



Report of Joint FAO/MOAC Detailed Technical Damages and Needs Assessment Mission in Fisheries and Agriculture Sectors in Tsunami Affected Six Provinces in Thailand

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Food and Agriculture Organization of the United Nations (FAO)

in cooperation with

Ministry of Agriculture and Cooperatives (MOAC)

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MAP

Kingdom of Thailand – Districts affected by the tsunami



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ABBREVIATIONS

ADB	Asian Development Bank
APRACA	Asia Pacific Rural and Agricultural Credit Association
ARC	The American Refugee Committee
CHARM	Coastal Habitats and Resources Management Project
CONSRN	The Consortium to Restore Shattered Livelihoods in Tsunami-Devastated Nations
DANIDA	Danish International Development Agency
DLD	Department of Livestock Development, Ministry of Agriculture and Cooperatives
DOAE	Department of Agricultural Extension, Ministry of Agriculture and Cooperatives
DOF	Department of Fisheries Ministry of Agriculture and Cooperatives
DMCR	Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment
DNP	Department of National Parks, Wildlife and Plant Conservation, Ministry of Natural Resources and Environment
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GTZ	The Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
IUCN	The World Conservation Union
JICA	Japan International Cooperation Agency
LDD	Land Development Department, Ministry of Agriculture and Cooperatives
MNRE	Ministry of Natural Resources and Environment
MOAC	Ministry of Agriculture and Cooperatives
MOI	Ministry of Interior
NACA	Network of Aquaculture Centres in Asia-Pacific
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
RFD	Royal Forest Department, Ministry of Natural Resources and Environment
SEAFDEC	South East Asia Fisheries Development Centres
TDH	Terre des Hommes
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNRC	United Nations Resident Coordinator
USAID	United States Agency for International Development

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Executive Summary

A joint FAO/Ministry of Agriculture and Cooperatives (MOAC) detailed technical damage and needs assessment mission in the fisheries and agriculture sectors consisting of two FAO specialists (fisheries and agronomy), two MOAC coordinators and local officers of the Department of Agricultural Extension (DOAE) and the Department of Fisheries (DOF), visited the six tsunami-affected provinces (Phuket, Phang-Nga, Ranong, Krabi, Trang, and Satun). The mission was undertaken from 11 to 24 January 2005. The purpose of the mission was to assess the damages caused by the tsunami of 26 December 2004 and to identify the emergency/rehabilitation needs of the tsunami-affected coastal communities in fisheries and agriculture sector. The damages to coastal forestry and the adverse impacts on the livelihoods of coastal communities were also observed as far as this was possible.

The most severe damage in terms of economic losses in the overall agriculture sector (fisheries, livestock and crop) were recorded in Phang-Nga (US\$ 24.3 million) which shared over 50 percent of the total losses, followed by Phuket (19 percent) and Krabi (11 percent).

The fisheries sector was most severely hit by the tsunami. The total damage to the fisheries sector alone was estimated by the Government to amount to US\$ 47.2 million, or 99 percent of the total damage to the overall agriculture sector (US\$ 47.8 million). These figures do not include lost earnings which fisher folk could continue to gain if they were not affected by the tsunami. The tsunami caused severe damage not only to fisher folk and aquaculturists, but also to fisher folk who earn additional income from ecotourism. The estimated damage as reported by the Fisheries Rescue Coordination Centre on 10 January 2005 includes damage to 3 714 small fishing boats, 1 199 large fishing boats, 554 ecotourism boats, 6 063 fish and shellfish cage farms (amounting to 609 869 sq m), 42 shrimp farms (266 rai), 573 hatcheries (86 818 sq m), 17 shellfish concession plots (819 rai) and 47 063 sets of fishing gears. In addition, 83 public harbours/piers were affected. The damage to private jetties/piers for private boats or fishery associated businesses (e.g. ice plants, gas stations, fish landing and markets, etc) has not been identified as yet. The most severe damage to fishing boats and gears was reported in Phang-Nga and Phuket, whereas the most serious impacts on the aquaculture sector were in Phang-Nga and Ranong. On the basis of interviews with the victims and information from various sources, the most urgent needs appear to be boat and engine repair or replacement; repair or replacement of fishing gears; repair or replacement of floating cages and nets; fish seeds for stocking; repair of farm equipment; repair of shrimp pond and hatchery structures; supplementary sources of income; and sources of funds such as micro credit to meet operating costs.

A total of 9 728 rai of agricultural land used for rice, horticulture and other crop production which were owned by 1 157 farmers were affected by sea water intrusion, making it saline and toxic to plants, thus causing crop damage. Soil reclamation is required on the basis of the level of salinity present. If the level of salinity is high, the application of organic fertilizer and gypsum will be required. Crops that were damaged over large areas include fruit trees, cashew nut, oil palm, coconut,

vegetables and grass land. Phang-Nga was the most severely damaged, followed by Ranong, Satun, Trang, Krabi and Phuket, in that order. With regard to livestock, 429 head of cattle and buffaloes, 2 574 pigs, sheep, and goats, and 7 727 poultry belonging to 4 889 farmers were dead or missing. The loss was estimated to amount to about 9.7 million baht. Another 5 257 head of cattle and buffaloes suffer from a lack of grazing land.

The mission recommends emergency assistance to replace crops and livestock lost as a result of the tsunami. Soil amendments in the form of gypsum and organic fertilizer should be provided, as well as tree seedlings (coconut, cashew nut, oil palm), rice and water melon seeds, and mineral blocks for cattle, buffaloes, sheep and goats, and hay for buffaloes, for the provinces of Ranong, Phang-Nga, Phuket, Trang and Satun.

About 1 910 rai of mangrove forests in the tsunami-affected provinces were damaged (mostly flattened and broken trees), which was less than one percent of the total mangrove forest in the provinces. Other coastal forests, e.g. Casuarina forests, fresh water forests, rear-mangrove forests, were also damaged. No damage assessment to these forests has been carried out. It is suggested that an in-depth assessment of mangroves and other coastal natural resources should be carried out which would serve as a basis for the development of an integrated coastal area management plan.

The mission observed the active initiative and leading role of the Thai Government in tackling this unprecedented disaster, including emergency relief and support to tsunami affected victims, in which concerted efforts and partnerships with civil society and the international community are needed to minimize adverse impacts of the disaster on the large number of already poor coastal population.

As a follow-up to emergency phase and for the sustainable restoration of livelihood of the affected coastal communities, medium- and long-term interventions including participatory community-based fisheries and natural resource management, sustainable human resource development and institutional capacity building in coastal communities in tsunami-affected areas, as well as strengthening linkages between community organizations and local administration, need to be pursued, in addition to the provision/rehabilitation of production assets, such as fishing boats/gears and land reclamation. Strengthening local community organizations, micro-finance, natural disaster insurance, community based early warning system for disaster prevention/mitigation and rehabilitation of tourism would be required in this context under a multi-disciplinary approach.

The medium- and long-term rehabilitation and reconstruction efforts also offer an opportunity for not just restoring livelihoods and rehabilitating ecosystems to the pre-tsunami situation, but to create conditions to overcome some previous weaknesses and create better livelihoods and sustainable natural resource management. It is suggested to focus on:

- Technologies which assist in creating sustained employment-intensive activities which benefit especially the most vulnerable and marginalized. The main emphasis is on alleviation of poverty.

- Real incentives and opportunities for people in coastal communities to build up economic activities into strong livelihoods that will also enhance and empower the local community. Long-term planning for promoting market-led and economically sustainable measures are needed.
- Integrated and holistic approaches for sustainable enhancement of livelihoods of coastal communities with minimum impact on the environment considering the fact that the economic well-being of the community depends on maintaining a variety of eco-systems around them.
- Effective mechanisms of delivering information and appropriate technologies to the affected communities.
- Capacity building to explore new opportunities / diversification for enhancing livelihoods.
- Micro-credit and other similar initiatives to re-establish and improve their livelihoods with greater involvement of village organization / NGOs.
- In planning and implementing rehabilitation programmes it is important to consider the social inequity of vulnerable groups, and gender specific issues such as the women's access to resources, culturally defined gender division of work and the multiple tasks women carry out as producers and caregivers.

Acknowledgement

This report was prepared by the FAO mission members who participated in the joint FAO/MOAC detailed technical damages and needs assessment mission and were assisted by a team of FAO technical officers from the FAO Regional Office for Asia and the Pacific. FAO would like to extend its gratitude and appreciation to the officials of the Ministry of Agriculture and Cooperatives (especially DOF, DOAE, and LDD), provincial governors as well as concerned provincial/district officers including those from the Ministry of Natural Resources and Environment, NACA, CHARM, associated NGOs, UN agencies and other development partners for their generous support and valuable information provided to the mission.

1. Introduction

1.1 Background

On 26 December a massive earthquake of magnitude 9.0 (Richter scale) occurred off the west coast of Northern Sumatra, Indonesia. This was followed by a series of aftershocks that triggered tidal waves (tsunami) that travelled at over 600 km h⁻¹ causing extensive coastal damage to Indonesia, Malaysia, Myanmar and Thailand. Later on the tsunami reached Bangladesh, India, Maldives and Sri Lanka. Finally, it reached the Seychelles, and, in Africa, Kenya, Somalia, Yemen and Tanzania. It was the largest earthquake since the 9.2 magnitude earthquake off Alaska in 1964 and was the fourth largest since 1900. It took nearly 300 000 lives in South and Southeast Asia and East Africa.

The fisheries sector was hit worst by the tsunami, but crop and livestock as well as coastal eco-systems, including mangroves and other crop trees, also suffered serious damages. In terms of economic loss, FAO's latest estimates from India, Indonesia, Maldives, Myanmar, Somalia, Sri Lanka and Thailand combined put the cost in the fisheries sector alone at US\$ 250 million. This relates to 111 073 fishing vessels destroyed or damaged; 36 235 engines lost or damaged beyond repair; 1.7 million units of fishing gear destroyed; and US\$ 200 million in damage to the infrastructure (such as aquaculture operations, fishing infrastructure, and harbours). The damages now have been assessed at US\$ 25 million in Maldives; in Aceh Province in Indonesia, 65-70 percent of the small-scale fishing fleet and associated gear were destroyed, and some 50 percent of fishers died; some 66 percent of the fishing fleet and industrial infrastructure in coastal regions have been destroyed and 10 out of 12 main fishery harbours were devastated in Sri Lanka; and some 5 400 fishing boats were damaged affecting the livelihoods of a large number of fisher households in six southern coastal provinces of Thailand.

