COASTAL PROTECTION AND SPATIAL PLANNING IN INDONESIA

MISSION REPORT
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1 EXECUTIVE SUMMARY

The consultant on coastal protection and spatial planning was engaged from 15 March to 30 April 2005 to carry out a forestry damage and needs assessment in Aceh Province, Indonesia and to identify the role FAO can play to assist the Government of Indonesia in post-tsunami forest rehabilitation. The consultant visited five districts in Aceh Province to assess tsunami damage to mangroves and other coastal forests. The four districts visited along the east coast did not have appreciable extent of mangroves at the time of the Tsunami. The once extensive mangroves along this coast, had been converted to aquaculture ponds over the past thirty years. The habitat conditions along most of the west coast are not conducive to mangroves, and the presence of mangrove in Aceh Barat District on that coast was found to be negligible. The dominant species of mangrove in Aceh is *Rhizophora apiculata*, with a limited amount of *Rhizophora mucronata* on the east coast. Most of the *Rhizophora* have suffered extensive damage from the Tsunami. The coastal forests other than mangroves, consisting mainly of *Casuarina* and coconut trees, were also damaged extensively. Damage to home garden trees in the Tsunami-affected villages was colossal. Evidence indicates that the impact of the Tsunami was appreciably reduced in areas with good cover of coastal forest and other vegetation, thereby reducing the loss of lives and property of the coastal population. The potential for large-scale planting of mangroves was found to be limited in the five districts visited, but further assessment is needed in the other affected districts.

The mission recommends:

- prohibiting the clearing of mangroves for large-scale new *tambaks;*
- establishing green belts – mangroves, other coastal forest, live fences and trees in home gardens – for sustainable livelihoods and as protective belts in coastal villages;
- encouraging the implementation of integrated coastal area management and developing and implementing Integrated Coastal Zone Management Plans (ICZMPs) in the coastal zones.

2 INTRODUCTION

The Indian Ocean Tsunami that occurred on 26 December 2004 caused serious damage to properties and ecosystems as well as loss of lives and livelihoods within coastal communities in Indonesia and seven other countries.

Aceh Province in Indonesia, which was close to the epicentre of the earthquake that created the Tsunami, sustained particularly heavy loss of lives, destruction of livelihoods and of infrastructure, and impacts on the coastal environment and coastal ecosystems, including coastal forests and mangroves.

Indonesia has made good progress in identifying needs for rehabilitation and reconstruction. Eleven working groups set up by the Ministry of Planning, BAPPENAS (the National Development Planning Agency), produced a Master Plan for Aceh and Nias Rehabilitation and Reconstruction. It was signed by the President of the Republic of Indonesia on 15 April 2005 and officially issued as Presidential Regulation (PR) No. 30/2005.

Issues pertaining to coastal protection including rehabilitation of mangroves and other forests for coastal zone protection as well as other related purposes were handled by the Working Group on Spatial Planning & Land Policy, and Environment and Natural Resources. The details are provided in Book 2 of the Master Plan (Natural Resources and Environment, BAPPENAS, April 2005).

3 APPROACH

In carrying out his terms of reference (TORs) (see Annex 1), the consultant used the following working methods:

- Held discussions with planners, policy-makers and forestry officials at the national, provincial and district levels:
  - Ministry level – with Ministry National Development Planning Agency (BAPPENAS), Ministry of Forestry, Ministry of Marine Affairs and Fisheries, and the Ministry of Environment;
  - Provincial level – with the provincial forestry staff at Banda Aceh;
  - District level – with the forestry staff in five districts in Aceh Province.
  - International organizations, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Development Programme (UNDP), Habitat and the International Labour Organization (ILO), and research organizations – Center for International Forestry Research (CIFOR) and the International Centre for Research in Agroforestry (ICRAF).
- National NGOs were also consulted for their inputs and views. Subsequently, a review of available reports on the Tsunami damage and study of the aerial survey CD of the Tsunami-affected areas were carried out. The aerial survey covered nearly 717 km, 437 km of the east coast and 280 km of the west coast of Aceh Province, and up to 7 km inland.
- Field visits were made to Tsunami-damaged villages and shorelines to assess:
  - damage to mangroves and coastal forests;
  - damage to home gardens particularly to trees;
  - potential for rehabilitation and planting of mangroves;
  - potential for establishment of trees on shores;
  - potential for live fence establishment;
  - communities' perceptions of green belt establishment, particularly mangrove rehabilitation.

Extensive field visits were made in Banda Aceh and Aceh Besar District (see Figure 1).Visits were also made to Pidie, Bireuen, and Aceh Utara Districts on the east coast and Aceh Barat District on the west coast. Aceh Jaya District, the only district along the west coast of Aceh Province that is reported to have moderate mangrove areas and is said to have suffered substantial Tsunami damage, could not be visited due to inaccessibility at the time.

A locally recruited forestry graduate was attached to the mission from 1 April. The provincial forestry office provided two forest officers who accompanied the mission and prepared the maps for selected villages for the purpose of green belt establishment.

4 ASSESSMENT OF DAMAGE TO THE ENVIRONMENT

4.1 Reported damage

The estimates of damage and loss to the environment as reported by various agencies are given in sections 4.1.1 and 4.1.2.

4.1.1 BAPPENAS[1]

The monetary damage to the environment according to BAPPENAS is estimated at Rp 6 180 billion, of which Rp 1 437 billion represents direct damage to environment and Rp 4 744 billion are losses in environmental services.

Table 1. Summary of damages and losses to the Environment (Rp billion)

Category	Area affected	Damages (Rp billion)	Losses (Rp billion)
Coral reef loss	97,250 ha		3,091
Mangrove loss	25,000 ha		1,099
Seagrass bed loss	600 ha		21
River mouth rehabilitation	7.5km	21.4	
Shallow well restoration	1,000 wells	9.3	
Forest loss	48,925 ha		204
Debris clearing		316	
Coastal area restoration	300 km	1,374.5	
Lost land use	53,795 plots		328
Total		1436.8	4,744

4.1.2 Report of the Ministry of Environment (2005)[2]

- Many natural ecosystems (mangroves, coral reefs, near shore zones and the coastal strip) were damaged, leaving them more vulnerable to possible future events such as high tides.
- There was some impact on coral reefs and mangroves but its extent is unknown.
- The total area of coral reefs off Aceh was 409 km2 – an average of 30 percent is estimated as damaged based on the World Conservation Monitoring Centre.
- Only small patches of seagrass occur off Aceh, but are likely to have been impacted through silt disturbance and later sedimentation.
- Uncertainties regarding the future for rice farming, coconut plantations, tambaks and open sea fishing;
- Up to two meters subsidence of the land in some areas.

4.2 Findings

4.2.1 Mangroves

The east coast habitat of Aceh Province is more conducive for mangroves than the west coast, except for Aceh Jaya District. Wetlands dominate the west coast in Aceh Barat District,

[1] *Indonesia Preliminary Damage and Loss Assessment: The December 26, 2004 natural disaster.*
[2] *Preliminary Report, Rapid Environmental Impact Assessment, Nangroe Darussalam and North Sumatra.* Ministry of Environment. 18 January 2005

whereas steep shorelines do not favour mangrove habitat in Nagen Raya District. Therefore, except for the district of Aceh Jaya, the west coast is mostly devoid of mangroves. Those that are there are found in sheltered areas, estuaries and along the river margins near the coastline.

The east coast of Aceh is reported to have once had dense mangrove forests, but during the last three decades most have been cleared and converted to "*tambaks"*, or aquaculture ponds which mainly produce shrimp for export. Commercial exploitation of mangroves for charcoal production has also degraded vast areas of mangroves along the east coast.

It was evident that the extent of mangroves prior to the Tsunami in the five districts visited was negligible, occurring in very small patches or as isolated trees around *tambaks* (aquaculture ponds, mainly for shrimps). Most of the mangroves, mainly *Rhizophora apiculata,* in modest contiguous units were damaged severely by the Tsunami. Only the tops of *Rhizophora* were broken with no evidence of uprooting, thanks to prolific, widespread and well-entrenched root system. One or two individual *Rhizophora* are standing firmly close to many *tambaks* in the affected areas.

Rhizophora apiculata is the dominant species of the mangroves along with a limited amount of *Rhizophora mucronata.* Only a few individuals of two other species of mangroves, *Avicennia* and *Sonneratia*, were observed in the districts visited, indicating a very poor diversity of mangrove species.

Since the late 1970s, most of the mangrove habitats in the Tsunami-damaged east and west coasts of Aceh Province have been converted to *tambaks*. Many *tambaks* were damaged by the Tsunami in Aceh Besar, Pidie, Bireuen, and Aceh Utara Districts along the east coast, and including four shrimp hatcheries in the Aceh Besar District. In a few villages, the *tambaks* extend parallel to the coastline for a distance of 1–2 km and inward towards the villages for 0.5 to 1 km.

A few *tambaks* owner*s* have already started repairing damaged *tambaks*. Some *tambak* owners expressed a desire to plant mangroves in strips of land available between them.

The conversion of mangroves to *tambaks* is in progress at Langsa in Aceh Timur District, southeast of Lhokseumawe, which was not very much affected by the Tsunami (see Figure 1). A ten-year old plantation belt of *Rhizophora*, 50 m wide, 500 m long, thrives well in Langsa. *Tambak* development threatens the remaining mangroves along the east coast, south of Lhokseumawe.

Rhizophora will be the main species used in the rehabilitation of degraded mangroves. However, other species of mangroves, such as *Avicennia* and *Sonneratia*, should also be used to improve the diversity of the mangrove ecosystem. Propagules of *Rhizophora* are in abundance in Langsa and could be procured from local people at Rp 0.5 per propagule. For large-scale planting, the strategy would be to send individuals from the respective districts to Langsa to procure the required number of propagules, transport them to the planting sites and raise them in nurseries. Extra care is needed not to damage the growing parts of the propagules during transportation. A spacing of 1.5 m x 1.5 m is recommended for planting *Rhizophora*. The species can tolerate high inundation – support with pegs would improve survival rates and reduce damage from waves. Participation of the local people in protecting the planted propagules against trampling by cattle is critical for survival. Damage from crabs is also common with *Rhizophora*.

