in a creek which act to flush the creek of sediment as a self-cleaning mechanism.

**UNDP - United Nations Development Program**

**UNEP-DMB** United Nation Environment Programme- Disaster Management Branch

**UNESCO** - United Nations Educational, Scientific and Cultural Organization

**WI-IP** Wetlands International – Indonesia Programme

**WWF-I** World Wide Fund for Nature Indonesia

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<sup>1</sup> Appendix A provides contact list of participants

<sup>2</sup> Bengen, Dr. Dietrich G, DEA. “Pengenalan Dan Pengelolaan Ekosistem Mangrove,” PKSPL-IPB, 2000

<sup>3</sup> BRR – ADB – Ministry of Fisheries. Earthquake and Tsunami Emergency Support Project (ETESP-Fisheries) - fisheries sector rehabilitation and reconstruction in Aceh Barat district of Aceh Province, Sumatera.

<sup>4</sup> Personal Communication with Head of Office – Paul Drossou and Livelihoods Coordinator – Melissa Bentivoglio, Australian Red Cross

<sup>5</sup> BRR – ADB – Ministry of Fisheries. Earthquake and Tsunami Emergency Support Project (ETESP-Fisheries) - fisheries sector rehabilitation and reconstruction in Aceh Barat district of Aceh Province, Sumatera.

<sup>6</sup> BRR – “Rehabilitasi Hutan Mangrove Dan Hutan Pantai Di Pesisir Nanggroe Aceh Darussalam”, by Eddy Purwanto (Deputi Bidang Operasi) Dr. R. Pamekas, M.Eng (Kepala Pusat Pengendalian Lingkungan dan Konservasi), March 2008

<sup>7</sup> Mangrove Rehabilitation and Mangrove Rehabilitation Workshop only, does not include livelihood program funds.

<sup>8</sup> BPKRI (Ministry of Finance) Laporan kinerja BRR ekonomi & usaha - BPK RI – *Report on the effectiveness of BRR spending and operations.*

<sup>ix</sup> FAO

<sup>x</sup> The Green Coast Program in Aceh is a joint partnership between IUCN, Wetlands International, Both ENDS and IUCN with primary funding support from OXFAM Netherlands. The Green Coast Program strives to restore ecological functions in coastal areas, and develop sustainable livelihoods for tsunami victims with a focus on participatory planning with local communities and women’s involvement.

<sup>11</sup> The Green Coast Project comprises 4 (four) major activities: (1) coastal ecosystem rehabilitation; (2) the development of alternative, environmentally friendly means of livelihood; (3) the creation of village regulations that support the coastal ecosystem rehabilitation efforts; and (4) environmental education campaign.

<sup>12</sup> BRR – “Rehabilitasi Hutan Mangrove Dan Hutan Pantai Di Pesisir Nanggroe Aceh Darussalam”, by Eddy Purwanto (Deputi Bidang Operasi) Dr. R. Pamekas, M.Eng (Kepala Pusat Pengendalian Lingkungan dan Konservasi), March 2008

<sup>13</sup> Mangrove Rehabilitation Assessment by WI-IP for CARE International, Simeulue Island, 2006

<sup>14</sup> Hachinohe, Hideli et. Al., “Nursery Manual for Mangrove Species at Benoa Port in Bali,” JICA & Ministry of Forestry and Estate Crops, Indonesia. 1998