In agriculture, the damages to crop production are mainly due to intrusion of sea water to agricultural land and deposition of saline sediment, destruction to irrigation and drainage facilities and loss of farming capital. For example, in Indonesia, over 30 000 ha of rice production was damaged due to salinity and immediate crop losses were estimated at 80 000 tons of unhusked rice and 160 000 tons of other crops. On the northwest coast, as many as 92 000 farms and small enterprises have been destroyed affecting the livelihoods of about 160 000 people. Rehabilitation options and the cost of rehabilitating agricultural lands will depend on the severity and extent of damage and Salinization and on the capacity to flush out salts and re-establish irrigation and drainage; a total of 5 500 ha (2 600 paddy, 2 150 other food crops, 150 fruit trees) have been damaged in Sri Lanka; some 1 300 ha of land were inundated by sea water, of which 900 ha were damaged in Thailand. About 30 percent of the field plots have been completely destroyed in the Maldives. In addition, salt water flooding may prevent farmers from cropping their land for one or more seasons or force them to adopt more salt tolerant crops and varieties. Property rights are threatened, not least for widows and orphans.

The livelihoods of millions of farmers and fisher folk of many coastal communities in these countries have been completely or partially destroyed. Economies at the community level were severely affected, causing hundreds of thousands of already poor people to fall into even deeper poverty. The world is still trying to grasp the immensity and long-lasting negative impact of this natural disaster on local populations and the affected countries' economy. Rebuilding these livelihoods is one of the main challenges facing the affected governments and international organizations and its partners as a continuous process following the initial phase of rescue and humanitarian relief. While the most pressing needs are for medical supplies, clean water, food, shelter and sanitation, the affected communities, the majority of which are heavily dependent on production assets such as fishing boats and gear as well as agricultural lands, need to restart production activities as soon as possible in order to regain their livelihoods.

1.2 The tsunami's impact in Thailand

The tsunami caused extensive damage to life and property in six southern coastal provinces of Thailand. The casualty figure stands at 5 322 dead, 8 457 injured and 3 144 missing¹. The severely affected areas include 292 villages in 78 sub-districts (*tambon*) of 24 districts (*amphur*). In these areas, 20 537 households with a total population of 91 638 are considered to have been directly affected through loss of, or injury to, a family member².

In terms of economic losses, the Department of Disaster Mitigation and Prevention estimated a total loss of US\$ 47.9 million in the fisheries/agriculture sector, out of which the fisheries sector alone shared US\$ 47.2 million (99 percent), the livestock sector US\$ 0.5 million, and agriculture/crop sector US\$ 0.2 million. These figures do not include lost earnings which coastal communities could have gained if they had been provided with production assets such as fishing boats and gears.

In Thailand, the most seriously affected sector was coastal fisheries. The estimated damage, as reported by the Fisheries Rescue Coordination Centre on 10 January 2005, includes 3 714 small fishing boats, 1 199 large fishing boats, 554 ecotourism boats, 6 063 fish and shellfish cage farms (totalling 609 869 sq m), 42 shrimp farms (266 rai), 573 hatcheries (86 818 sq m), 17 shellfish concession plots (819 rai) and 47 063 sets of fishing gears. In addition, 83 public harbours/piers were affected. The damage to private jetties/piers for private boats or fishery associated businesses, for example, ice plants, gas stations, fish landing, markets, and others has still to be assessed. The tsunami caused severe damage not only to fisher folk and aquaculturists, but also to fisher folk earning additional income from ecotourism.

¹ OCHA Situation Report No. 22 (28 January 2005)

² UNRC Distaste Field Situation Report 7 and UNCT Field Trip Report 10-13/01/05

According to the report dated 20 January 2005 received from MOAC/DOAE, 9 726 rai of agricultural land used for rice production, horticulture and other crop production, which were owned by 1 157 farmers in the six provinces, were affected. MOAC/DLD estimated, according to its report of 4 February 2005, that 535 560 heads of livestock including cattle, buffaloes, pigs, sheep, goats, ducks, chickens and geese, which belonged to 4 898 farmers, were affected, in addition to 10 730 animals which were dead or missing. The environmental damage was severe in some areas: for example 3 146 rai and 550 rai of coral reefs were slightly damaged and severely damaged respectively; 6 200 rai of beaches were damaged; 1 910 rai of mangrove forest were damaged; 222 ring wells and 50 tube wells were damaged.

The Department of Disaster Mitigation and Prevention estimated that the most severe damages in terms of value to the fisheries and agriculture sector occurred in Phang Nga (US\$ 24.3 million) which shared over 50 percent of the total damages in the sector, followed by Phuket: US\$ 9.0 million (19 percent), Krabi: US\$ 5.0 million (11 percent), Ranong: US\$ 4.5 million (9 percent), Satun: US\$ 3.2 million (7 percent) and Trang: US\$ 1.8 million (4 percent).

The government, in collaboration with various partners, provided emergency humanitarian relief to both Thai and foreign victims of the tsunami, including accommodation, food, and land clearing, and provided limited financial compensation to the victims engaged in agricultural sectors (fisheries, crops and livestock).

A large number of Tsunami affected coastal communities relied heavily on fisheries and agricultural activities for their income and livelihoods. The sudden loss or damage of their production assets such as fishing boats and fishing gears as well as damage to their crops and agricultural land resulted in severe economic losses to the hundreds of thousands of already poor coastal population.

1.3 The joint FAO/MOAC detailed technical damage and needs assessment mission

a. Purpose

The purpose of the joint FAO/MOAC mission was to assess damage to coastal fisheries, aquaculture, agriculture and livestock, and identify the needs for emergency assistance and rehabilitation. More specifically, the FAO specialists (TOR in Annex 2) and members of the mission carried out the following tasks:

- 1) assessed the damage to coastal fisheries, coastal aquaculture, agriculture and livestock through field visits, verification of available data, observation of the affected areas, discussion with affected victims, concerned government officers, and other relevant partners;
- 2) identified the Government emergency and rehabilitation strategy and plan, and assessed the areas to reinforce the national response;

- 3) assessed the emergency as well as medium/long-term rehabilitation needs and their priority;
- 4) identified priority interventions and inputs with specifications and local supplies for coastal fisheries, coastal aquaculture, agriculture and livestock, for emergency assistance;
- 5) identified an institutional mechanism for emergency assistance and inputs distribution at provincial and district levels;
- 6) prepared a project document for emergency assistance for the fishers and farmers for the next six to twelve months; and
- 7) prepared project profiles for medium/long-term rehabilitation in the coastal fisheries, coastal aquaculture, agriculture and livestock sectors.

In addition, the mission made efforts to assess the damage to the mangroves and other coastal forests at every possible opportunity.

b. Composition

The members of the mission team consisted of two FAO specialists i.e. Dr. Praphas Weerapat (Agronomy – FAO Leader) and Dr. Hassnai Kongkao (Fisheries), two overall coordinators from MOAC, namely Dr. Waraporn Prompoj (Fisheries Foreign Affairs, Department of Fisheries) and Ms. Pitsini Jirawat (Planning Division, Department of Agricultural Extension), and 16 local coordinators from the Provincial/District Offices of MOAC (see Annex 1).

The mission was technically supported and backstopped by a team of FAO technical officers of the FAO Regional Office for Asia and the Pacific (RAP) and the Thai Affairs Section (TAS) of RAP³.

c. Itinerary

The team visited the most affected areas of six western coastal provinces of southern Thailand, namely, Phuket, Phang-Nga, Krabi, Trang, Satun and Ranong during the period from 11 to 24 January 2005 and held meetings and discussions with relevant government officials, NGOs and community leaders in order to obtain an overall picture of the damage, assess the communities' needs and the ongoing rehabilitation activities of government institutions, NGOs and other agencies. Upon the completion of the field visits, the mission spent approximately two weeks in Bangkok for further analysis of data, consultations and report writing. The mission was completed on 8 February 2005. The mission report was further elaborated and reinforced by the FAO/RAP Backstopping Team prior to finalization. The Terms of Reference for the mission is presented in Annex 2 and the list of persons met and details of the itinerary are presented in Annexes 3 and 4, respectively.

³ Mr. Gamini Keerthisinghe (Senior Plant Production Officer), Mr. Simon Funge-Smith (Aquaculture Officer), Mr. Masakazu Kashio (Forest Resources Officer), Mr. Yuji Niino (Land Management Officer), Mrs. Carolyn Benigno (Animal Health Officer) and Ms. Kayo Torii (Programme Officer, TAS)

2. General overview of pre-tsunami state in affected provinces

The worst hit area, the central Thai Andaman coast from Phang-Nga to Krabi with Phuket at the centre, has undergone rapid economic development in recent years. In the past, the rural and coastal communities of Phang-Nga and Phuket relied more on land based activities such as collecting forest products, commercial agriculture (fruit orchards, cashew, copra, rubber) and especially tin dredging (Phang-Nga, Ranong and Phuket provinces). Fishing and aquaculture, although present, were very marginal activities some 30 years ago. They are now significant employers and economic contributors to the Andaman provinces, especially in areas that do not enjoy major tourist incomes.

The boom in the tourism industry brought an attractive source of income and jobs for the locals, especially for the younger people (up to 50 percent of the staff employed by the destroyed major tourism complexes of Khao Lak were from the surrounding communities). The tourism industry also provided new opportunities for other businesses such as small souvenir shops and restaurants.

In summary, the flourishing and fast development of the coastal areas of Phuket, Phang-Nga and Krabi provinces attracted people from all over the world, in addition to those from the kingdom. This has “artificially” increased the population having their livelihoods almost entirely oriented, directly or indirectly, towards the exploitation of the coastal natural capital and resources.

The tight interdependency of a limited range of livelihoods all linked to the coastal environment and sustaining a large mixed population constitutes the major source of vulnerability for the post-tsunami recovery.

Coastal Fisheries / Agriculture: All along the central portion of the coast, the fishing communities, which are traditionally among the poorest in Thailand, saw an opportunity and directed a significant part of their activity to supplying restaurants and resorts with fresh, highly prized reef fish species and seafood products in general. This increased the over exploitation of marine resources, including those in protected areas, and expanded in size the area exploited. There was also an opportunity to provide sea transportation services for tourists to nearby beaches and islands as an alternative to the less profitable fishing activities.

Migrant workers from Myanmar have become a significant part of the labour force in the commercial fishing industry, shrimp farms and other rural farming activities as young Thai nationals from fishing communities tended to target the more profitable tourism related jobs.

Unfortunately, data on the number of fishing boats/vessels, various fishing gears as well as the statistics on aquaculture, shrimp farms, etc. and their catches/production in the six tsunami affected provinces were not available.

Agriculture/Livestock: The worst affected provinces namely, Ranong, Phang-Nga, Phuket, Krabi, Trang and Satun are located on the western coast of Thailand. The livelihoods of the people in these provinces are mainly based on fisheries, agriculture (crops such as rice, rubber, oil palm, fruits, vegetables, coconut) and raising farm animals such as cattle, buffaloes, sheep, goats, chickens, ducks, geese, and quails. The majority of farmers grow rubber, fruit trees, and oil palm. The average income is about 30 000 – 100 000 baht per year per household. Rice fields in these provinces are very small (total area ranging from 7 165 rai in Ranong to 100 000 rai in Satun) and the production is not enough to meet the demand. The areas under different crops are presented in Tables 1 and 2.