There is widespread interest among the local communities, forest officers, and both national and international NGOs to rehabilitate degraded and deforested mangrove sites. On his own initiative, a villager from Banda Aceh has collected around 50 fallen *Rhizophora* propagules and planted them in the creek nearby. Oxfam is promoting the planting of *Rhizophora*

propagules in Cadak village in Aceh Besar District, under the cash-for-work scheme, paying Rp 250 per propagule planted. Another local NGO, Yayasan Lahan Ekosistem Basah (LEBAH), has raised a *Rhizophora* nursery and planted nearly 0.1 ha with propagules in a different locality at Cadak village. Many private individuals have collected *Rhizophora* propagules from Langsa and are selling them to interested persons and organizations. *Rhizophora* propagules in polypots (30 cm x 20 cm) are sold at Rp 2 500 per plant in Banda Aceh. The *Rhizophora* are fruiting and shedding propagules abundantly in Langsa.

Concentrated effort is needed to plant mangroves in all possible sites, even small ones. It is possible to plant adequate numbers of *Rhizophora* propagules in isolated patches in many coastal villages. Degraded mangrove areas, mouth of rivers, riverbanks, bunds between *tambaks*, and abandoned *tambaks* are sites that could be planted with mangroves. Increasing mangroves would have positive environmental benefits (e.g. fish production) and, depending on the site and the extent of planting, for coastal shorelines protection.

The mangrove ecosystem has direct and indirect connections with inland and coastal resource systems. Mangrove conservation and sustainable use therefore depends greatly on integrated planning that should encompass all aspects of the human, physical and biological aspects of the entire coastal zone.

Mangroves are just one constituent of the coastal ecosystem, whereas there are many others such as coral reefs, seagrass and other coastal forests. Indiscriminate clearing of mangroves for *tambaks*, charcoal production and settlement has already depleted the mangrove resources, and mangrove destruction is still continuing today, unabated. Conservation of mangroves cannot be planned in isolation both because of their interaction with and value to other sectors, but also because of conflicting demands on the resource.

4.2.2 Other coastal forests

The trees of the other coastal forests consist mainly of *Casuarina equisetifolia*, many of which have been damaged, some uprooted and some broken by the Tsunami. Herb and shrub vegetation was almost totally lacking on the shore except for a few patches of newly emerging *Ipomoea pescaprae*. Other tree species on the shore include *kuda-kuda* (*Dolichandrone spathacea*) and *waru-laut* (*Hibiscus tiliaceus*, *Thespesia populnea),* which had not suffered much damage from the Tsunami. The last three species are members of the associate mangrove community in the last stage of primary succession of mangrove vegetation (IUCN, 1993). *Pandanus* was observed on sandy shores, most of which had been uprooted and carried inland by the Tsunami in the affected areas. Coconut trees (*Cocos nucifera)* dominate the line of demarcation of the shore from village settlements that have also suffered uprooting damage to a varying degree. *Casuarina* and coconut trees on loose sandy soil and waterlogged sites were completely uprooted. Although coconut trees have a well-developed fibrous root system, they cannot withstand an onslaught by tsunamis on weak sites. Many *Casuarina* and coconut trees on firm soils have withstood the impact of the Tsunami on sites where damage to building, bridges and property was severe.

One effect of the Tsunami was to change the width and configuration of the coastal land. The width of the shore has been decreased along the east and west coast of Aceh Province, ranging from 1 m to as high as 100–200 m. In a few villages, the sea is very close to homesteads, and, in some instances, it has intruded into the villages. Potential for establishing other coastal forests varies from village to village and can be considered moderate. There are many areas with steep shores where it is impossible to plant any trees.

Overall, the damage to other coastal forests is extensive and the replanting requirement is immense. Most of the surviving *Casuarina* trees are more than 25 years old. *Casuarina* timber is used widely in building construction and for boat building. Planting of *Casuarina* on

an extensive scale can help meet the critical timber demand of the province. *Casuarina* trees add aesthetic value to the landscape and can help promote eco-tourism, as has been the case of a 30-year old *Casuarina* plantation in resort village around 15 km from Banda Aceh. However, procuring *Casuarina* plants or seeds may be a constraint. At least one metre tall *Casuarina* plants, priced at Rp 25 000 per plant, are required for plants to survive during high tides.

Planting of coconut saplings is in progress at Lho'nga (see Figure 1). Planted saplings are fenced using wooden materials to prevent damage from free-ranging cattle. Coconut saplings are readily available for planting,

A few palmyra palms (known as "sugar palm" in some countries) (*Borassus flabellifer*) were observed in Aceh Besar. This multi-purpose palm is suitable for planting on the shores and has many uses:

- timber – mainly as rafters in building construction;
- leaves – as fodder, thatching material for roof and fence;
- leaflets – for weaving, handicraft material.

4.2.3 Trees in home gardens

Numerous trees are found in home gardens, mainly fruit trees including coconut; Jak (*Artocarpus heterophylla*), breadfruit (*Artocarpus altilis*), mango (*Mangifera indica*), Neem (*Azadirachta indica*), *Asam sunti*, otaheite gooseberry (*Phyllanthus acidus*), water apple (*Eugenia aquea*), guava (Psidium guajava), sapodilla (*Manilakara zapota*) and arecanut (*Areca catechu*), as well as *pinang*, melinjo nut (*Gnetum gnemon*) and others – in the home gardens were completely damaged by the Tsunami.

The magnitude trees lost and damaged is quite considerable. The loss of fruit trees will adversely impact the livelihood of the communities, including from loss of cash income and from scarcity of fuelwood and timber. The average land holding in coastal areas ranges from 0.5 ha to 3 ha per household. The larger holdings have good potential for home garden development with trees as well as for agro-forestry. Many households earn substantial income by selling fruits from trees in home gardens. Furthermore, the households meet their requirement of fuelwood from the home gardens and derive income from selling timber. Currently, the Jak tree is in high demand for boat building.

There is an urgent need to promote tree planting in homesteads by establishing tree nurseries. Two villages have sent proposals to the agriculture department in Banda Aceh to supply them with fruit trees for home gardens. Establishing tree nurseries to meet the demand for fruit trees is a priority.

The contribution of trees outside forests to the timber industry is quite considerable. Nearly 60 percent of the logs sawn at a Meulaboh sawmill in the west coast originates from homesteads. Uprooted coconut trees are sawn using chain saws and used widely in house construction. On average, five coconut trees are required to produce one cubic metre of sawn timber, with a sale price of Rp 100 000 at Meulaboh. In addition to selling uprooted coconut trees for timber, live coconut trees are also sold in Aceh Barat District, mainly due to a shortage of timber for house construction.

Many trees in the urban areas have also been damaged by the Tsunami. A large number of saplings are required to replace the dead trees and for additional planting in parks, avenues, parking lots, adjacent rivers and agricultural lands. Urban trees help in maintaining natural processes (water, gaseous and nutrient cycles and support flora and fauna) and provide economic and social benefits.

4.2.4 Live fences

Live fence with *kuda-kuda* (*Dolichandrone spathacea*) and *waru* (*Thespesia populnea*, *Hibiscus tiliaceus*) is a notable feature in almost all the coastal villages in the districts visited. Tsunami damage to live fences has resulted in bent or arched trees, but uprooting of trees was not observed. In a few instances where live fences had been fenced with barbed wire, the entire fence was pushed down to the ground. Live fences certainly afforded some protection from the Tsunami to households in some areas.

The leaves of *kuda-kuda* are used as cattle fodder, whereas the *waru* timber is used in boat building. The trees have also been known to grow very close to the seashore to a height of 15 to 20 m. The branches of *kuda-kuda* are regularly cut once or twice a year and the cuttings are priced at Rp 2 000 per an average size pole – the price varies with the size of the pole. Propagation is through cuttings, which are available in adequate numbers from existing live fences. Survival rates from planting of cuttings are very high, almost 100 percent.

4.2.5 Nipa palm, sago palm (or rumbia) and rubber

Wherever the seawater has inundated, nipa palm (*Nypa fruticans)* and sago palm, or *rumbia* (*Metroxylon sagu),* have died, as witnessed mostly in Pidie, Bireuen and Aceh Barat Districts. Mortality is very high in the inundated rubber (*Hevea brasiliensis)* plantations in Aceh Barat District. The three species appear to be extremely sensitive to high salinity levels in the following descending order – rubber, *rumbia* and nipa palm. Some of the damaged nipa palm are regenerating with the onset of rains and decrease in soil salinity levels. Even though rubber has also contributed to the reduction in the impact of the Tsunami, planting of rubber near the coast should be avoided in the future. Both nipa palm and *rumbia* provide a number of useful products to sustain the livelihoods of many local communities; their habitats need protection against encroachment and conversion to other forms of land use. *Rumbia* grows mostly in the wetlands in Aceh Barat District at the edge of nipa palm stands, furthest away from the coast.

5 GREEN BELT ESTABLISHMENT AND INTEGRATED COASTAL ZONE MANAGEMENT (ICZM)

5.1 Green belt

Coastal vegetation, including mangroves, other coastal forests, live fences and trees in the home gardens, undoubtedly provided a strong line of defence against the impact of the 26 December Tsunami. If not for this vegetation, intrusion of sea water inland would have been to greater depths and damage to lives and property much more severe.

Since the Tsunami, the protective role of green belts has raised considerable interest among policy-makers and planners in the Asia-Pacific region, and earnest attempts have already begun in many countries to plant tree saplings on shores on a mass scale and to rehabilitate mangroves.

The National Development Planning Board's Master Plan (Book 2: Natural Resources and Environment, BAPPENAS, April 2005) proposed green belt development for Aceh rehabilitation and reconstruction. While a rather wide (100–300 m) belt of mangroves and other coastal forests, as well as coastal trees such as *Casuarina* and coconut along the shoreline to the periphery of village settlements, would certainly afford protection of the coastal villages from the impact of tsunamis and other coastal storm events, among other benefits, there are many constraints in achieving this objective, including:

- space close to shore inhabited by local communities, many of whom depend on the sea and *tambaks* for their livelihoods, and would resist being displaced by a green belt;

- complications in resettling involved communities, such as:

  - finding suitable alternative land to resettle villages in order to maintain the past village structure and composition;

  - the villagers' preference to live near the sea;

  - realistic compensation payments confounded by lack of land certificates for most of the land holdings, together with the destruction of available land certificates by the Tsunami.

- ambiguity in the ownership of and responsibility for coastal lands, forests and mangroves;

- high cost of planting, management and protection;

- terrain unsuitable for planting (e.g., lack of adequate space on shore, steep shorelines)

The green belt proposal in this report does not envisage forced relocation of people from their dwellings. Any programme to establish green belts must be carried out with the full participation of local communities if is to be successful. It is essential that the benefits to the communities be clear and that any related the costs (e.g., opportunity costs from alternative uses of the land) are acceptable.