Table 1 Details of pre-tsunami cropping area in the six tsunami-affected provinces in 2004

Provinces	Total Planting Area (rai)	Area (rai)			
		Rubber	Oil Palm	Coconut	Rice
Ranong	558 442	116 151	17 244	5 750	7 165
Phang-Nga	915 464	633 044	72 862	27 495	5 868
Phuket	139 488	112 374	-	16 380	2 250
Trang	1 781 950	1 209 538	66 279	15 423	43 158
Krabi	2 346 081	887 508	722 506	8 051	21 173
Satun	700 000	352 214	103 892	5 888	100 000
Total	6 441 425	3 310 829	982 783	78 987	179 614

Sources: DOAE Provincial Office in Ranong, Phang-Nga, Phuket, Trang, Krabi, Satun, 20 January 2005

Table 2 Details of pre-tsunami livestock production in the six tsunami-affected provinces in 2004

Province	No. of Farmers	No. of Native Cattle	No. of Buffaloes	No. of Pigs	No. of Sheep	No. of Goats	No. of Chickens	No. of Ducks
Ranong	5 109	3 539	922	16 132	3 500	-	654 533	13 834
Phang-Nga	16 285	4 392	3 735	19 501	6 992	49	2 150 497	53 107
Phuket	3 601	1 357	1 852	13 241	2 229	14	409 226	33 100
Krabi	15 838	22 102	1 203	22 537	11 880	307	443 932	24 783
Trang	43 559	58 353	551	51 311	8 434	146	819 752	56 498
Satun	15 779	20 183	723	3 706	11 958	58	216 886	32 396
Total	100 171	109 926	8 986	126 428	44 993	574	4 694 826	213 718

Source: Department of Livestock Development, 10 February 2005

Mangroves and other coastal forests: In the last few decades, the mangrove forests in Thailand were largely lost during the process of development activities. By the mid 1990s, the total area had dropped to 167 582 ha, about one-third of the original area. Due to rehabilitation efforts in recent years, by the year 2000, 245 255 ha had been recovered; 209 310 ha or 85.3 percent were located in southern Thailand (RFD, 2002). The mangrove forests in the south mostly spread over the mud flats of river mouths and shore lines, but they also decorate the fringe of semi-sandy beaches in a narrow, broken belt. Their ecological niches are restricted to tidal zones, which is regularly inundated by brackish water.

There are other types of forests in the coastal zones of the south. These include the rear-mangrove forests, freshwater swamp forests, *Casuarina* forest, and various types of mixed forests with tree species of *Terminalia*, *Tamarindus*, *Thespesia*, *Hibiscus*, *Pandanus*, *Cocos*, etc. Coconut palm and rubber plantations, as well as rambutan, mangosteen and durian orchards are representative of the landscape of the south. They are not generally recognized as forests, but such woody vegetation forms quasi-forests.

The majority of mangroves in the south are secondary forests, partly because of their historical utilization for charcoal and timber production. Other reasons include illegal logging, clear cutting for fish or shrimp farming, and socio-economic development activities, e.g. construction of harbours, roads, etc. Some degraded areas have naturally regenerated or been artificially replanted. Most mangrove trees are less than 12 cm in diameter and 10 m in height.

3. Damage assessment

3.1 Livelihoods of coastal communities

According to the Department of Disaster Mitigation and Prevention, Ministry of Interior, 5 322 people died, 8 457 people were injured, and 3 144 went missing as a result of the tsunami⁴. Nearby 300 villages in 78 subdistricts (Tambons) of 24 districts were affected. In these areas, 20 537 households with a total population of 91 638 people are considered to be directly affected through loss of, or injury to, a family member. In Phang-Nga, the most affected province, over 19 000 people from 4 500 households were directly affected covering 45 villages in 14 subdistricts of six districts.⁵ More than 3 600 houses were destroyed and almost 3 200 houses were damaged. Approximately 70 percent of the total damage was in Phang-Nga province. This disaster had a serious impact on the local population, their livelihoods and the local economy. Many survivors are in a state of shock and are not in a frame of mind to work. They need emergency support from the public and the government. At present, they have enough food to eat, but they need housing and occupational support (seeds, planting materials, equipment, tools, etc.) to restart agricultural activities. In general, the fisheries sector was the worst affected, however, some people were involved in both the fisheries and agriculture sectors. Affected communities' needs are listed in Table 3.

The Department of Disaster Mitigation and Prevention reports that the estimated damage to the fishery sector is US\$ 47.2 million, with half of the losses in Phang-Nga. The losses in the business sector are currently estimated at nearly US\$ 390 million, excluding the losses to 98 damaged hotels and resorts in Phang-Nga, which have yet to be estimated. Damage to civil infrastructure, including roads, bridges and piers is estimated at US\$ 7.8 million, with almost 70 percent of the damage in Phang-Nga.

According to the DOF record of 10 January 2005, at least 33 725 victims/families (of which 5 202 and 28 523 come from fishery and aquaculture families, respectively) from 396 villages in 74 subdistricts suffered from damage related to their fishing and aquaculture activities as well as to some of their houses. The deaths of relatives or of the farmers themselves also occurred. These figures do not include an uncounted number of families that suffered the loss of or damage to their private jetties/piers for their own boats or for use by the fishery services sector such as ice plants, gas stations, fish landing and markets. Apart from the actual damage to properties, victims also lost their opportunity costs or incomes until the next catch/harvest.

⁴ OCHA Situation Report No. 22 (28 January 2005)

⁵ UNRC Distaste Field Situation Report 7 and UNCT Trip Report 10-13/01/05

Table 3 Summary status of affected communities

Welfare related and rapid needs
<ul style="list-style-type: none"> • Rice shortage - rice security assured for further three months (other types of food are assured, but rice consumption in temporary shelter camps of displaced communities is considerable and requires support). • Milk supplement for children (powder/canned). • Schooling related – school fees, school lunch, tsunami awareness, day care /nursery facilities (lack of income and loss of family members requires support to meet basic education needs). • Welfare support/income support (50 baht per person per day) for the next three months (total loss of income generating capacity requires fundamental income support).
Housing, land rights and utilities
<ul style="list-style-type: none"> • Issues of temporary and permanent accommodation (including land titling, displaced tents, inability to reconstruct, state land, national parks. Many coastal communities are based within untitled land, state land, mangroves etc. Lack of title prevents them for claiming compensation for lost housing and creates conflicts about their rehabilitation and eventual location of their replacement accommodation.). • Electricity (lack of income generation makes communities unable to pay for utilities – even if they are rapidly restored). • Water for drinking and washing is salivated in many affected areas – this requires rehabilitation or interim water storage facilities. • Dredging of channels and entries to ports and harbours. The tsunami carried huge quantities of sand and sediment into creeks and channels. • Restoration of the dockside services for fisheries (fuel and ice particularly).
Employment and livelihood rehabilitation
<ul style="list-style-type: none"> • Fishery livelihood related (replacement or repair/rehabilitation). Most of the affected communities relied in some way upon fisheries or aquaculture for income. The inability to return to fishing or aquaculture is critically affecting their ability to generate income and their debts are mounting. Also they have no way to start to reinvest in replacement of the lost livelihoods. <ul style="list-style-type: none"> - Boats (repair or replacement, need boat repairs yards for self help, access to wood and materials, skilled local craftsmen in short supply) - Engines (many lost or damaged – need repair and replacement as above) - Fishing gears (lost gear need replacement) - Aquaculture related (cage aquaculture particularly and also other forms of coastal aquaculture damaged - considerable financial loss cage culture entrepreneurs) • Other livelihoods issues of coastal communities
Community development processes
<ul style="list-style-type: none"> • Improved information system for community development (too many assessments and to many uncoordinated interventions have resulted in poorly targeted assistance. This has generated confusion and conflict as beneficiaries are unevenly targeted and selection mechanisms and types of support inappropriately delivered). • Mechanisms for community strengthening and management of community resources (communities with existing organizations – such as fisher’s organizations, savings groups or any other form of community mobilization/organization mechanisms have recovered quicker than those without. In particular such communities and groups are easier to deal with in terms of delivering assistance and the local decision making processes of how such assistance will be shared amongst the community/beneficiaries.

Source: Presentations made at DOF/EU CHARM “Workshop on fishing communities and livelihoods impacts of tsunami”, Phuket 14-15 February 2005.

3.2 Coastal fishery

The total damage to the fisheries sector in the southern province (US\$ 47.2 million) was much higher than other agriculture subsectors. This does not include the opportunity cost that the affected fishermen/ aquafarmers have to forgo during their forced inactivity until they undertake the next catch/harvest. This tsunami severely affected not only fisher folk and aquaculturists, but also fisher folk who earn additional income from ecotourism. The estimated damage as reported by the Fisheries Rescue Coordination Centre on 10 January 2005 includes damage to 3 741 small fishing boats, 1 199 large fishing boats, 554 ecotourism boats, 6 063 fish and shellfish cage farms (totalling 609 869 sq m), 42 shrimp farms (266 rai), 573 hatcheries (86 818 sq m), 17 shellfish concession plots (819 rai) and 47 063 sets of fishing gears. In addition, 83 public harbours/piers were affected whereas the damage to private jetties/piers for private boats or fishery associated businesses (e.g. ice plants, gas stations, fish landing and markets, etc) has not been assessed yet.

The proportion of damaged large boats (over 10 m length) was greatest in Phuket (41 percent), Phang-Nga (27 percent), Ranong (17 percent), Krabi (12 percent), Satun (2.9 percent) and Trang (0.1 percent). For small boats (below 10 m length) the figures were Krabi (22 percent), Phang-Nga (20 percent), Trang (17 percent), Phuket (17 percent), Satun (15 percent) and Ranong (9 percent). The most severely damaged small boats (432 of these) and large boats (390 of these) at district level were in Muang district, Phuket. The severe damage to large boats (mainly trawlers and purse seiners) was caused by several boats being crushed against each other and subsequently hitting the fishing ports, bridges, and rigid structures or by sinking. It is noted that the primary data, which were collected from the claims of victims, for valuing damages, were either overestimated or underestimated by the victims.

Some small-scale fisher folk may overestimate their claims in cases where there are no lost boats and/or equipment available for inspection. The large scale operators might not bother to report the value of damage to their boats as making a claim for compensation requires a lot of paper work and because they expect very little compensation from the government. It also takes time for DOF/authorized officers, who are updating the necessary data, to re-estimate/counter check any compensation claims by actual investigation under the government's emergency assistance programme. Hence, it was not possible to get the true value of damage to both fishing boats and fishing gears during this mission period.



Fig. 1 Small fishing boats were worst hit



Fig. 2 Large trawlers were damaged



Fig. 3 Some damaged boats ended up in mangrove areas



Fig. 4 Engines in need of repair

Table 4 Number of damaged to fishing boats

Province	Large boats	Small boats	Large sunken boats	Small sunken boats	Value (US\$)*
Ranong	204 (17%)	314 (9%)	13	27	12 331
Phang-Nga	322 (27%)	754 (20%)	124	46	915 546
Phuket	490 (41%)	642 (17%)	157	41	1 884 618
Krabi	147 (12%)	804 (22%)	1	54	19 269
Trang	1 (0.1%)	648 (17%)	-	-	-
Satun	35 (2.9%)	552 (15%)	6	49	20 520
Total	1 199 (100%)	3 714 (100%)	301	217	2 852 284

Source: Department of Fishery, 10 January 2005

Note: * = This covers the cost for retrieval of boats only. The value of completely damaged or lost boats, boat and engine repair is not included.

According to the DOF data of 7 January 2005, 421 bamboo traps, 13 690 other fish traps (including crab traps and squid traps) and 1 871 nets were lost or damaged.

The mission considers that the actual damage to these fishing gears should be higher than that recorded because various types of gear such as air compressors for diving to collect coral reef fish, lobster and shellfish, and illegal fishing gears were not included in the calculations. The details of damage at the district level are shown in Annex 13 and are summarized at the provincial level in Table 5.

The most severe damage to fishing gears was found in Satun, Phang-Nga, Phuket, and Krabi, in that order.

Table 5 Damage to fishing gears in six provinces

Provinces	Bamboo trap (legal) (unit)	Other traps (unit)	Nets (unit)	Value (US\$)
Ranong	-	297 (2%)	191 (10%)	-N/A-
Phang-Nga	-	514 (4%)	477 (25%)	-N/A-
Phuket	-	463 (3%)	491 (26%)	-N/A-
Krabi	150 (36%)	575 (4%)	347 (19%)	-N/A-
Trang	-	412 (3%)	182 (10%)	-N/A-
Satun	271 (64%)	11 429 (84%)	183 (10%)	-N/A-
Total	421 (100%)	13 690 (100%)	1 871 (100%)	-N/A-

Source: Department of Fisheries, 7 January 2005

3.3 Coastal aquaculture

The most severe damage in the aquaculture sector was to fish cages (estimated loss at US\$ 20.3 million) for marine fish farming of which Phang-Nga (29 percent), Ranong (20 percent) and Satun (18 percent) were mostly affected (see table 6). The cultured species include grouper, sea bass, red snapper, lobster, etc. Though fish cages are mainly located in sheltered areas, well protected by mangroves such as the mouth of rivers and canals, the rapidly rising tides and their reversal caused the fragile cage structures to break by crashing them in to other cages or rigid structures or mangrove trees. If the fish stocks did not escape from the damaged cages, the remaining stocks might be injured by the collision and subsequently die as a result of bacterial infection of their wounds. The total damage to shrimp ponds was reported to amount to only 233 rai (mainly in Krabi and Phang-Nga) because most shrimp farms along the Andaman coast are located on higher ground which the tsunami waves could not reach. Shrimp hatcheries were heavily damaged in Muang district, Phuket, Takua Pah district and Tai Muang district, Phang-Nga, where the structures were mainly destroyed. Because of good water quality, many of these hatcheries also operated broodstock development and sold the newly hatched larvae (*nauplii*) to other small-scale hatcheries. Fortunately, the main areas for shrimp hatcheries are in the Gulf of Thailand. The rest of the hatcheries were only slightly affected, such as by the loss of and damage to water pumps, other equipment and shrimp seed stocks. The impact on shellfish culture covered 819 rai of seabed concession for cockles and mussels as well as 165 013 sq m of mussel and oyster rafts/cages. The worst shellfish damage was in Phang-Nga, Phuket, Satun and Ranong. The damage at the district level is shown in Annex 13 and the provincial level data are summarized in Table 6.

Table 6 Damage to coastal aquaculture in six affected provinces

Province	Fish Cages	Shrimp Ponds	Hatcheries	Shellfish	Total
*Ranong	90 904 sq m (20%) No of farms (US\$) 677 (4 405 403)	10.05 rai -N/A- -	- - -	21.47 rai (plus 165 913 sq m of cages) 432 (93 434)	22 907 (4 498 837)
Phang-Nga	129 798 sq m (29%) No of farms (US\$) 3 008 (3 994 861)	105.50 rai 17 (391 744)	10 718.14 sq m 180 (3 215 205)	400.00 rai -N/A- -	3 205 (7 601 810)
Phuket	44 134 sq m (10%) No of farms (US\$) 315 (3 083 026)	36.48 rai 2 (12 385)	76 100.00 sq m 209 (513 551)	362.58 rai 72 (820 319)	598 (4 429 281)
Krabi	77 834 sq m (18%) No of farms (US\$) 389 (3 187 173)	114.00 rai 23 (176 641)	- - -	30.37 rai 6 -	418 (3 363 814)
Trang	23 660 sq m (5%) No of farms (US\$) 243 (1 076 056)	- - -	-N/A- 144 -	5.25 rai 2 (8 462)	245 (1 084 518)
Satun	78 526 sq m (18%) No of farms (US\$) 966 (4 604 375)	- - -	-N/A- 40 -	- - (385 898)	1 006 (4 990 273)
Total	444 856 sq m	266.03 rai	86 818.14 sq m	819.67 rai (+165 013 sq m of cages)	
Farm (US\$)	5 568 (20 350 894)	42 (580 770)	573 (3 728 756)	512 (1 308 113)	6 695 (25 968 533)

Source: Department of Fishery, 10 January 2005

Note: * = Updated information received from Ranong Provincial Fisheries Officer on 20 Jan 2005



Fig. 5 Smashed fish cages



Fig. 6 Fish cages were washed onshore



Fig. 7 Small traps



Fig. 8 Shrimp hatcheries were damaged



Fig. 9 Crab traps



Fig. 10 Box traps

3.4 Agriculture

The Ministry of Agriculture compiled the data received from the DOAE provincial offices and estimated the damage in the agricultural sector. As of the report on 26 January 2005, 9 726 rai of agricultural lands (rice, horticultural and other crops) owned by 1 157 farmers were affected.

Significant damage to agricultural land resulted from the intrusion of sea water (Fig. 11-13). Damage due to direct impacts of the tidal waves to crops at close proximity to the coast line was minor. However, the majority of crops suffered from the high level of salinity. Fruit and plantation trees showed toxicity symptoms such as yellowing and drying leaves (Fig. 14). The Land Development Department (LDD) reported that about 8 000 rai of agricultural land in the six provinces were estimated to be affected by salinity.



Figs. 11a Damage to agricultural lands due to sea water intrusion



Figs. 11b Damage to agricultural lands due to sea water intrusion



Fig. 12 Sea water intrusion and uprooting of young oil palm trees



Fig. 13 Crops affected by sea water intrusion

Fruit trees, namely cashew, rambutan, mango, longong, jackfruit, and mangosteen were more vulnerable to salinity and more severely affected than the other crops. Some affected mangosteen trees showed yellowing and twitching of young leaves, whereas older or mature leaves remained green at the time of assessment after five to ten days of sea water intrusion (Fig. 14). It was, therefore, recommended to monitor the damages frequently, preferably weekly, at least for a period of six weeks after sea water intrusion. Young oil palms, especially two to three years old trees, grown in areas near the coast were severely damaged because of salinity (Fig. 15). Leaves and the leaf axis of whole plants turned red and dried indicating that the oil palm was not tolerant to high level of soil salinity. Rubber trees more than three years old showed greater tolerance to salinity. Coconut, as expected, showed a high degree of tolerance to salinity, but many young and smaller trees near the coast were knocked over because of the direct impact of tidal waves. Oil palm trees withstood the direct impact of tidal waves. Details of damage to the crop sector are presented in Table 7.



Fig. 14 Young leaves of mangosteen showing saline toxicity symptoms



Fig. 15 Severely damaged oil palm plants

Table 7 Damaged cropping areas by Province

Province	Number of affected districts	Number of affected farmers	Affected area * (rai)	Damaged cropping area (rai)			Total (rai)
				Rice	Other field crops	Horticulture, coconut, oil palm	
Krabi	3	13	60	15	5	40	60
Trang	2	76	1 222	100	167	21	288
Phang-Nga	5	675	8 406	37	---	8 369	8 406
Phuket	1	10	68	---	10	80	90
Ranong	3	241	2 313	44	12	314	370
Satun	2	142	577	122	387	3	512
Total	16	1 157	12 646	318	581	8 827	9 726

Source: Department of Agriculture Extension, 26 January 2005

* Affected area: The area where the agricultural land was flooded with sea water

Crop damage in Phang-Nga province was reported in five districts (Takua Pah, Kuraburi, Tay Muang, Takua Thung and Ko Yao). The total area damaged was 8 406 rai affecting 300 farmers. Takua Pah was the most severely affected district. Damaged crops included fruit trees, oil palm, cashew nut, vegetables, and rice. Oil palm trees and rubber seedlings in Takua Thung were severely damaged due to salinity. Soil was dark in colour with high moisture content with poor drainage due to dispersion of soil organic matter and loss of soil structure affected by salinity (Fig. 16).



Fig. 16 Agricultural land affected by salinity in Takua Thung

In Ranong province, damage to crops was mainly located in Muang Ranong, Kapur, and Suk Samrarn districts. Suk Samrarn and Kapur were the most severely affected districts in the province. Damaged crops included cashew, mangosteen, longong, rambutan, mango, coconut, rubber and seedlings of fruit trees, covering an estimated area of 1 354 rai belonging to 238 farmers. Coconut was tolerant to salinity, but many trees were destroyed due to the impact of tidal waves.



Fig. 17 Damaged coconut trees from direct impact of tidal waves

Crop damage in Satun province was reported in two districts, Thung Wa and La Ngu. Crops, including rice, water melon and oil palm, belonging to 185 farmers and covering a total area of 587 rai were damaged. Grasslands were dry as a result of sea water intrusion posing feeding problems for cattle and buffaloes.

Damage to crops in Trang was reported in two districts, Pa-lian and Haad Samran. Crops, including rice and water melon, covering 177 rai and belonging to 76 farmers were damaged. Lodging and empty grains were the main problems in rice because of salinity, whereas the fruits of water melon dried before harvesting.

Crop damage in Krabi was reported in three districts (Muang Krabi, Neua Klong, and Ko Lanta). Crops, including rice, oil palm, water melon, rubber seedlings, and coconut, belonging to 14 farmers and covering a total area of 56 rai were damaged. Oil palm trees showed saline toxicity problems (Figs. 12 and 15).

Damage to crops in Phuket was reported in two districts (Muang Phuket and Thalong). Crops, including vegetables, pineapple, rubber, mango, cashew nut, and coconut, belonging to 10 farmers and covering 25 rai were damaged. The coconut was slightly damaged, but vegetable crops were severely damaged because of salinity. Salt was visible on the soil surface, indicating a high level of soil salinity (Fig. 18).