5.1.1 Identification of villages for green belt establishment

The potential for green belt establishment in villages in the five districts visited was assessed. Villages that fit the following criteria were identified:

- The villages were affected by the Tsunami, even if the damage was moderate.

- There was a high potential for intervention in at least two of the following four components of a green belt: mangroves, other coastal forests, live fences and trees in the home gardens

- The community showed willingness to participate in the green belt programme.

A total of 42 villages were identified as having high potential for greenbelt programme according to these criteria (see Annex 2).

There is need to consider the extent to which the communities would be prepared to forego, even marginally, some of the benefits they have been enjoying traditionally as a consequence of green belt development. A few of the green belt measures, such as giving up a small strip of land in the *tambaks* for mangrove rehabilitation, may not be agreeable to the owners if this would curtail their income.

5.2 Integrated coastal zone management (ICZM)

Lack of clarity in the control and utilization of coastal resources, insufficient adherence to land and resource use regulations, and conflicting demands have led to abuse and degradation of the coastal environment. For example, mangrove areas classified as conservation forests

fall within the jurisdiction of the district forestry offices, and the remainder within that of the local government. However, there is no clear line of demarcation on the ground.

The Tsunami has been a force of major disruption to peoples' lives, their productive resources, their communities, the land and natural resources, and infrastructure, among other things. In the rehabilitation and reconstruction process, decisions will be made about changes in land and resource use to respond to the altered environmental, social and economic conditions. Trade-offs in land uses (including for aquaculture production, forestry and agriculture) will have to be weighed and conflicts between conflicting land and resource use resolved. For example, in planning coastal forest rehabilitation and reforestation (including establishment of green belts and home garden rehabilitation), attention should also be given to the impacts on and interaction with other sectors and productive assets (e.g. agriculture and fisheries) and impacts on the adjoining villages, and to resolving contentious issues.

Integrated coastal zone management (ICZM) is a process by which rational decisions are made concerning the conservation and sustainable use of coastal and ocean resources and space. Spatial planning is among the core mechanisms for management of the coastal zone and could play an important role in the ICZM process. The process is designed to overcome the fragmentation inherent in single-sector management approaches (e.g. fisheries, forestry, agriculture), in the splits in jurisdiction among different levels of government and in the land-water interface. ICZM is a broad and dynamic process that requires the active and sustained involvement of the interested public and many stakeholders with interests in how coastal resources are allocated and conflicts are mediated. The ICM process provides a means by which concerns at local, regional and national levels are discussed and future directions are negotiated. In order for the development and implementation of ICZM to be meaningful and successful, the participation of village communities is essential.

The European Union adopted recommendations on implementing ICZM in Europe on 22 May 2002 (European Commission, 2002). The principles of ICZM recommended by the European Union are valid and relevant to the conditions in Aceh (and elsewhere). They are:

- having a long-term view;
- having a broad, holistic approach;
- having flexible management;
- working with natural processes;
- supporting and involving relevant administrative bodies;
- using a combination of instruments;
- applying participatory planning;
- reflecting local characteristics.

Integrated coastal zone management plans (ICZMPs) can be prepared at different levels – national, provincial, district, and local, but they should be compatible with one another. Working through existing community-based organizations (CBOs), or, if absent, developing new mechanisms at for ICZM at local level, would be the fundamental prerequisite for integrated planning and developing integrated management plans.

Every village in Aceh Province has a village chief chosen by the village community. Main decisions pertaining to village development and other major actions are decided at village meetings presided by the village chief. The village chief therefore serves as the main contact to interact with communities and to form CBOs based on user group vocations such as fishers, farmers, *tambak* fishers, charcoal producers, salt producers and nipa workers. These various groups will represent the interests and views of their groups, which are vital to the development of integrated management plans.

Village planning exercises (sectoral as well as for ICZM) should be held with the participation of various stakeholders to guarantee acceptance of the plans by the entire village. In the course of planning, attention should also be given to impacts of resource use on the adjoining villages and to resolving contentious issues. Village level plans should be compatible with plans at sub-district, district, and finally at the provincial level. Conversely, development of higher level plans (national, provincial) should involve stakeholders and take into account plans at the more local level.

The villagers need training and assistance in compiling village profiles, required data and plans. The local government institutions and NGOs will clearly have to play a major role in assisting communities. This would entail building the capacities of the district institutions and NGOs to facilitate the communities.

A village level plan could consist of two main sections, *description* and *prescription* (i.e. action). The description section will give details of the village and ongoing activities such as:

- socio-economic data;
- land use supported by maps;
- utilization of natural resources such as Nipa and firewood;
- data for greenbelt establishment:
- shore width;
- potential for tree planting;
- potential for mangrove rehabilitation;
- requirements for live fences;
- plant requirements for home gardens;
- information on fisheries;
- information on aquaculture;
- information on agriculture.

The *prescription/action* section of the plan will be developed based on the details presented in the description section. Details for forestry, for example, could give details of:

Utilization:

- Nipa fronds collection (locations, quantity, fees to be paid);
- Collection of:
    - Pandanus leaves,
    - honey
    - bark
    - medicinal products
    - others;
- Firewood collection.

Details of green belt establishment:

- other coastal forests (the number and species to be planted, including location);
- requirements of mangrove plants for rehabilitation and location;

- households that would establish live fences;
- quantity and kind of plants required for home gardens to be raised at the nursery and all associated costs.

Similarly, all other user groups will develop prescription plans. All of the prescriptions of each user group will be thoroughly discussed by the various groups, and the consolidated plan will be discussed at the village level before approval. Often this process would necessitate conflict management to reconcile different stakeholders' needs.

6 BENEFITS OF MANGROVES

There was barely any material to prepare a working paper on the pros and cons of using mangroves and trees in the specific conditions in east and western coastal areas in Aceh. Hence, it was decided to present two sections for the consultant's TORs, one on the benefits of mangroves and the other on benefits of trees. It is envisaged that this will meet the intended purpose of TORs.

This section on the benefits of mangroves highlights the importance of mangroves for local communities and the necessity if ICZM for the conservation of mangroves. The situation in Aceh is comparable to what is taking place in many other countries in the region – conversion of mangroves to aquaculture ponds, agriculture lands, or for human settlements and other purposes. The pros and cons of conserving mangroves have to be weighed with those of conversion by coastal communities for other uses of the land. Economic ventures such as *tambak*s on mangrove areas are financially attractive in the short term, but not necessarily so in the long term, whereas the impact on the environment is very adverse and difficult to reverse.

6.1 Need for increased understanding of mangroves and the mangrove ecosystem

What are mangroves and what is a mangrove ecosystem? Mangrove forests are taxonomically diverse, salt-tolerant trees and shrubs that thrive in the inter-tidal zones of sheltered tropical bays, rivers and estuaries. The most diverse location for the mangroves is the Indo-Pacific region, containing approximately 40 different species.[3] They depend on terrestrial and tidal waters for their nourishment, and salt deposits from upland erosion as substrate for support. All species of mangroves are adapted to thrive in the salty coastal environment. They have developed three mechanisms for dealing with the salinity of available water:

- Extrusion – salty water is taken up and the salt is then excreted;
- Exclusion – salty water is prevented from entering the tree;
- Tolerance – the tree tissues have tolerance to high salt content in water.

Mangroves help provide for a great diversity of plant and animal life, such as shelter, nutrients and essential habitats for aquatic inhabitants such as crabs, shrimps, fish and various invertebrates, and other species such as shorebirds and monkeys. The mangroves and their association with other plants and animals constitute the mangrove ecosystem. Mangroves are one of the most productive existing ecosystems, representing an important natural renewable resource.

Many coastal communities are entirely dependent for their survival on a variety of direct and indirect products from mangroves, including a range of commercial and traditional products, both wood and non-wood. Many local people, even those living outside coastal zones, depend

[3] Mangrove Action Project - a website with detailed information on mangrove forests (available at: www.earthisland.org/map/map.html)

solely on mangroves for biomass energy.

The economic contribution of mangroves to the sustainable livelihoods of coastal communities, fisheries production and the environment is generally not reflected in countries' national accounts. There is no adequate procedure to measure the indirect benefits, whereas most of the direct benefits are obtained either free or for an insignificant fee. This has resulted in policy-makers and planners undervaluing or ignoring the importance of mangroves, the consequences of which have favoured the conversion of land for other uses.

Increasing awareness of the importance of tropical mangroves capable of providing productive, protective and social benefits has highlighted the need to conserve and manage them sustainably. In spite of the recognition of the role of the mangrove ecosystem, mangroves are being degraded and destroyed, generally at a very much higher rate than that of tropical rainforests and on a large scale through over-exploitation and conversion of mangrove lands to single-use options such as aquaculture or agriculture.

The east coast of Aceh province once had dense mangrove forests, most of which have been cleared and converted to *tambak*s during the last two decades to produce shrimps for export. Commercial exploitation of mangroves for charcoal is reported to have commenced in 1887 in Indonesia. Production of mangrove charcoal for export continued for a very long time, which degraded vast areas of mangroves on the east coast. Although there are no realistic figures on the rate of mangrove deforestation, it is envisaged that it is much higher than the national forest depletion rate.

Mangrove deforestation results in many adverse consequences. There is loss of coastline protection services and of the production potential of the rich ecosystem at the local level. Salt water seeps into groundwater and intrudes into creeks, making well-water undrinkable, reducing crop yields and turning valuable farmland into saline wasteland. Moreover, the impacts of tidal flooding become more severe. Without mangroves, the coast and riverbanks are more prone to erosion. Also, non-wood mangrove forest products such as nipa palm fronds become scarce and expensive. There is always a decline in fish and prawn catches with the loss of breeding grounds.

Large-scale conversion of mangrove lands for aquaculture and salt production is of critical concern. In Cambodia, the Philippines and Thailand, large areas of mangroves have been cleared for intensive shrimp culture. The traditional practice in the Ayeyarwaddy delta in Myanmar is small-scale backyard hatcheries. Intensive shrimp farming not only requires large areas of mangroves to be cleared, but also degrades the surrounding environment. The current degradation of mangrove areas in Cambodia is mainly due to intensive shrimp farming, charcoal production, fuelwood cutting and conversion to salt farms.