Fig. 18 Salt damage visible on the soil surface

3.5 Livestock

Damage in the livestock sector was compiled by the Ministry of Agriculture and Cooperatives based on the data from the DOAE and DLD provincial offices. According to the report of 4 February 2005, 535 560 head of livestock including cattle, buffaloes, pigs, sheep, goats, ducks, chickens and geese belonging to 4 898 farmers were affected because of feed shortages and damage to infrastructure in addition to 10 730 animals which were dead or missing. The Department of Disaster Mitigation and Prevention, Ministry of Interior, estimated the sustained losses of the livestock sector at US \$ 0.5 million with 90 percent of the animal, losses occurring in Phang-Nga and Ranong province, including cattle, buffaloes, pigs, sheep, and goats. Chickens, ducks, quails, and geese were directly hit by the tsunami and died as a result. The surviving animals were in a critical condition because their barns were destroyed and there was a shortage of feed. They were, therefore, relocated one to two kilometres inland where the area had escaped damage and better conditions were available for raising livestock. Sick and wounded animals were provided with first aid by provincial livestock officers with drugs, feed and hay.

Details of damage to livestock are summarized in Table 8.

Table 8 Damage to livestock sector

Province	No. of Districts	No. of Farmers	Affected animals *			Dead/Missing animals		
			Cattle Buffaloes	Pigs, Sheep, Goats	Poultry	Cattle Buffaloes	Pigs, Sheep, Goats	Poultry
Krabi	3	36	715	108	312	7	107	203
Trang	2	9	675	1 030	29 944	---	32	47
Phang-Nga	5	3 127	2 151	5 340	472 558	232	2 007	4 213
Phuket	1	129	269	218	1 564	---	97	800
Ranong	3	1 571	1 242	1 899	17 082	170	396	2 384
Satun	2	26	205	28	220	20	23	80
Total	16	4 898	5 257	8 623	521 680	429	2 574	7 727

Source: Department of Livestock Development, 4 February 2005.

* Suffering from lack of feed and water

Damage to livestock in Phang-Nga was reported in four districts namely, Takua Pah, Kuraburi, Tay Muang and Ko Yao. The Department of Livestock reported that 6 452 farm animals (cattle, buffaloes, pigs, native chickens, and ducks) belonging to 236 farmers were dead or missing because of the direct impact of the tsunami. The poultry sector was the most severely affected. Livestock damage in Ranong province was reported in three districts (Muang Ranong, Kapur, and Suk Samrarn). Kapur and Suk Samrarn were among the most severely affected districts of the province. Livestock, including cattle, buffaloes, sheep, chickens and ducks belonging to 154 farmers were reported dead or missing. In Satun province, damage to livestock was mainly in the districts of Thung Wa and La Ngu. Farm animals, including 20 head of cattle, 22 sheep and one goat belonging to 25 farmers were reported dead or missing. A number of cattle, buffaloes, and sheep belonging to 300 farmers in these districts are suffering from an acute shortage of animal feed mainly because of the extensive damage to the grasslands (Fig. 19).



Fig. 19 Damaged pasture lands and emergency supply of feed to surviving livestock

Damage to livestock in Trang was reported in two districts (Pa-lian and Haad Samrarn). Livestock, including 79 sheep and chickens, belonging to nine farmers was reported dead or missing. In Krabi province damage to livestock was reported in three districts (Muang Krabi, Neua Klong, and Ko Lanta), where a total of 317 farm animals (cattle, buffaloes, sheep, ducks and chickens) belonging to 36 farmers were reported dead or missing. Damage to livestock in Phuket was reported in two districts (Muang and Thalang) where 897 animals including pigs, sheep, duck, chickens and geese belonging to 22 farmers were reported dead or missing.

3.6 Mangrove and other coastal forests

The Office of Mangrove Conservation, Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment, reported on the mangrove destruction caused by the tsunami of 26 December 2004 and stated that about 1 900 rai and 10 rai of mangrove forest in Phang-Nga (Takua Pah, Kuraburi, Tay Muang), and Satun (Tarutao National Park) respectively were affected. The damage was less than one percent of the total mangrove forest in the six provinces. From discussions with MOAC provincial officers in Phang-Nga province, the mangrove destruction was minor and partly caused by being hit with the tsunami affected fishing boats which ended up in the mangrove forests. Damage to national parks was also reported at Laem Son in Ranong, Sirinad in Phuket, Surin in Phang-Nga, Similan in Phang-Nga, Tan Boke (Ko Hong) in Krabi, and Noparat Thara in Krabi province. Details of the mangrove destruction are presented in Table 10.



Fig. 20. Common view of the mangroves in Southern Thailand (Courtesy of the Department of Marine and Coastal Resources)

As shown in Fig. 20, the majority of mangroves in the south are secondary growth forests, partly because of their historical utilization for charcoal and timber production. Other reasons include illegal logging, clear cutting for fish or shrimp farming, and

socio-economic development activities, e.g. construction of harbors, roads, etc. Some degraded areas have been naturally regenerated or artificially replanted. Most mangrove trees are less than 12 cm in diameter and 10 m in height.

The damage to the mangroves is displayed in Figures 21, 22, 23 and 24. The damage is concentrated in the sea front areas where the tsunami had the greatest physical impact. Mangrove trees are broken and knocked down in a landward direction. Although Figures 23 and 24 display the most severe damage (30-40 meters to the inland), the tsunami's impact is confined to less than 10 meters inland in most cases. Mangroves further inland are unharmed. Another type of serious damage observed was caused by the boats that were swept up by the force of the tsunami as shown in Fig. 25.



Fig. 21. Typical secondary growth mangroves. The main species are *Rhizophora apiculata* and *R. mucronata* (Courtesy of the Department of Marine and Coastal Resources)



Fig. 22. Damaged mangrove trees (Courtesy of the Department of Marine and Coastal Resources)



Fig. 23. A severely damaged mangrove stand (Courtesy of the Department of Marine and Coastal Resources)



Fig. 24. Broken mangrove trees along the sea front



Fig. 25. Serious damage to the mangroves was caused by the boats swept there by the force of the tsunami

In many places, the local people told the mission team that a mangrove forest was a buffer to protect communities, including houses and land from the force of the tsunami. For example, the chief of Ban Haad Sai Khao Village, Tambon Kampuan Suk Samrarn district, Ranong province, said that he believed that the mangrove forest in front of their community protected them from significant tsunami damage. For this reason he will encourage the villagers to rehabilitate the mangrove forest.

The mission team also visited the Ranong Mangrove Forest Research Centre⁶ which is located in Tambon Ngao, Muang Ranong District, about 15 km south west of Ranong town. No mangroves in the Research Centre, which faces the Ngao Canal, have been damaged by the tsunami.

⁶ The Centre was established by the Royal Forest Department, MOAC in 1982, and is now under the Department of Marine and Coastal Resources. The Centre conducts the following activities: 1) research; 2) dissemination of information on mangroves and their ecology to the general public; and 3) mangrove forest conservation. About 38 mangrove species are reserved in the Centre.

Table 9 Damage to mangrove forests

Location of damage	Damaged areas (rai)
1. Unit number 16 (Takua Pah, Phang-Nga) - Ban Bang Nai Si, Takua Pah - Ban Tung Noi, Takua Pah	50 50
2. Unit number 17 (Nangyon, Kuraburi, Phang-Nga) - Ban Tung Nangkam, Kuraburi - Ban Kao Ra, Kao Phra Thong	350 150
3. Unit number 18 (Bangwan, Takua Pah, Phang-Nga) - Ban Ao We, Kuraburi - Ban Pak Jok, Kuraburi - Ban Tung Dab, Kuraburi	300 200 50
4. Unit number 19 (Lamken, Phang-Nga) - Ban Nog Na, Takua Pah - Ban Tablamu, Ta Dindang, Tai Muang	150 600
5. Unit number 36 (Ta Pae, Satun) - Tarutao National Park	10
Total	1 910 (=305.6 ha)

Source: the Department of Marine and Coastal Resources, 14 January 2005

The estimated area of mangrove forests in the South in 2000 was 209 310 ha or 85.3 percent of the national total, which was 245 255 ha (RFD, 2002). The six provinces surveyed by the mission team had a total of 176 590 ha, or the majority of the mangrove forests in the South. Thus, only about 0.17 percent of the mangroves was in fact damaged. Although this figure is likely to increase after further damage assessment, the total is unlikely to exceed one percent.

The mission team was unable to spend much time making a detailed assessment of the damage to other coastal forests. However, on the basis of field observations, reports from the local people, and a photographic analysis, the team's general assessment is that these sustained more serious damage than the mangroves. Figures 26, 27, 28 and 29 indicate that the damage mostly occurred on sandy beaches where, sometimes, a layer as deep as one metre was lost as a result of sand erosion. Large trees have deeper and more developed root systems to hold them against the impact of a tsunami and therefore uprooted large trees were seldom seen. Uprooted medium and small size trees were common however.



Fig. 26. Trees on sandy beaches were the most affected by the tsunami. This photo shows serious sand erosion. A large amount of sand has been washed out and the tree roots are now exposed. (Courtesy of the Department of Marine and Coastal Resources)



Fig. 27. A narrow sandbar is susceptible to the impact of a tsunami. A smaller tree was uprooted by the loss of the sandy layer. (Courtesy of the Department of Marine and Coastal Resources)



Fig. 28. Very serious sand erosion — a loss of about one meter plus the sand layer, in a *Casuarina* stand. (Courtesy of the Department of Marine and Coastal Resources)



Fig. 29. Trees uprooted as a result of sand erosion (Courtesy of the Department of Marine and Coastal Resources)

Casuarina, coconut palm, *Terminalia* and *Tamarindus* appear to have been relatively more resistant to the tsunami than other species found along the coast, such as *Leucaena leucocephala* (*ipil-ipil*). Kapok trees (*Ceiba pentandra*) appear to have offered a medium degree of resistance. The mission team recommends that more scientific studies, including on the long-term effect on root-exposed standing trees, be carried out. This would provide important information on the appropriate species to plant as part of a programme to rehabilitate the area.

The mission team also observed that the damage to the woody vegetation along the rocky seashore was almost negligible. Further study would be needed to determine the reasons for this.

In the rubber plantations inundated by sea water, the leaves of rubber trees have turned brown (see Fig. 30). Because of their economic value in latex and wood production, further study to determine a prognosis is recommended.



Fig. 30. Rubber trees with brown leaves

The mission's mandate did not include an environmental impact assessment of coastal natural resources. However, it is worth noting that some epiphyte ferns attached to trees were observed to have died (Fig. 31). Whether the cause of this was salt water is hard to say with any certainty at this stage. Further study on biodiversity is recommended and should cover this environmentally sensitive species group.



Fig. 31. A dead epiphyte fern on a tree (Courtesy of the Department of Marine and Coastal Resources)

Fig. 32 indicates that a woody stand on a coastal area, especially on sandy beaches that are not suitable for agricultural uses, can act as a buffer zone offering protection to the human communities and infrastructure behind it.



Fig. 32. A well grown *Casuarina* stand on a sandy beach

Mangrove and other coastal forests appear to have played a significant role in protecting beaches, land, houses, animals, and fruit trees from the destruction of the tsunami. However, no scientific studies have been carried out to determine their protective functions in relation with the specific conditions of a stand, such as the location, size and shape, species composition, tree height and density, soil type, etc., linked with the management systems practiced.

4. Emergency needs in six affected provinces (6 to 12 months)

Most of the tsunami affected coastal communities relied heavily on fisheries and agricultural activities for their incomes and livelihoods. The sudden loss or damage of their production assets, such as fishing boats and fishing gears as well as damage to their crops and agricultural land, resulted in severe economic losses to the hundreds of thousands of already poor coastal population.

To minimize the adverse impact of a disaster of this nature, the Government needs to join forces with the international community and civil society to provide emergency assistance to those affected and act as quickly as possible to reinstate income generating activities and to reconstruct their lives, livelihoods and community.

4.1 Livelihoods of coastal communities

The initial emergency and short-term interventions for providing direct support to those who lost (or sustained damage to) their production should focus on the restoration of livelihoods of fisher folk and farmers through the provision of production assets and means of income generation such as fishing gears, seeds, fertilizers, etc.

While pursuing the above actions, it would be important to consider the following principles:

- participatory and community centred approach (including the identification of needs and selection of beneficiaries);
- support to the local economy including the procurement of inputs from local sources and creation of employment opportunities;
- equitable distribution of benefits to end stakeholders and avoidance of social conflict or tension among beneficiaries;
- pro-poor and gender-sensitive approach with a focus on the most vulnerable groups;
- careful selection of appropriate interventions, technologies and inputs based on sustainable and environmentally sound development principles;
- creation of opportunities for people and communities to build economically sustainable and market-led livelihoods;
- ensure transparency and promote Government (GO) and civil society / NGO co-operation and partnership.

4.2 Coastal fishery

From the mission surveys in many severely affected villages, the common urgent needs of small-scale fisher folk include boat and engine repair and/or replacement, and fishing gear replacement. It was observed that there has been a very high demand for wood, which is mainly used to reconstruct houses and various fishery related facilities. If there is a shortage of wood for these activities, the fisher folk will probably use wood illegally cut from the forest. Therefore, to avoid forest destruction, the provision of wood should be a priority for any emergency fishery assistance programme. Fisher folk also need to earn their living from alternative sources of income as it will probably take 3-12 months for lost boats and engines to be replaced. Thus, opportunities for temporary employment should be given to these victims immediately. Owners of large boats who are entitled to receive very little compensation from the government or other donors, need soft loans/credit with a reasonable grace period to enable them to repair or replace their boats, fishing gears and for fishing operations.

The owners of the damaged fishing jetties/piers and fishery related businesses have a similar need. There is also a fish marketing crisis caused by the common fear of consuming marine fish that, it is assumed, have fed off dead bodies (perhaps even family members) lost at sea. This situation needs to be addressed urgently.

The Department of Fisheries (DOF) has identified the following priority areas for emergency and short-term interventions:

- Fishing equipment and gear (boats, engines, engine parts, nets, traps etc) replacement and repair
- Fishing boat replacement and repair / shipyard building
- Communication equipment and system for fishing operation both for small- and large-scale fishers
- Rebuilding and repair of fish landing areas and piers
- Minor equipment and facilities for fish handling such as buckets, insulated boxes, cold storage at fishing piers
- Major “non-fishing” items such as houses
- Access to flexible forms of or low interest micro finance / credit, particularly for large-scale fishers, shrimp hatchery operators, fish landing operators, fish handling operators.

4.3 Coastal aquaculture

The common needs in the major affected areas are:

- The repair and replacement of fish and shellfish cages;
- fish and shellfish seeds;
- the repair of shrimp ponds and hatcheries;

- the repair and replacement of equipment used in shrimp farms and hatcheries;
- low interest loans or credit facilities for aquaculture operations (i.e. feed, chemicals, fuel, labour, etc.); and
- income for poor farmers so that they and their families can survive until they can harvest their crops. This may take six to ten months.

With regard to the specific needs of the coastal aquaculture subsector:

- Fish traps should be urgently provided to the fish farmers who also own small fishing boats, so that they can capture those young and adult fish that escaped from the damaged cages during the tsunami episode for further culture or fattening in new cages. This is perhaps the quickest way for fish cage farmers to recover from this disaster. Moreover, the fish seed suppliers cannot fulfil all the demands for fish seeds and thus they may increase their prices making it difficult for many small fish farmers to purchase them.
- Shellfish farmers should be supplied with mussel and oyster seeds or spats collected from the Gulf of Thailand, and the cockle spats from the south, as they prefer these.
- Shrimp pond and hatchery operators who receive very little compensation from the government and the various donor agencies should be given long term credit and low interest rates to enable them to renovate their facilities and meet their high operating costs.
- Sea sludge and sand that is blocking the waterways used for aquaculture activities and navigation should be removed. The shallower rivers and canals may also cause pollution at the bottom of cages when fishes are fed with fresh feed and should be dredged to avoid this.
- Advice on the treatment of fish diseases should be given urgently as many groupers that survived the tsunami have skin diseases.

4.4 Agriculture/livestock

In the short term, actions in crop and forage production must focus on procuring inputs and/or information needed to ensure the timely start of the planting season for both restoring food production activities and forage/feed production for livestock. All efforts must be made to deliver seeds/planting materials and other inputs in a timely manner taking into account local needs in agriculture areas including those affected by salinity.

Discussions with DOAE officials and farmers concluded with the following immediate needs:

- Seeds, planting materials, soil amendments (gypsum) and organic and mineral fertilizers should be provided to enable farmers to resume crop production as early as possible.
- Damage to agricultural lands and standing crops should be identified and assessed and interventions should be implemented as soon as possible to restore agricultural production capability. Measures should be taken to reclaim

salt affected soils, such as application of gypsum. The application of organic fertilizers is also recommended — the rates of application of soil amendments and fertilizer to be determined in consultation with the DOAE and Land Development Department (LDD) officers.

In addition, the following short-term interventions should be explored:

- Intensification of agriculture on most production lands, adjacent to the damaged areas
- Rehabilitation of agricultural lands with little damage through re-levelling and where salts will be naturally flushed from topsoil by the seasonal monsoon rains or easily leached (sandy soils, functioning and substantial water supply and energy)
- Replacement/repair of damaged farm irrigation systems. Open wells used for potable and irrigation supply may need to be pumped out and disinfected. Repair of damaged tail ends and drainage in large irrigation schemes
- Reclamation of coastal lagoons and deltas that can be easily repaired through clearing of blocked drainage channels
- Integrated Strategy of water management oriented towards restoration of affected agro-aqua-ecosystems. The low part of the watershed needs additional water allocation and improved management to clean up agricultural lands and coastal groundwater and surface aqua-systems.

In consultation with DOAE Provincial Officers in Ranong and Phang-Nga provinces, the following new interventions were proposed as some of the income generating activities:

- Vegetable growing in net houses. The purpose of this technique is to support affected groups of farmers in Ranong province to produce chemical-free vegetables through the use of organic fertilizers for the local market as an additional and alternative source of income and for their own consumption.
- Hydroponic vegetable growing. The purpose of this technique is to support affected groups of farmers in Krabi province to produce vegetables where the soil was heavily affected with salt water such as in Ko Lanta district of Krabi province. Training of farmers and availability of appropriate tools, materials and facilities (Annex 9) are an important prerequisite for successful implementation of this intervention. The curriculum on the training is presented in Annex 10. Krabi Extension and Agriculture Development Centre, DOAE, could carry out such training.

It is important that these interventions be implemented using a participatory approach and farmers should organize themselves and form a group at their own initiative. Thus, the willingness of farmers to undertake such measures needs to be determined, prior to further action.

With regard to the livestock sector, on the basis of discussions with DLD officers and farmers, as well as field observations made in the affected areas, emergency assistance is required to meet the needs for concentrate and hay, mineral blocks for feeding cattle, buffaloes, sheep, and goats. DLD suggested that veterinary drugs are not an immediate requirement as they are being provided by the Department.

4.5 Mangrove and other coastal forests

The damage to the mangrove forest /environment as reported by the Office of Mangrove Conservation, Department of Marine and Coastal Resources, Ministry of Environment and Natural Resources, covers about 1 910 rai or about 306 ha.

It is reported that mangrove and other coastal forests had played an essential role in protecting the communities behind them from the surge of tsunamis. The damage to the mangrove areas of the all six provinces was assessed to be minor. However, other types of forests, especially sandy beach forests and peat swamp forests, seem to be more severely affected. Serious sand erosion caused many trees to be uprooted and their roots exposed. In addition, some freshwater plant species appeared to have been affected in their habitats by the tsunami. As these negative impacts have not yet been assessed, it is urgently required to conduct a series of scientific studies to enhance the ecosystem rehabilitation efforts. The study should include:

- physical damage to those forests by forest type, species composition, location, shape and size of stand, tree height and density, etc.;
- ecological damage and sensitivity (by forest type, species, etc.) and long-term effects on biodiversity;
- socio-economic damage to tree farm plantation, such as coconut, rubber trees, cashew nut, etc.; and
- the effectiveness of coastal woody vegetation to mitigate damage to local communities. Findings will be used for better planning of rehabilitation strategies, ecosystem management, and disaster prevention for the local communities.

To identify the assessment areas, remote sensing (RS) and GIS technologies should be fully utilized in combination with field observations.

5. Medium- and long-term rehabilitation needs (1 to 5 years)

5.1 Livelihoods of coastal communities

The main challenge in the rehabilitation of livelihoods is to support the coastal communities in rebuilding their economies in a sustainable manner considering the available skills and the resources. Thus, long-term planning and management and coordination of rehabilitation activities should be focused on establishment of sustainable livelihoods for the coastal communities. In this context, a number of related issues have been taken into consideration in national planning and policy development such as coastal zoning, sustainable agricultural practices and environmentally sound fisheries and aquaculture. However, further debate and consensus building is required to further improve these processes to identify and implement integrated coastal area management practices with the active participation of the coastal communities. Detailed technical assessments of the damages due to the tsunami and their impacts on livelihoods and the environment, as well as effective communication of these findings to all stakeholders including the international community, are important prerequisites for effective planning of interventions and strategies for rehabilitation of livelihoods.

The rehabilitation and reconstruction efforts offer an opportunity for not just restoring livelihoods and rehabilitating ecosystems to the pre-tsunami situation, but to create conditions to overcome some previous weaknesses and create better livelihoods. In general, the focus should be on:

- Technologies which assist in creating sustained employment-intensive activities which benefit especially the most vulnerable and marginalized. The main emphasis is on alleviation of poverty.
- Real incentives and opportunities for people in coastal communities to build up economic activities into strong livelihoods that will also enhance and empower the local community. Long-term planning for promoting market-led and economically sustainable measures are needed.
- Integrated and holistic approaches for sustainable enhancement of livelihoods of coastal communities with minimum impact on the environment considering the fact that the economic well-being of the community depends on maintaining a variety of eco-systems around them.
- Effective mechanisms of delivering information and appropriate technologies to the affected communities.
- Capacity building to explore new opportunities / diversification for enhancing livelihoods.
- Micro-credit and other similar initiatives to re-establish and improve their livelihoods with greater involvement of village organizations/NGOs.
- In planning and implementing rehabilitation programmes it is important to consider the social inequity of vulnerable groups, and gender specific issues

such as women's access to resources, culturally defined gender division of work and the multiple tasks women carry out as producers and caregivers.