Mangroves are sensitive to many ecological factors, including changes in water flow, salinity and the physical and chemical properties of the substrate. Some causes of mangrove degradation lie outside the mangrove ecosystems, such as dams, upland logging, agricultural runoff and tsunamis. Therefore, mangrove preservation and sustainable use may be highly dependent on integrated planning processes in place. In addition, use of mangrove resources must be managed to avoid detrimental changes in the mangrove ecosystem itself.

In brief, the causes of mangrove deforestation globally can be attributed to three interrelated failures: market, policy or intervention, and information.

Market-oriented conversion of mangrove forests to *tambak*s and agriculture, pursuance of short-term policy for economic gains against long-term adverse consequences, and lack of adequate information on the status of renewable resources and natural resources dynamics

have all contributed to the degradation and deforestation of mangroves. An effective management policy that promotes conservation of mangroves should have the following goals:

- Set up a public education and awareness programme to enlist public support to prevent further destruction of mangroves by halting all unjustifiable conversion activities;
- Meet the traditional needs of the local communities while ensuring protection of the diversity of plant and animal life;
- Manage the mangrove resources on a sustainable basis within the framework of ICZM with the participation of the local communities;
- Regard mangroves as an integral part of the coastal zone rather than an ecosystem surviving in isolation;
- Conduct impact assessment on all projects in and adjacent to mangroves, prior to approval.

6.2 Uses of mangroves

The number and variety of uses and products from mangrove forests are substantial. Policy-makers, planners and resource managers dealing with mangroves should have good knowledge of the mangrove ecosystem, the potential uses of mangroves, and the impacts of such uses.

Mangrove ecosystems are thought to contain globally 60 species of trees and shrubs and more than 20 additional species frequently associated with the mangrove flora but not necessarily restricted to it. It is also believed that mangrove environment provides a habitat for dependent biota of more than 2 000 species of fish, invertebrates and epiphytic plants.

The structure and composition of mangrove ecosystem vary along latitudinal and longitudinal gradients from the giant, closed forests in Latin America to the more familiar, closed forest species of *Rhizophora, Avicennia, Bruguiera, Xylocarpus and Excoecaria* found in Asia, to the stunted shrubs in very dry conditions. Climatic and site conditions such as air and water temperatures, soil factors, and water and light availability determine the mangroves' structure and functional properties. Physical factors, such as erosion and sedimentation together with inter-tidal waves, also affect their structure.

The economic potential of mangrove forests stem from three main sources – forest products, marine products and tourism. The benefits of the mangrove ecosystem based on management options can be considered under the following broad headings:

- Preservation;
- Recreation;
- Wildlife;
- Fisheries;
- Honey production;
- Nipa palm;
- Wood production;
- Aquaculture;
- Salt production ;
- Agriculture.

6.2.1 Preservation

The benefits of mangrove preservation are that the essential ecological processes and genetic diversity are maintained in perpetuity. Mangroves, seagrass beds and coral reefs are linked together by the water masses that move in and out with the tide, and by the animals that move between these habitats. Many fish and prawn species are usually found offshore inhabit mangrove areas during part of their life cycle. Other species such as mud crabs spent most of their lives in the mangroves and move to the open sea to spawn.

The importance of mangrove ecosystems demands that many more reserves be declared protected areas as a matter of urgency in virtually every country with mangrove resources. The negative impact of declaring selected mangrove areas "preserved" is that the degradation and deforestation of mangroves in the adjoining areas tend to increase or continue unchallenged. The type and extent of human uses and the degree of dependence of local inhabitants should be subject to close examination when delineating protected areas for the preservation of their unique habitat, species diversity and what they represent. Even reserved areas can be de-reserved, as occurred in Sabah, Malaysia in 1980s when one of the largest mangrove reserves in the world was de-gazetted to permit exploitation for wood chips. One way to offer additional protection to the reserved areas is to link such areas to international conventions or programmes, such as the Man and the Biosphere Programme (MAB) and World Heritage Sites of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

6.2.2 Recreation

The mangrove ecosystem provides a range of opportunities for recreation, which is capitalized by many countries to develop eco-tourism. Managing mangrove forests for recreation help the local communities generate income from tourism and earn foreign exchange for the country if the eco-tourism sites attract foreign tourists. Crocodiles- and bird-watching are some of the major attractions of mangrove eco-tourism. Nearly 16 countries in the world are currently making use of mangroves for eco-tourism. In the Caribbean islands and the Philippines, mangrove recreational parks attract many local and foreign visitors and tourist industries have found tours very profitable. Mangroves occupy nearly 22 percent of the Australian coastline and recreation is their major use today.

There is potential for tourism in the east and west coast of Aceh Province, which if promoted could assist mangrove conservation measures. Langsa on the east coast has the biophysical and socio-economic attributes of a recreation area and could be a potential site for eco-tourism.

6.2.3 Wildlife

Wildlife are captured for food (fish, prawns, crabs, oysters, molluscs, etc.) or other animal products (horns, hides and skins). Most of the wildlife of the mangrove ecosystem is valued primarily for its role as a recreational or scientific resource. Large-scale conversion of mangroves with the consequent loss of habitat has resulted in many of the species becoming endangered of extinction. Sumatran tiger (*Panthera tigris sumatrae*) (Saenger, Hegerl and Davie, 1983), found only in Sumatra, is considered an animal at risk in mangrove ecosystem. The Bengal tiger (*Panthera tigris tigris*) is an endangered species and is protected within the mangrove reserves in Myanmar, India and Bangladesh.

Many problems facing wildlife management are attributed to the distribution and coordination of responsibilities for forests, wildlife and fisheries. Preparation of integrated management plans that encompass all activities would enhance wildlife management in mangrove habitats.

6.2.4 Fisheries

The important role played by mangroves in sustaining fisheries production is widely accepted. The advantage of mangroves in sustainable fisheries stems from providing the primary habitats such as shallow bays, inlets and channels for the commercially important fish species. Furthermore, the mangrove habitat provides the main food source for the primary consumers in the food chain, which in turn is consumed by the secondary consumer population consisting of small forage fish species and by the juveniles of the larger predatory species of the third level.

The degradation or deforestation of mangroves therefore results in deprivation of nutrition in the adjacent habitats, with a consequent decline in fishery production. Macnae reported (FAO, 1974) a correlation between mangrove estuarine area and annual yields of penaeid shrimp in Indonesia in 1974. A recent study at the University of Exeter, England provides evidence that mangroves are nurseries for reef fish.[4] Salinity changes can also cause loss of mangroves, consequently affecting the fish production.

In addition to supplying the protein needs, fisheries operations are the principal source of income for coastal communities. More than five million people are estimated to be directly employed in full-time fishing in Southeast Asia. The multiplier effect of fishing activities is considerable if people engaged in support activities such as marketing, processing, transport, vessel construction, gear manufacture and repair activities are also accounted.

6.2.5 Honey production

Although there is potential to obtain honey and beeswax from the mangroves, the utilization is minimal in the Asia-Pacific. Only India and Bangladesh extract a considerable amount of honey. Nearly 2 000 people are employed in India (FAO, 1982) in collecting around 20 tonnes of honey per annum from the Sunderbans, whereas the amount collected from Bangladesh's Sunderbans (FAO, 1982) is approximately 150 to 200 tonnes per annum. As an integral small-scale activity, beekeeping in mangrove areas can provide a number of social and economic benefits without any detrimental effect on the mangrove ecosystem while promoting mangrove conservation measures.

6.2.6 Nipa palm (Nypa fruticans)

Nipa palm is one of the most common, widely distributed and useful palms in the mangrove forests. It grows in wide range of countries – Indonesia, India, Bangladesh, Myanmar, Sri Lanka, Malaysia, the Philippines, Thailand, Cambodia, Vietnam and Papua New Guinea. Its uses include sap or juices and leaves for roof thatching and dwelling walls. Nipa sap is a source of sugar and is used to produce vinegar and alcohol in Malaysia, India and Bangladesh. There are two factories in Sarawak, Malaysia for the production of alcohol from nipa sugar. In the Philippines, the cultivation of nipa for alcohol production has been continuing for many years. The nipa leaf industry is of socio-economic importance in many countries, providing employment and income for local communities.

Managing nipa palms for sap and leaves production will provide employment and income for the local communities, especially for women, and would facilitate conservation of mangroves with the participation of the communities. Nipa is widely used for thatching by local communities along the east and west coast of Aceh Province.

6.2.7 Wood production

Mangrove forests in Asia have been managed for wood production under sustained yield

[4] cited by John Roach in *National Geographic News*, 4 February 2004

principles since the mid-19th century. The main objective of management is to produce and sustain the maximum volume of wood for conversion to charcoal, fuelwood, poles, posts for local populations, domestic and industrial use and export purposes. The mangrove forests have favourable silvicultural characteristics that lend themselves to sustained-yield utilization under intensive management. The standard silvicultural system followed is mostly selection felling, but also includes strip clearfelling and natural regeneration in many instances.

Attention should be given to introducing sound management of mangrove forests for sustainable harvesting of fuelwood to meet the demand of coastal villages in the east and west coasts.

6.2.8 Aquaculture

Aquaculture, mainly shrimp farming, is one of the main causes of mangroves destruction in the east and west coasts of Aceh Province. Shrimp farming is considered potentially lucrative, but efforts have often failed. Several costly experiences indicate that mangrove environments are not necessarily the optimum locations for aquaculture ponds. However, socio-economic benefits may outweigh the environmental concerns and governments are compelled to allow setting up aquaculture ponds on mangrove sites.

Today, it is generally accepted that setting up ponds on a large scale in mangrove areas can be a costly mistake and should be resorted to only in the absence of other options. Nonetheless, mangrove areas are being converted into shrimp or fishponds at a considerable rate.

The recommendations for aquaculture would be to:

- promote floating-cage or raft cultures that have minimal ecological impact on the mangrove ecosystem;
- prohibit setting up large-scale shrimp ponds in mangrove areas.

It is regrettable that conversion of mangrove areas to *tambak*s is currently in progress in Langsa along the east coast on a large scale. Most of the large-scale *tambak*s are mainly controlled by affluent landowners from outside the locality who have no concern for the environment or long-term adverse impacts.

6.2.9 Salt production

Mangrove resources are lost in many countries due to conversion of mangrove land to solar salt operations in the coastal areas. In the majority of cases, salt production is associated with the conversion of mangrove forests in a way that is often irreversible. It is unfortunate that salt production will also continue to impinge on the mangroves because of its socio-economic importance. If such an option is inevitable, however, it should be subject to rigorous environmental impact assessment prior to the granting of approval. Fortunately, salt production was observed on a limited scale only in Aceh Barat District in the west coast.

6.2.10 Agriculture

Around 200 000 ha of mangroves were reclaimed for agriculture in Indonesia between 1969 and 1974, with a larger area reclaimed between 1974 and 1979 (Bird and Ongkosongo, 1980). The potential for continued loss of mangroves is great because most of the remaining mangroves are not under any degree of preservation status.

Mangrove soils are characterized by properties that limit their agriculture value, including potential acid sulphate clays, salinity, and shrinkage or subsidence when the soils are worked. Planting of coconuts is very prevalent in the third or fourth year on mangrove land converted

to agriculture.

The problems encountered with conversion are flooding, salinity, gradual decline in yield and the formation of acid sulphate soil. Most of the agriculture lands in mangrove areas are cultivable only during the rainy season and are unproductive during the summer dry season due to the formation of a saline crust on the soil surface.

The conversion of mangrove areas for agriculture should only be attempted once all other alternative agricultural development options such as intensification or expansion into upland areas have been exhausted.

6.2.11 Mangroves for coastal protection

Mangroves serve as the first line of defence against the impacts of tsunamis, hurricane and cyclones, as shown on 26 December 2004. There is evidence to substantiate that mangroves and trees had reduced the impact of the Tsunami and lessened the damage, which was more severe when all mangroves and other coastal forest trees had been removed. The people of Simuelue attribute minimum loss of life and damage from the Tsunami to the protective belt of mangroves on their island. Rapid depletion of the mangrove forests along the entire coastline of Orissa, India is being cited as the main reason for the recent cyclone lashings that have been plaguing the coastline area.

All of the Tsunami-affected countries share interest in conserving existing mangroves, rehabilitate degraded areas and restoring mangroves on deforested land. The restoration or establishment of mangroves is a management option that can be applied to stabilize unregulated areas such as riverbanks, shorelines and canals or to enhance or regulate natural regeneration. Such activities should be undertaken with the participation of local communities. Working with communities in the conservation of mangroves guarantees success and would benefit them and the rest of the country.

7 BENEFITS OF TREES IN THE COASTAL AREAS

Trees found in the coastal zones other than mangroves can be categorized as: trees in other coastal forest, trees in homesteads, trees on avenues and in other public places.

7.1 Other coastal forests

The trees of other coastal forests have a variety of environmental and protective functions, including:

- stabilizing soils and protecting against erosion
- acting as natural barriers preventing debris such as wood from flowing inland during high tides;
- reducing the force of tsunamis and high waves;
- reducing energy of winds from the sea and helping to create sand dunes;
- providing a habitat for a variety of wildlife

They also add aesthetic beauty to the landscape. Other coastal forests along with mangroves offer a range of opportunities for eco-tourism for earning income and benefiting the local population. All other coastal forests contribute substantially and free of charge to the supply

of biomass fuel to the coastal population. The beach trees also provide a number of economic benefits.

7.1.1 Common tree species of other coastal forests in the east and west coast of Aceh, and their economic benefits

- *Casuarina* – provides timber for building construction and boat building;
- Coconut (*Cocos nucifera)* trees – provides fruit and drink, timber, leaves for thatching;
- Waru (*Thespesia*) – provides timber for boat building;
- *Kuda-kuda* (*Dolichandrone spathacea*) – provides fodder for cattle, floaters for fishing nets;
- Palmyra (*Borassus flabellifer*) – provides fruits, sugar, toddy; leaves as fodder and thatching material;
- *Pandanus* – provides leaves for handicraft material.

7.2 Trees in homesteads, avenues and other public places

Cultivation of trees in homesteads and farmlands has been a traditional practice in Indonesia since time immemorial. Agro-forestry and cultivated farmlands in Indonesia contribute significantly to the economy by providing rubber latex, resin, spices, fruits and nuts as well significant amounts of bamboo, fuelwood, rattan and medicinal plants. The contribution of biomass fuel and timber from trees outside forests is universally recognized and in many forest-deficient countries, the contribution is very high – as much as 90 percent in Bangladesh. Trees outside of forests are important even in some areas of countries that have abundant timber resources.

The price of timber in Aceh sky-rocketed after the Tsunami and a considerable proportion of timber used in reconstruction originates from home gardens. Coconut timber from uprooted trees as well as felled live trees is used widely as rafters in house construction in the east and west coast. A few individuals sell their coconut trees at Rp 20 000 per tree for income. *Casuarina,* which provides good timber, is grown as an avenue tree and in other public places.

The potential for cultivating trees in home gardens and public places in Aceh is very high. In the context of declining forest resources, cultivated trees will play a major role in meeting the wood demand of the local population in the future and cultivation of trees should be intensified.

Income from fruits of many cultivated trees such as coconut and Jak are substantial and support the livelihoods of many households. A list of tree species commonly grown in the east and west coast of Aceh and main uses are given below.

7.2.1 Common trees species of home gardens and their economic benefits

- *Artocarpus heterophyllus* – provides edible fruit, fodder, high quality timber for doors windows and boat building;
- *Atrocarpus altilis* – provides edible fruit;
- *Mangifera indica* – provides edible fruit;
- *Tamarix indica* – provides edible fruit;
- *Phllyanthus acidus* – provides edible fruit;

- *Psidium guajava* – edible fruit;
- *Eugenia aquea* – edible fruit;
- *Azadirachta indica* – timber, medicinal products;
- *Sesbania gandiflora* – edible flowers and leaves;
- *Casuarina* – timber for building construction and boat building;
- *Manilkara zapota* – edible fruit;
- *Areca catechu* – betel nut, chewed with betel.

8 RECOMMENDATIONS ON THE GOVERNMENT PROPOSAL TO SET UP COASTAL PROTECTION BELTS

8.1 The Master Plan Green Belt Proposal

The Background section of the Master Plan states that the rehabilitation and reconstruction of Aceh and Nias should take into account environmental safety against disasters and carrying capacity. Book 2 on Spatial Planning & Land Policy and Environment & Natural Resources recommends development of green belts in the coastal zone along with rehabilitation of *tambak*s and development of urban forest.

The mangrove plantation target is set at 164 840 ha for Aceh and 9 750 ha for North Sumatra between 2006 and 2010.

Related activities for mangrove establishments prescribed in Book 2 are:

- mapping of mangrove ecosystem;
- studying the characteristics of ecosystem;
- planning;
- implementation;
- institutional building to promote community participation.

8.2 Recommendations on the Proposal

The following data on mangrove areas was supplied by the Center for Regional Forest Management, Sumatra:[5]

- Ministry of Forestry 2004: Aceh 346 838 ha, of which around 296 078 ha are located along 761 km of the north and east coastlines, 49 760 ha along 706 km west and south coastline, and around 1 000 ha on 1 000 km of the Simeulue Island coastline.
- Wetland International 2000: Around 30 000 ha of mangrove are in good condition, including those on Simeulue Island, 25 000 ha in very bad condition and 286 000 in fairly bad condition.
- Director General of Land Rehabilitation and Social Forestry (1998): The total mangrove forest is around 346 843 ha, of which around 26 692 ha are badly

[5] Personal communication, Mr. Iman Santoso, Director, Regional Office for Forest Planning and Co-ordination

degraded, 288 647 ha moderately degraded, and around 31 503 ha still in good condition.

The true extent of mangroves and its status in Aceh is very difficult to estimate, but the above figures indicate:

- at least more than 300 000 ha of mangroves are on state land;
- around 25 000 to 30 000 ha are still in good condition;
- an appreciable amount more than 200 000 ha are in a degraded state.

Target of 164 840 ha

Based on the above figures on mangrove areas, which indicate adequate availability of mangrove habitats, the Master Plan's target of 164 840 ha of mangrove plantation in five years would be possible. The ten-year-old thriving plantation at Langsa (see section 3.2.1 "of the Master Plan document) demonstrates that planting of mangroves could be carried out without difficulty.

However, based on experience from other countries on areas available for reforestation from state records and the reality on the ground, there could be difficulties in implementation, particularly in Aceh because of settlements near mangrove habitats and *tambak*s.

Mapping the mangrove ecosystem

It is necessary, therefore, to map the existing mangrove areas as proposed in Book 2 as early as possible to obtain realistic estimates. Mapping using aerial photographs would give a better picture of the land availability, yet extensive field truthing and verification has to be done to determine ownership and prohibitive cost. If donor funding is forthcoming, it is worthwhile carrying out the exercise because aerial photographs could be used developing an overall plan for rehabilitation and reforestation of mangroves as part of the Aceh reconstruction and development programme.

In the absence of aerial photographs, the next option would be to make use of high-resolution satellite imagery with extensive field truthing. This could be done on a pilot scale to determine feasibility.

The task of identifying converted mangrove areas for other landuse and verifying ownership would be an immense task. Participation of village communities in mapping exercises is essential for producing realistic maps.

Planning and implementation

Planning and implementation are crucial to the establishment of mangroves. Planning can be done only when adequate data are available, especially on areas available for implementation. It is necessary to diversify the species to be planted. Two species recommended in addition to *Rhizophora* are *Avicennia* and *Sonneratia*. In addition, other mangrove species occurring along the east and west coast should also be introduced.

The modality for implementation needs careful thought to enlist the active participation of local communities and local NGOs in order to reduce the programme cost and to ensure the success of established plantations. The proposal demands a large number of personnel to

perform a multitude of functions at the village level, which the state institutions will not be able to offer; local NGOs should supplement the extra needs.

All mangrove habitats bordering village settlements depend on the mangroves for a variety of products. It is recommended that mangrove planting programme be planned and implemented (see section 10).

Institutional building to promote community participation

For the mangrove reforestation to be successful, the most important prerequisite is active community participation in the replanting activities. Mobilizing communities require dedicated staff with knowledge in participatory approaches and methodologies. Most of the district staff are not competent enough to undertake this new task and the need for training to build capacity is immense. Intensive training to build the institutions at the district, provincial and national levels for mobilizing the village communities is a high priority.

Further, the local NGOs would also need training to undertake the task.

The trained staff should have the capability to educate, motivate and create awareness in the local communities so that they would:

- have better perception of the mangroves and mangrove ecosystem;
- understand the importance of mangrove conservation;
- actively participate in the mangrove planting and maintenance programme.

9 FRAMEWORK FOR A FORESTRY-RELATED PROGRAMME

Time did not permit the collection of the necessary information and the preparation of a detailed forestry framework for Aceh Province. During discussions with the provincial and district forestry staff, it was evident that watershed management and forest management are very high priorities of the province. A forestry framework for the province would encompass the following main components:

1. Watershed management
2. Forest management
3. Harvesting and utilization
4. Institutional development
5. Forestry extension and participatory forestry
6. Nature conservation
7. Integrated Coastal Zone Management (ICZM).