5.2 Coastal fishery and aquaculture

In trying to get the right outlook at to what a rehabilitated fishery and aquaculture sector would look like, it is important to have some key features identified. Therefore, a 'vision' for fisheries and aquaculture is a sector that:

- contributes to poverty alleviation, sustainable livelihoods and food security at household, local and national levels;
- is based on sound regulation, good governance and functional management institutions that ensure equitable development and safety within the different parts of the sector;
- uses appropriate technologies with due recognition of the environmentally sustainable limits to harvesting natural resources and aquaculture products;
- is part of a holistic view of the coastal ecosystems and is managed according to the principles of integrated coastal zone management, including the wider aspects of land, tenure and relocation of communities;
- has a well integrated supply chain from harvest to consumer that supports labour intensive post-harvest activities (which are mainly carried out by women), equitable trade and marketing that ensures safe food for all.

Guidelines for the rehabilitation of the fishery and aquaculture sectors

Specific guidelines for the fishery sector include those that ensure:

- a well-regulated fishing capacity that is commensurate with the sustainable yield of the fishery resource;
- a balance of small-scale artisanal fisher folk fishing inshore waters and larger-scale "industrial" vessels restricted to off-shore waters (with a "pro-poor" policy that gives preference to beach-based labour intensive fishing);
- use of non-destructive fishing gear and practices and adequate safety at sea;
- healthy ecosystems that have been rehabilitated through participatory practices that involve the people that depend on them;
- an industry based on good governance with strong institutional support from both government and NGO's; and
- a sector supported by a high quality on-shore infrastructure that ensures food safety and value-adding potential in post-harvest processing and sale of fish products.

Specific guidelines for the aquaculture sector include those that ensure:

- environmentally sound management practices that do not pollute, damage habitats or cause long-term irreversible harm (including use of feed and seed from sustainable sources);
- use of technologies and farm-management practices that are appropriate to rural people and minimize impacts on other users of the coastal environment; and
- supports farmer organizations, marketing, processing manufacturing of inputs and outputs, fair trade and markets, international and regional partnerships and wide-scale communication, facilitation of dialogue and sharing of experiences.

Rehabilitation processes

The implementation activities will follow a step-wise approach starting with detailed impact/damage assessments and needs analyses that form the basis of all rehabilitation activities. These assessments should include the institutional capacity of different organizations at all levels (and economic sectors) to deliver effectively and the organizational ability of recipients to receive and utilize inputs. Actions taken should have a clear indication of measurable outcomes with an emphasis on “accountability” and “transparency”. Effective communication is a core element of any intervention and such actions will support coordinated partnership between governments, NGOs, international agencies and bilateral donors. In particular, the findings and outcomes of assessments should be communicated clearly to development partners throughout the process.

Key strategies and priority areas recommended for the rehabilitation process⁷

<i>Strategy 1 - Improve Policy, Institutions and Processes</i>
<ul style="list-style-type: none"> • Set clear policy objectives which acknowledge trade-offs between competing objectives (economic, social and environmental). • Strengthen fisheries management institutions • Promote integrated coastal management as a governance process for facilitating discussions between stakeholders. • Ensure consultation with and participation of stakeholders
<i>Strategy 2 - . Provide physical assets</i>
<ul style="list-style-type: none"> • Provide physical assets through conducting needs assessments, purchasing, and identification targeted beneficiaries, to ensure timely delivery to those in need. • Provide physical assets that support broad livelihood activities, involving both CONSRN partners and other agencies with the competency and mandate. • Control the provision of physical assets to avoid over-capacity, recognising the trade-off between the need for rapid inputs (such as boats), versus good governance and legislation.

⁷ These strategies and priority areas were the conclusions of the FAO Regional workshop at which Thailand was a participating country.

<ul style="list-style-type: none"> • Provide policy advice and advocacy on over capacity issues through regional meetings. • Support development of legislation (which reflects local level needs, monitoring, and registration for example) at national level to reduce over capacity. • Supply physical assets that are compatible with the needs of the affected people ("like for like" principle) • Monitor the process of procurement and distribution by all suppliers
<p><i>Strategy 3 - Ensure equitable access to inputs and the sustainably managed resources</i></p>
<ul style="list-style-type: none"> • Carry out stakeholder analysis to ensure participation and equitable access to resources, determination of levels of fishing capacity and equitable planning for aquaculture activities. • Consult with the fisher communities and fish farmers in a transparent way before considering relocation. • Rehabilitate important habitats and ecosystems (such as coral reefs and mangroves) through participatory approaches with communities and in cooperation with the concerned Government Departments, Ministries and Institutions. • Ensure access to supplies of seed and broodstock for aquaculture.
<p><i>Strategy 4 - Provide appropriate financial mechanisms</i></p>
<ul style="list-style-type: none"> • Assess and understand the existing financial mechanisms (formal and informal) in their cultural context. • Ensure overcapacity is not encouraged through provision of loans to repair and replace vessels. • Support the establishment of an enabling environment for financial institutions and systems (formal, informal) to ensure their rapid return to normal operation • Provide all players in the supply chains have access to appropriate finance but with a focus on small scale non-commercial lending. • Collaborate with APRACA through providing technical inputs to their assessments and (through APRACA collaboration) to the Banks for their lending guidelines.
<p><i>Strategy 5 -Improve community livelihoods and responsible coastal resources / management.</i></p>
<ul style="list-style-type: none"> • Facilitate the empowerment of communities (through development of human skills) to ensure greater community organization and participation in networking, negotiation and self-reliance [such as development of marketing or micro-enterprise organisations]. • Increase skills, knowledge, ability to work and health of all those in affected fishing and aquaculture communities with emphasis on small-scale, marginalized, resource poor people, and • Enhance the capacity of the institutions working to support them (to be implemented at the community and national level). • Facilitate the empowerment of communities (through development of

human skills) to ensure greater community organization and participation in networking, negotiation and self-reliance [such as development of marketing or micro-enterprise organisations].

- Train and plan in the implementation of responsible community coastal resource management strategies and enforcement.
- Provide training in sustainable livelihoods approach

Strategy 6 . Re-build and enhance the social asset, resources and networks upon which people in affected fishing and aquaculture communities draw in pursuit of their livelihood strategies and psychosocial well-being (to be implemented at the community and national level).

- Establish, rebuild and strengthen community organizations (e.g. fisher groups, cooperatives, religious groups, women's support groups, etc)
- Strengthening existing social institutions
- Identify existing expertise and skills in particular disciplines and sectors and map to needs.
- Network and communicate with existing organizations and ensure expertise and activities publicised.
- Support establishment of structured mechanisms for consultation, interaction, communication and coordination between governments, donors and NGO's.

5.3 Agriculture / Livestock

In the medium and longer term, the aim of the intervention in agriculture is to restore crop production and enhance the livelihoods of the affected population in the devastated areas. More specifically, concrete actions are envisaged to restore the food-production capabilities by restoring sustainable crop production systems (i.e. field and horticultural crops, forage/pasture) and the reintroduction of crop and agrobiodiversity that were lost as a result of the tsunami.

Interventions will also aim at supporting national institutions in reinstating the farmers' know-how level that has been weakened as a result of the loss of experienced farmers. This entails training of trainers and farmers on good agricultural practices and environmentally-appropriate horticulture and livestock-based farming systems. In restoring crop production, it is important to assess the damages to agricultural land, so that appropriate interventions can be identified and implemented.

As discussed in the previous sections, the main damage to agricultural land and water resources were due to salt water intrusion. Standing crops, especially fruit trees, exhibited symptoms of saline toxicity after five to ten days of sea water intrusion. Coconut trees showed tolerance to soil salinity and no damage was visible. However, as a result of the direct impact of tidal waves, many coconut trees near the coast were destroyed.

Rehabilitation of salt affected soil

Discussions were held with the Tai Meuang Land Development Unit in Phang-Nga and with the staff of the Regional Office for Asia and the Pacific with regard to the various possibilities of reclamation of salt affected soils.

The chief of the Tai Meuang Land Development Unit suggested that: (1) If the pH of the affected soil is below 8, soil reclamation could be done by application of gypsum (natural calcium sulphate) and organic fertilizer (compost of crop residue and animal waste); (2) if the pH of the affected soil is above 8, soil reclamation should be done by flushing and leaching of soil with water and planting of legume crops such as mung bean and cowpea.

The guidelines provided by the Agriculture Department of FAO will be useful in identification of appropriate reclamation measures depending on the severity and extent of the salinity damage (please find the details in Annex 14 or at the web site: <ftp://ftp.fao.org/agl/aglw/docs/idp57.pdf>]

If soil sodicity occurs gypsum application will be required to promote water infiltration and leaching and the amount of water required for leaching depends on the initial salinity and soil type (field data from other areas showed that a silt-clay soil with a soil water salinity of about 17 dS/m needed about 500 mm of water applied for five months to reduce the salt content in the top 50 cm to permit moderately salt tolerant crops to grow).

As for the livestock sector, the surviving animals suffer from lack of feed and water resources, thus growing salt tolerant improved varieties of pastures and grasses should be incorporated into a medium- to long-term rehabilitation plan. Interventions in this area by the Department of Livestock Development, the Land Development Department and the Department of Agriculture are foreseen.

5.4 Mangrove and other coastal forests

As mentioned in 3.6, the view of the village chief in Ranong province implies that the mangrove forest in front of his village might have acted as an effective buffer to minimize the tsunami damage to his communities. Such a protective function provided by mangroves and other coastal forests has been witnessed by the people living in coastal areas. In fact, some woody vegetation has been established to help protect coastal communities from shore line erosion caused by strong tropical storms or monsoon waves, and currents. Wind break forests offer another example. As a result, those tree stands serve to local communities for the long-term security of their livelihoods and environment.

Despite many similar cases reported by local people, scientific evidences for the mitigation functions of mangroves and other coastal forests, especially against a tsunami, are weak. Views of witness remain as anecdotes and thus endless arguments continue whether mangroves and other coastal forests are effective buffers or not or

how effective they are. It is, therefore, essential to carry out a series of scientific studies to give the anecdotes a scientific background. To learn lessons from this disaster through the tragic experiences of the tsunami victims is the best way to ensure a safer future for the survivors.

The Department of Marine and Coastal Resources is planning to carry out studies on the protective functions of mangroves and other coastal forests to seek scientific proof. The findings, which will be available within 7-8 months, will be utilized in the medium- and long-term rehabilitation plans in Thailand to better manage the existing mangrove forest reserves and the patches of other coastal forests. It is suggested that the following guiding principles should be taken into consideration for medium/long-term rehabilitation:

- Study the mitigation functions of mangroves and other coastal forests, by determining relations between their size and shape, location, species composition, and management system, and the magnitude of a tsunami;
- Learn from what the local communities observed and experienced, including their traditional knowledge;
- Design the most appropriate buffer zones in the different ecological conditions and the socio-economic requirements of the local communities, including tree planting activities;
- Balance the short- and long-term benefits of stakeholders, in a partnership between the local communities and authorities;
- Coordinate the rehabilitation programmes with various regional activities that have been initiated by UN agencies such as FAO, UNDP, UNEP; other international, regional and national organizations, including NGOs; and donors; and
- Keep in mind that there is a growing awareness to shift the framework of the coastal natural resources management system from the conventional sector approach to an integrated approach. In this new framework, the building of buffer zones or greenbelts takes on an essential role in the whole coastal area management strategy and implementation plans.