Details are given in the next section for component 7 only, which would share a number of elements with components 4, 5 and 6. The forestry office will have to play an important role in ICZM in Aceh because mangrove rehabilitation and other coastal forest establishment will be a major activity.

10 RECOMMENDATIONS[6]

It is recommended to initiate early action towards:

[6] Note: these recommendations are those of the consultant and do not necessarily reflect the recommendations of FAO for follow-up action.

- prohibiting large-scale conversion of mangroves to new *tambaks*;
- establishing green belts;
- developing ICZMPs.

It is preferable to confine the activities only to the east coast in Aceh Besar, Pidie, Bireuen and Aceh Utera Districts.

10.1 Prohibiting large-scale conversion of mangroves to new *tambaks*

Conversion of mangroves to new *tambak*s on a commercial scale along the east and west coast of Aceh Province should be completely prohibited. Ownership of all mangroves rests with the State, irrespective of jurisdiction by different government agencies. The green belt programme of the government will not receive credence by the local communities and the international community if the government permits the continued clearing of mangroves for conversion to *tambak*s while, at the same time, promoting green belts for protecting the coastal communities.

In rehabilitating heavily damaged *tambak*s near the shoreline, the owners should be advised to plant a belt of mangroves at the boundary as a protection measure.

When preparing ICZMPs (section 9.1) the location, extent, ownership and the impacts of all *tambak*s should be carefully scrutinized and appropriate recommendations made in the plans to offset adverse impacts.

10.2 Establishment of green belts

Objective

To create awareness and understanding of the role of coastal forests and other vegetation in coastal protection and establish green belts to enhance the environment, provide protection against tsunamis, cyclones and hurricanes, and improve the sustainable livelihoods of the local communities in coastal villages in Aceh Province.

Inputs

Technical assistance:

- Coastal zone management expert with experience in mangroves and participatory methodology – 18 months in three assignments: 12+3+3;
- Expert on participatory methodology – 3 months;
- Remote sensing specialist – 2 months.

Budget

- Approximately US$ 14 717 per village, including planting cost for mangroves and other coastal forests, without the technical assistance cost;
- If planting cost is not included, the cost per village would be US$ 12 369;

- Details of budget are given in Annex 10.3, including the number of mangrove plants and trees for home gardens to be raised per village;

- Home garden tree nurseries to be managed by the village communities on a self-sustaining basis after five months;

- The number of villages to be targeted depends on availability of funds; a minimum of 25 villages are recommended to justify the technical assistance input.

Outputs

- Community awareness on the need for conservation of mangroves and integrated coastal zone development;

- Community participation motivated and secured;

- Trained extension staff and community-based organizations capable of motivating and mobilizing village communities in participatory coastal zone management programmes;

- Mangrove and tree nurseries established and management gradually transferred to local communities;

- Tree nurseries to provide plants for urban forestry;

- Green belts established and a strategy for the establishment of future green belts developed;

- 50 000 mangrove propagules planted per village;

- 800 saplings planted on shore per village;

- 2 km of live fence established in homesteads per village;

- 50 000 multi-purpose trees raised, supplied and planted in home gardens per village;

- village levels maps produced for the coastal zone, which include area estimates and mangrove sites for reforestation;

- methodology and procedures defined for mapping mangrove resources using high-resolution satellite imagery;

- district forestry staff trained in mapping mangrove resources using satellite imagery.

Strategy

- The villages identified as having high potential for green belt establishment will be selected for implementing the activities along the east coast.

- Activities will commence first in Banda Aceh and Aceh Besar District, and then proceed to other targeted districts in the east coast.

- Nurseries will be established for mangroves and raising of trees for home gardens.

- Home garden nurseries will supply saplings for planting in the urban areas.

- Contract shall be entered into with Yayasan Lahan Ekosistem Basah (LEBAH), a local NGO for Aceh Besar District, and the Organisation for Industrial, Spiritual and Cultural Advancement (OISCA) for Pidie, Bireuen and Aceh Utara Districts in order to jointly implement the activities together with FAO and to achieve outputs.

- FAO and provincial and district forestry offices will monitor and evaluate progress and achievements.

- All activities shall be implemented with the participation of the local communities.

- The forest officer (see section 2) attached to the mission at Banda Aceh from 1 April shall be employed on a casual basis for three months to interact with communities and will follow up on green belt establishment in the identified villages.

Duration of project – 3 years

10.3 Development of Integrated Coastal Zone Management Plans (ICZMPs)

Objective

To develop ICZMPs in four villages for regulating, managing and protecting coastal zone resources to secure sustainable and integrated development.

Outputs

- a co-ordination mechanism the development of ICZMPs;

- an appropriate authority to co-ordinate and lead the development of ICZMPs identified and empowered;

- regulatory processes reviewed and amended if necessary, and responsibilities for issuing of licences and permits by various local government departments and ministries clearly defined and streamlined;

- existing legislation reviewed and amended as required to empower authorities to exercise control over use of coastal zone natural resources without ambiguity;

- trained extension staff capable of developing ICZMPs;

- trained NGO staff capable of developing ICZMPs;

- guidelines developed for the preparation of ICZMPs;

- developed and implemented ICZMPs for four villages.

Inputs

Technical assistance:

- coastal zone management expert with experience in mangroves and participatory methodology – 18 months of shared technical assistance (in three assignments: 12+3+3) to function for both recommendations in sections 10.1 and 10.2.

- expert on participatory methodology – 3 months of shared TA to function for both recommendations in sections 10.1 and 10.2.

- remote sensing specialist – 2 months of shared TA to function for both recommendations in sections 10.1 and 10.2.

Strategy

- Four villages covered under the green belt establishment programme (section 9.1) should be selected for developing ICZMPs, one per district in the four districts of the east coast.

- The consultant and the NGO will co-ordinate, develop and prepare the ICZMPs with the active participation of the communities and relevant government institutions.

- The governor will appoint a co-ordinating committee consisting of representatives from the provincial forestry, fisheries, agricultural and other connected institutions, and select the chairman for the committee.

- The co-ordinating committee will provide assistance to the consultant and the NGO.

Duration of project – 3 years

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ANNEX 1. TERMS OF REFERENCE

TERMS OF REFERENCE

International Forestry Consultant

Coastal Protection and Spatial Planning, Indonesia

Background

The Indian Ocean tsunami that occurred on 26 December 2004 caused serious damage and loss of lives and livelihoods in coastal communities and ecosystems in India, Indonesia, Malaysia, Maldives, Myanmar, Seychelles, Somalia, Sri Lanka and Thailand.

Northern Sumatra, Indonesia, which was close to the epicentre of the earthquake that created the tsunami, sustained particularly heavy loss of life, destruction of livelihoods, destruction of infrastructure, and impacts on the coastal environment and coastal ecosystems, including coastal forests and mangroves.

Indonesia is moving quickly to identify needs for rehabilitation and reconstruction. The Ministry of Planning, BAPPENAS, has produced a draft rehabilitation and reconstruction plan, which is undergoing inter-Ministerial discussions at the national and provincial levels and through stakeholder consultations. The final plan is due to be presented to the President of Indonesia on 20 March.

Eleven working groups have been formed to assist in the development of the plan. The Working Groups on Spatial Planning & Land Policy and Environment & Natural Resources are addressing, among other issues, coastal protection, including rehabilitation of mangroves and other forests for coastal zone protection as well as other purposes.

A forestry consultant is needed to provide technical assistance to the Ministry of Forestry and to interact with other Ministries and stakeholder groups in the development of recovery and reconstruction plans. The consultant is also needed to provide input to FAO on the forestry components of its comprehensive programme to assist Indonesia in rehabilitation and reconstruction, in particular related to coastal forest rehabilitation, reforestation/afforestation and forests and livelihood issues.

Another forestry consultant is being fielded to address the issue of wood products demand and supply for reconstruction. The forestry consultant in coastal protection and special planning will be expected to liaise with him and coordinate efforts.

Tasks to be Undertaken by the Consultant

Under the general guidance of the Assistant Director General, Forestry Department and the Coordinator of the FAO Forestry Department Tsunami Response Task Force and in close collaboration with the officers and consultants in the FAO Representation in Jakarta and sub-offices set up in Banda Aceh and Meulaboh, the forestry consultant in coastal protection and spatial planning will undertake the following tasks:

- Provide technical advice to the Ministry of Forestry on plans for replanting/restoration of coastal forests, in particular mangrove forests, to enhance coastal protection and to contribute to an integrated, inter-sectoral approach to coastal ecosystem rehabilitation;
- Interact with the Ministry of Forestry, Ministry of Agriculture, Ministry of Marine Affairs and Fisheries as well as provincial authorities and local stakeholders in the

affected areas to provide advice on the forestry component of the BAPPENAS tsunami rehabilitation / reconstruction plan within the context of integrated coastal zone management;

- Interact with other UN agencies (e.g., UNEP, UNDP, ILO, HABITAT, UNESCO), national and international (e.g. CIFOR, ICRAF) forest research institutions, and international and national NGOs to facilitate a coordinated approach to forest-related actions in the tsunami recovery efforts, in particular as related to rehabilitation and restoration of mangroves and other coastal forests;
- Provide advice, including detailed plans and costs, on the establishment of tree nurseries: i) to supply planting material for forest rehabilitation and restoration and for home gardens and agroforestry systems and ii) as an income-generation opportunity.
- Prepare a working paper on pros and cons of using mangroves and trees in the specific conditions in east and western coastal areas in Aceh with technical recommendations on the Government proposal to set up coastal protection belts
- Prepare a framework for FAO's forestry-related programme (with the exception of the wood products issue, being covered by the second consultant) in the tsunami rehabilitation effort as input to FAO's comprehensive programme.

ANNEX 2. LIST OF VILLAGES IDENTIFIED FOR GREENBELT ESTABLISHMENT

1. BANDA ACEH*
SUB District MEURAXA
Villages :
Deah Tengoh
Ulee lheu
Kampong Pie
Kampong Blang
Lamteungoh
SUB District SYAH KUALA
Villages
Deah Raya
Tibang
Alue Naga
Pasie
2. ACEH BESAR*
SUB District MESJID RAYA
Villages
Durung
Ladong
Ruyung
SUB District BAITUSSALAM
Village
Baet
Cadek
Kahju
Cot Paya
Lambada Lhok
SUB District LHO'NGA / LEUPUNG
Villages
Meunasah Bale
Meunasah Mesjid Lampu'u
Meunasah Lambaro
Wheu Raya
Lamsenia
Pulot
Layeun
Lhoeksedu
3. PIDIE / SIGLI
SUB District PIDIE
Villages
Cot Payang
Sub District KOTA SIGLI
Village
Pasir Rawa
SUB District PANTE RAJA
Villages
Trienggadeng
Parade
SUB District BANDAR BARU
Village
Lancang Paru

4. BIREUEN
SUB District SAMALANGA
Villages
Pantiering
Blang Kejren
Reng Timur
SUB District MUARA BATU
Villages
Krueng Mane
5.ACEH UTARA / LHOKSEUMAWE
SUB District SAMUDRA
Villages
Beringin
SUB District BAYU
Villages
Lamcoek
SUB District TANAH PASIR
Villages
Lapang
6. ACEH BARAT / MEULABOH
SUB District JOHAN PAHLAWAN
Villages
Gampong Pasier
Ujong Karang
Padang Sirait
SUB District SAMATIGA
Villages
Suak Atima
Kuala Bubon
SUB District MEUREBO
Villages
Peunaga Pasie
* Banda Aceh and Aceh Besar are considered to be in the east coast

ANNEX 3. NURSERY PLANTING COSTS

Nursery and Planting cost	Unit cost Rp.	Qty No.	Total cost Rp.	US$ Total cost	US$ Unit cost
Mangroves for planting 50,000 plants					
Polypots 20x30	100	50000	5000000	543	
Plants-Filling polypots, transplanting @Rp 200 per polypot	200	50000	10000000	1087	
4 people for 3 months for nursery	40000	372	14880000	1617	
Fertilizer @ Rp 2000 per kg for 150 plants	13	50000	666667	72	
Transport and Planting @Rp 400 per plant	400	50000	20000000	2174	
Sub-total mangroves	1011	50000	50546667	5494	0.11
Other coastal forests -1 km 2-rows @ 2.5mx2.5m 400x2=800 plants					
Seeds/plants @4000	4000	800	3200000	348	
Polypots 20x30	100	800	80000	9	
Plants-Filling polypots, transplanting @Rp 200 per polypot	200	800	160000	17	
One person for 5 months	40000	155	6200000	674	
Fertilizer @ Rp 2000 per kg for 100 plants	20	620	12400	1	
Planting and fencing (per plant)	2000	800	1600000	174	
Sub-total Other coastal forest	14066	800	11252400	1223	1.53
Live fence using Kuda Kuda-2km		2km			
Not coasted since the operation has to be done by individual households					
Home gardens to produce 50000 plants in one ha nursery					
Site preparation 25 people for 1ha	40000	25	1000000	109	
Seeds/Plants/Cuttings (Average cost)	1000	50000	50000000	5435	
Fencing 1 ha 25 people	40000	25	1000000	109	
3 people for 5 months	40000	465	18600000	2022	
Fertilizer @ Rp 2000 per kg for 100 plants	20	50000	1000000	109	
Materials - Hoe, watering cans, fencing materials etc	LS	LS	2000000	217	
Sub-total Home gardens	1472	50000	73600000	8000	0.16
Exchange rate used: One US$ = Rp.9200					
SUMMARY	Rp - Total cost - US$		Rp - Unit cost - US$		
Mangroves	50546667	5494	1011	0.11	
Other coastal forest	11252400	1223	14066	1.53	
Home gardens	73600000	8000	1472	0.16	
Total	135399067	14717			
Planting costs	Rp.	US$	US$*		
Mangrove	20000000	2174			
Other coastal forest	1600000	174	12369		
Total	21600000	2348			
* Total per village without planting cost					

ANNEX 4. ITINERARY

Mar-15	Departed Colombo to Bangkok
16	Bangkok - RAPA - Briefing by Mr. Kashio, Regional Forest Resources Officer at RAP, Bangkok. Attended tsunami relief committee meeting at RAPA. Met with Mr. Jean-Jacques Franc de Feariere, FAO Coordinator Banda Aceh and Mr. Ulrich Schmidt CTO Fisheries, Aceh
17	Bangkok-Jakarta - Met with Mr. Kashio in the morning and left for Jakarta, Indonesia
18	Jakarta - FAO Office: Met with FAOR O-I-C Mr. Rudolf Ziesler, Mr. Alexander L. Jones Regional Emergency Coordinator, Asia-Pacific
19	Jakarta - Reviewed reports relating to tsunami damage available at FAO office and examined aerial-survey-CD of tsunami affected areas in Aceh province taken on 11 January 2005.
20	Continued examination of aerial-survey-CD of tsunami affected areas in Aceh province.
21	Jakarta - Met with Mr. Benni. H. Sormin, ARR FAO , Mr. ReneErnst Suter, Mr. Nicholas Hughes, Administrative Officer, FAO Sub-Office, Banda Aceh, arranged appointments
22	Jakarta - Met with Dr. Ir. Edi Effendi, TEDJAKUSUMA, Director of Forestry and Water Resources Conservation, BAPPENAS, Mr. Daniel van R. Claasen, Team Leader UNEP, Asian Tsunami Task Force, Indonesia, Mr. Dodo Uliman Widianto, Habitat Programme Manager, Indonesia
23	Jakarta - Met with Mr. Lakshmi Dewanti, Head of Planning Department representing Dr. Agus Prabowo, Director for Control of Natural Resources and Environment BAPPENAS, Mr.Iman Santoso, Director, Regional Office for Forestry Planning and Coordination, Sumatra, and Mr. Bambang Moerdino, Director International Cooperation Bureau, Ministry of Forestry, Jakarta Met with Han Qunli Program Specialist for Ecology, UNESCO, Mr. Makoto Ikeda UNV Environmental Specialist, Mr. Alberto Hernandez Salinas UNESCO Volunteer for Environmental Sciences, Jan H. Steffen CSI, Eris Widjanavh Environmental Science Programme
24	Jakarta - Met with Mr. Ferianto Hadi S. Djais, Director for Space System of Sea, Coast and Small Islands, Ministry of Maritime Affairs and Fisheries; Mr. Lucas Adyaksa, Environment Officer, UNDP; Mr. Heru Waluyo Koesworo, Deputy Assistant for Coastal and Marine affairs, Ministry of Environment
25	Jakarta-Banda Aceh - To FAO Office Jakarta and thence to Aceh by flight. Met with Mr.Jean-Jacques Franc de Feariere, FAO Coordinator Banda Aceh and Christoph , Logistics
26	Banda-Aceh - Carried out survey of tsunami damage along the north-east and north-west coast of Banda Aceh and Aceh Besar district
27	Banda-Aceh - Continued survey of tsunami damage along the north-east and north-west coast of Banda Aceh and Aceh Besar district
28	Banda-Aceh - Met with Dinas Forestry staff in the morning and Mr. Huseni Deputy Chief in the evening and discussed rehabilitation proposals and field programme. Security briefing with UNDSS.
29	Banda-Aceh - Assessed potential for rehabilitation along the coast of Banda Aceh and discussed with communities. Met with Mr. George Kuru, FAO Forestry Consultant on wood supply for reconstruction
30	Banda-Aceh - Met with Mr. Huseni along with Mr. Jean-Jacques Franc de Feariere, FAO Coordinator Banda Aceh and discussed forestry issues in Aceh Province. Continued assessment of areas for rehabilitation along the coast of Banda Aceh
31	Banda-Aceh - Assessed potential for rehabilitation along the east-coast of Aceh Besar and discussed with communities
01-Apr	Banda-Aceh - Continued assessment of potential for rehabilitation along the east-coast of Aceh Besar and discussed with communities
2	Banda-Aceh - Assessed potential for rehabilitation along the west-coast of Aceh Besar and discussed with communities
3	Banda-Aceh - Visited Cadek village along with …, an NGO to see Rhizophora planting work and nursery. Visited IDP camp at .. and discussed issues relating to rehabilitation, relocation etc.

4	Banda-Aceh - Continued assessment of potential for rehabilitation along the west-coast of Aceh Besar and discussed with communities
5	Banda-Aceh - Met with IDPs from Tibang village, Ule-Lheu, and Alue Naga village in Banda Aceh and discussed rehabilitation proposals
6	Banda-Aceh - Met with IDPs, village chief and elders from Riyuining village and discussed firm proposals for beach forest establishment, mangrove reforestation and promotion of live fences
7	Bireuen - To Pidie District - visited Sigili, Pasi Rawa village, Cot Payung village, Trenggadeng village, Tu village, Lancang Paro village and Parede village. To Biruren District - visited Blang Keju village, Ring village and Pantering village
8	To Aceh Utara District - visited Beringin village, Lamcock village, Lapang village
9	Bireuen - Banda Aceh
10	Banda-Aceh - To Riyung village and met with village chief and elders and discussed coastal forest rehabilitation, trees for home gardens and live fences along with two staff of the Dinas Forestry Office
11	Banda-Aceh - Meulaboh - To Meulaboh from Banda Aceh by helicopter with two Dinas forestry staff and Mr. Irwn Syah. Met with Ir.Kamaruddin. MST. Subdin, District Forestry staff and discussed proposals for rehabilitation in Aceh Barat District. Visited tsunami affected villages in Meulaboh and attended security briefing by UNDSS
12	Meulaboh - Visited villages in Samatiga sub-district (Suak Timah, Kuala Bubun), Johan Pahlawan sub-district (Ujung Kanag, Gampong Pase, Padang Sirait) and Meureubo sub-district (Penangga Pasir). Met with Mr. Ir.Kamaruddin. MST. Subdin, District Forestry staff and obtained proposals for rehabilitation in Aceh Barat District. Met with Roanld…
13	Meulaboh - Banda Aceh - Departed Meulaboh by helicopter to Banda Aceh. Visited Rirung village in Banda Aceh
14	Banda-Aceh - To Dinas Forestry Office in Banda Aceh and finalized locations for rehabilitation with forestry staff. Met with Mr. Federico Negro, Socio-economic Reintegration Specialist, ILO
15	Banda-Aceh - Jakarta - Met with Dinas Forestry staff, discussed mapping work and left for Jakarta
16	Jakarta - Worked on draft report
17	Jakarta - Worked on draft report
18	Mr.Iman Santoso, Director, Regional Office for Forestry Planning and Coordination, Sumatra, and Mr. Bambang Moerdino, Director International Cooperation Bureau, Ministry of Forestry, Mr. Harry Santoso, Director Watershed Management and Land Rehabilitation, MoF, Jakarta
19	Jakarta-Bogor-Jakarta CIFOR - Met with Ms. Moira M. M. Moeliono; ICRAF - Mr O-J - Meine van Noordwijk; Mr. Ario Damar, Mr. Luky Adrianto, Center for Coastal and Marine Resources Studies, Bogor Agricultural University
20	Jakarta - Met with Mr. Harry Santoso, Director Watershed Management and Land Rehabilitation, MOF, Jakarta
21	Jakarta -Bangkok DeBriefing at FAO Representation, Mr. Benni. M. Sormin
22	Bangkok - Colombo Debriefing at Bangkok - RAP- Mr. Patrick Durst, Mr. M. Kashio, Mr. S. Appanah
23	Colombo

ANNEX 5. PERSONS MET

RAPA	Mr. Patrick Durst, Senior Forestry Officer
	Mr. Kashio, Regional Forest Resources Officer at RAP, Bangkok
	Mr. Simmathiri Appanah, National Forest Programme Advisor
FAO Jakarta	Mr. Rudolf Ziesler O-I-C FAO Indonesia
	Mr. Benni. H. Sormin, ARR FAO
FAO- B.Aceh	Mr.Jean-Jacques Franc de Ferriere, Area Coordinator, NAD
	Mr. Christophe Charbon, Operations Officer, NAD
	Mr. Nicholas Hughes, Administrative Officer, FAO Sub-Office, Banda Aceh,
	Mr. George Kuru, FAO Forestry Products Consultant
	Mr. Ulirich W Schmidt, Chief Technical Officer - Fisheries
	Mr. Peter de Young, Liaison Officer, Banda Aceh
	Mr. Nicholas Hughes, Programme and Administrative Officer, FAO Sub-Office
FAOMeulaboh	Mr. Ronald Dijk, Land and Water Management Specialist
	Mr. Robert Ulric Lee, FAO Fisheries Consultant,
TCEO	Mr. Alexander L. Jones Regional Emergency Coordinator, Asia-Pacific, Jakarta
	Mr. Rene Ernst Suter, Liaison Officer, Jakarta
	Ms Victoria Sun, Operations Officer
	Mr. Angus Graham, Program Officer, Jakarta
BAPPENAS	Dr. Ir. Edi Effendi, TEDJAKUSUMA, Director of Forestry and Water Resources Conservation, BAPPENAS
	Mr. Lakshmi Dewanti, Head of Planning Department, Control of Natural Resources and Environment
MOF/FD	Mr.Iman Santoso, Director, Regional Office for Forestry Planning and Coordination, Sumatra
	Mr. Bambang Moerdino, Director International Cooperation Bureau, Ministry of Forestry
	Mr. Harry Santoso, Director Watershed Management and Land Rehabilitation, MOF, Jakarta
	Mr.I. Nyoman Yuliarsana, Director, Seed Division
UNESCO	Mr. Han Qunli, Senior Program Specialist for Environmental Sciences
	Mr. Makoto Ikeda UNV Environmental Specialist
	Mr. Alberto Hernandez Salinas UNESCO Volunteer for Environmental Sciences,
	Jan H. Steffen CSI,
	Ms Eris Widjanavh Environmental Science Programme
UNEP	Mr. Daniel van R. Claasen, Team Leader UNEP, Asian Tsunami Task Force, Indonesia
MoMAF	Mr. Ferianto Hadi S. Djais, Director for Space System of Sea, Coast and Small Islands, Ministry of Maritime Affairs and Fisheries
UNDP	Mr. Lucas Adyaksa, Environment Officer, UNDP
ILO	Mr. Federico Negro, Socio-economic Reintegration Specialist, ILO
HABITAT	Mr. Dodo Uliman Widianto, Habitat Programme Manager, Indonesia
ICRAF	Mr. Meine van Noord wijk, Regional Co-ordinator
	Mr. Laxman Joshi, Local knowledge and KBS approach
CIFOR	Ms. Moira M.M. Moeliono, Research Policy Reform
DINAS FORESTRY	Mr. Huseni
	Mr. Rusli
	Mr. Roswantu
	Ir.Kamaruddin. MST. Subdin, District Forestry staff
LEBAH	Mr. Muswil Ayub and 4 others

ANNEX 6. BRIEF NOTES OF DISCUSSION HELD WITH ORGANIZATIONS, INDIVIDUALS AND COMMUNITIES

Ministry of Forestry

Mr. Bambang Moerdino, Director International Cooperation Bureau, Ministry of Forestry, Mr. Iman Santoso, Director, Regional Office for Forestry Planning and Coordination, Sumatra, Mr. Harry Santoso, Director Watershed Management and Land Rehabilitation, MOF, Jakarta

Met with the staff of the Ministry of Forestry/Department of Forestry three times, once before proceeding to Aceh and twice after return. The officials were of the view that the Blue Print by the National Development Planning Board for Aceh Rehabilitation and Reconstruction on proposed Greenbelt development, does not envisage to compel or force the tsunami affected people out of their original dwellings. It only emphasises the importance and need for establishment of green belts in the coastal zones to protect the coastal communities from tsunami, cyclone and hurricane. Agreeable to the view any development of the coastal zone including greenbelt establishment should be participatory involving all the stakeholders. The problem of timber scarcity in meeting the industrial and domestic demand is already apparent and timber demand and supply situation is becoming critical. They were supportive of the mission's proposal on greenbelt establishment. The mission expressed concern about large scale clearing of mangroves for *tambaks* in Langsa.

Mr. Federico Negro, Socio-economic Reintegration Specialist, ILO

The ILO is providing training in organization and management skills to village communities in Aceh Besar district to form co-operatives and pursue economic development activities. Currently training is in progress in two villages. Interacting with established Community Based Village level Organizations would facilitate implementing integrated coastal resources management plans. ILO has resources to provide training at the village level for CBOs that wish to pursue small-scale economic activities. Income generation activities in forestry, fisheries and agriculture could be linked to ILO established CBOs.

Mr. Han Qunli Program Specialist for Ecology, UNESCO

Whether green belt is necessary and is it possible? The government's blueprint pertaining to green belts may not be acceptable to the local communities, and what is the alternative? The high cost of regeneration, rehabilitation and maintenance of green belts are a concern and it may be prudent to try out the green belt programme on a pilot scale in selected locations with people participation. There was no input into the blueprint on "Environment and Natural Resources" of BAPPENAS from UNESCO and it may be too late to recommend changes to the proposals. The best option would be to co-operate in implementing the blueprint proposals, with modification that is appropriate to the local situation with the support of the local communities. UNESCO is perturbed with the high scale illegal logging and encroachment threatening the national park and forests in the Aceh province.

ICRAF

Not carrying out any work in Aceh at the moment, but plans to study the impact of salinity on the tree crops in the near future. FAO has measured the salinity levels after tsunami in Aceh and the data would be useful. Work is mainly concentrated on cultivated forests and farmlands. Concept of greenbelt, promoting growing of trees in home gardens discussed. Cultural reasons are attributed for not cultivating *Sesbania grandiflora* in home gardens in

Indonesia. Contribution of cultivated forests and farmlands to the economy of Indonesia is very significant.

CIFOR

Not involved in Aceh on any programme. People's participation - adaptive collaborative management - in any coastal development programme was stressed by CIFOR.

Communities and Village Chiefs

The concept of mangrove rehabilitation and green belt establishment were discussed with communities, in all the villages visited including ten chiefs of villages. The views of the communities are almost unanimous:

- Highly supportive of mangrove rehabilitation, but stated that available land is very limited. Many people have the same opinion including provincial forestry staff
- Very much in favour of other coastal forest establishment
- Supportive of planting of live fences
- All decisions, such as location of planting sites, choice of species, management of other coastal forests, utilisation of coastal resources etc have to be discussed and decided at village level meetings
- Communities are in a dilemma on relocation. While many, especially those living very close to sea would like to be relocated in safer locations the prospect is very unlikely for many reasons:
    - Difficulty in finding suitable alternate land. The villagers would agree to relocation only if all the people of a village were given a contiguous land to maintain the past village structure and composition. Further the villagers preference is for land in proximity to the sea and not very far away.
    - The villagers are of the opinion that the government will not pay realistic compensation for their lands even if they decide to relocate on their own accord. A high percentage of the villagers are not in possession of land certificates, whereas the tsunami has destroyed many land certificates, confounding compensation claims.

OISCA - International NGO with national branches

The NGO has prepared a proposal for mangrove rehabilitation and beach forest establishment in Pidie district. The NGO expressed to work with FAO in coastal forest rehabilitation.

Yayasan Lahan Ekosustem Basah (LEBAH - Local NGO)

The NGO based in Banda Aceh, founded in 1998 is actively assisting village communities in integrated management of natural resources. Claimed to manage 100 ha of coastal land, owned by many villagers at Cadak village in Aceh Besar district. Visited the site at Cadak with members of the NGO and observed planting of *Rhizophora* propagules in about 0.05 ha and also a *Rhizophora* nursery. The nursery is stocked with about 5,000 propagules in

polypots; filling of polypots and transplanting of propagules was in progress at the time of visit. Most of the NGO members are from the Faculty of Forestry, Aceh.

District Forestry Staff at Lhoksumave, Meluaboh and Sigili

The Lhoksumave and Meluaboh district offices have submitted proposals to the provincial authorities for greenbelt establishment in Ache Utara and Aceh Barat districts respectively. The proposals for Aceh Barat (Meulaboh) include planting trees on the coast and enriching Nipa and Rumbia stands that were damaged by the tsunami. Potential for mangrove restoration or planting in Aceh Barat district is very poor. The proposals for Aceh Utara (Lhoksumave) include in addition to tree planting mangrove rehabilitation.

All three-district staff emphasised the importance of education and awareness creation as the first step towards conservation of mangroves and integrated development of coastal zone and also the need for community participation. Granting of permission to the villagers by the village chiefs to continue working on mangrove areas cleared for tumabks was mentioned at these meetings.

Mr. Dodo Uliman Widianto, Habitat Programme Manager, Indonesia

Stressed the need for constructing escape routes by constructing roads leading to hills - an aspect of spatial planning. During the last tsunami most of the people were trying to escape in vehicles on roads, which were running parallel to the coast and had no chance to escape. Habitat is against importing pre-fabricated houses and prefers houses to be built using local raw materials.