6. Government emergency assistance and rehabilitation plan and strategy

6.1 Government plan, strategy and priority to address emergency needs

a. Coastal fishery

A first step assistance plan was immediately carried out by the Department of Fisheries which established the Fisheries Rescue Coordination Centre at the Andaman Marine Fisheries Research and Development Centre in Phuket in order to collect all relevant data pertaining to the damaged fisheries and to rescue the victims and boats in the six provinces.

All DOF facilities and staff in those six provinces, supported by staff from the headquarters, were involved in this rescue plan. Twenty DOF fishery patrol boats, the Mahidol Research Vessel and the MV SEAFDEC Research Vessel were able to rescue 1 548 victims, 517 dead bodies, 189 fishing boats, 2 190 fish cages, 150 units of fishing gears and 43 engines. The Rescue Centre also provided 3 636 first aid kits and food to the victims.

The second stage of the DOF emergency plan was to compensate the victims in cash for their losses or damaged boats, fishing gears and aquafarms. This DOF compensation programme can assist the victims to start up their fishing/aquafarming activities and restore their livelihoods. In many provinces, the governors have already advanced US\$ 50-125 per victim for those items that are very urgently needed before approval of the DOF compensation budget by the cabinet.

US\$34.5 million aid was allocated to Ranong (US\$13 553 000), Phang-Nga (US\$ 5 297 000), Phuket (US\$5 204 000), Krabi (US\$4 198 000), Trang (US\$1 510 000) and Satun (US\$4 691 000). Claims will be compensated by cash payment according to the actual cost of damage or loss, but will not exceed the maximum budget item as in Table 10.

Table 10 DOF budget for emergency assistance to fishery sector

	Unit	Total budget in US\$ (by actual costs but with maximum payment)	Retrieval (max.) per victim, US\$	Repair (max.) per victim US\$	Replacement (max.) per victim US\$
Small fishing boat	3 426 boats	6 676 308	256	512	1 692
Big fishing boat	1 222 boats	7 050 000	641	1 795	5 128
Sub-total	4 648 boats	13 726 308			
Small ecotourism boat	313 boats	609 949	256	512	1 692
Big ecotourism boat	241 boats	1 390 385	641	1 795	5 128
Sub-total	554 boats	2 000 334			
Bamboo trap (legal)	421 fishermen	107 949			256
Other traps	13 690 fishermen	3 510 256			256
Nets	1 871 fishermen	479 743			256
Sub-total	15 982 fishermen	4 097 948			
Total		19 824 590			

Source: DoF, January 2005

b. Coastal aquaculture

Table 11 DOF budget for emergency assistance to aquaculture sector

	Number of farmers	Total budget in US\$ (by actual costs but with maximum payment)	Repair & seed for restocking (max.) / farmer
Cage	27 828	14 270 769	513 (cage & seed)
Shrimp pond	42	21 538	513 (pond & PL)
Hatchery	573	293 846	513
Shellfish farm	80	40 770	513
Total	28 523	14 626 923	

Source: DoF, January 2005

Victims are also eligible to submit requests to the DOF for additional compensation if some registered items have not yet been covered or correctly estimated. The government is now seeking soft loans (i.e. one year interest free) for shrimp feed (approximately US\$ 9 230/farm) and fish feed (approximately US\$ 770/farm).

c. Agriculture/livestock

The Department of Agricultural Extension (DOAE) of the Ministry of Agriculture and Cooperatives (MOAC) surveyed the number of affected farmers and areas of crop damage in order to prepare a list of victims eligible for compensation that will be paid according to the rules and regulations of MOAC. Table 12 provides an overview of the compensation plan. In addition to the compensations, the MOAC also distributed vegetable seeds donated by the private sector to DOAE. The DOAE has requested 27 million baht for the rehabilitation programme in the six tsunami-affected provinces.

Table 12 Compensation for damage to crops

Crops	Compensation
1. Rice	243 baht / rai
2. Other field crops	289 baht / rai
3. Horticultural and other tree crops	369 baht / rai
4. Crop damage which requires land clearing	7 500 baht / rai

Source: Department of Agricultural Extension, 26 January 2005.

The procedure of identifying eligible livestock farmers for compensation was similar to that for the crops sector. The compensations will be calculated as shown in Table 13. The DLD also provided animal feed and drugs for treatment of sick animals. The DLD has no fixed plan yet to request a special budget for rehabilitation of the tsunami-affected livestock. The cost of the compensation as mentioned above will be paid from the Provincial Emergency Budget.

Table 13 Compensation for damages to livestock

Animals	Compensation (baht)
1. Cattle and buffaloes	Not more than 2 head/farmer, 15 000 baht/head
2. Pigs, sheep, goats	Not more than 10 head/farmer, 1 200 baht/head
3. Chickens (for meat and laying eggs)	Not more than 1 000 head/farmer, 20 baht/head
4. Native chickens	Not more than 300 head/farmer, 32.5 baht/head
5. Ducks (for meat and laying eggs)	Not more than 1 000 head/farmer, 32.5 baht/head

Sources: Department of Livestock Development, 28 January 2005.

d. Mangrove and other coastal forests

As the damage to mangrove forests was only 1 910 rai (about 306 ha) or less than one percent of the total mangrove forests in the tsunami affected six provinces, the Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment, did not give high priority to a mangrove rehabilitation programme as can be seen from the amount of money currently allocated for this task.

A specific Government compensation plan for the mangrove and coastal forestry sector for individual victims/communities was not available at the time when the mission took place.

6.2 Government rehabilitation programme

Because of the national elections in early February, no medium/long-term strategy and rehabilitation programmes had been approved at the time of the joint mission. However, the government has established the Task Force III for Community Livelihood to coordinate with other agencies and donors working on rehabilitation.

The Department of Fisheries develops the Fisheries Rehabilitation Plan affected by the tsunami both for coastal resources and for the victims in fishing communities. It contains two schemes, i.e. Livelihood Rehabilitation and Rehabilitation and Coastal Fisheries Resource Rehabilitation, comprising phases covering immediate needs, short-term rehabilitation, medium-term rehabilitation and long-term rehabilitation with identified needs in household/village as well as at institutional levels⁸. The details are as follows:

⁸ “Rehabilitation Strategy for Fisheries Resources and Tsunami Victims among Fishing Communities of Thailand”, Country paper presented by Department of Fisheries at the FAO Regional Workshop on Rehabilitation of Fisheries and Aquaculture in Coastal Communities of Tsunami Affected Countries in Asia held from 28 February to 1 March 2005.

a. Livelihoods Rehabilitation

Household/Village Level

Direct immediate/short-term support needs identified so far include items such as:

- Fishing equipment and gear (boats, engines, engine parts, nets, traps etc.) replacement and repair
- Fishing boat replacement and repair/shipyard building
- Communication equipment and system for fishing operation both for small- and large-scale fishers
- Fish landing areas and piers rebuilding and repair
- Minor equipment and facilities for fish handling such as buckets, insulated boxes, cold storage at fishing piers
- Major “non-fishing” items such as houses
- Access to aquaculture inputs (fish seed, cage reconstruction materials)
- Access to flexible forms or low interest of micro finance/credit particularly for large scale fishermen, shrimp hatchery operators, fish landing operators, fish handling operators.

Medium-term/long-term counselling and capacity building needs among fishers and their organisations identified so far include:

- Training in natural disaster and sea safety for habitants in fishing communities, including the development of a demonstration fishing community for early warning on natural disasters such as a radio warning system, an escape pattern when a disaster has occurred;
- Training fishers in boat building and repair
- Capacity building for village fisher organisations in micro-credit and revolving fund management
- Training in alternative marine-based livelihoods such as sea farming or offshore fish cage culture
- Planning for recovery among village fisher organisations particularly on quality of life

Institutional Level

Medium-term/long-term capacity building is also required among supporting institutions, including government and NGOs including:

- Training of DOF personnel on food safety particularly on toxicology analysis techniques to address concerns of the public about safety of seafood that has depressed local markets and for longer term monitoring

- Training for the trainers (DOF officers and TAO officers) on natural disaster and sea safety
- Participatory planning and/or co-management on coastal zone and fisheries resources management
- Responsible fisheries and aquaculture management

b. Coastal and Fisheries Resources Rehabilitation

Institutional Level

Medium-term/long-term

- Coastal and Fisheries resource assessment and rehabilitation – provide mapping of fisheries resources and develop mitigation plans such as the restoration of fish habitats, mangrove rehabilitation, and so on.
- Enhance the capacity of Marine Research and Development Center of Andaman Sea in Phuket, and the Units in Phang-Nga and Satun in order strengthen their capacity in the assessment, monitoring and rehabilitation programme for the fisheries resources and coastal areas in the six affected provinces of Andaman.

c. Agriculture/livestock

An Earthquake and Tsunami Early Warning System will be established in cooperation with various international bodies. MOAC will assist in the rehabilitation of the affected crop and livestock farms.

DOAE surveyed the crop damage for a rehabilitation programme involving crop replanting in the six affected provinces. The medium/long-term rehabilitation programme in the agriculture sector hasn't yet been finalized by the Ministry at the time when the mission took place in January 2005.

d. Mangrove and other coastal forests

The Department of Marine and Coastal Resources has not yet prepared a specific plan to rehabilitate the destroyed mangrove forest because of a negligible level of damage. On the other hands, the Department of National Parks, Wildlife and Plant Conservation has drafted a master plan for the management of marine national parks on Thailand's Andaman coast. Mangroves and other coastal forests outside of the protected areas will not be included in the plan. The Department hopes to coordinate the rehabilitation work with the existing marine park management plan, including environmental impact assessment work.

The Ministry of National Resources and Environment, in collaboration with other partners such as the Asian Development Bank, is planning to prepare a Regional Development Plan for the Tsunami Affected Andaman Region, which would focus on

economic development, infrastructure, community development, natural resources and environmental rehabilitation, etc.

6.3 Government's institutional arrangement to deliver emergency programme

a. Selection criteria of beneficiaries who receive compensation

Fisheries: In order to simplify the process of payment, the following most updated government criteria, as of 10 January 2005, for selection of beneficiaries (which was modified from the DOF compensation payment scheme for national disaster in 1998) are being used:

- Victims must have reported their claims within 30 days after the disaster at government offices in the six affected provinces.
- Victims must have been certified by Kor-Chor-Por-Or (District Committee for Assistance on National Disaster Victims) and Kor-Chor-Por-Jor (Provincial Committee for Assistance on National Disaster Victims).
- Victims must have been registered with DOF for boat operating licenses, fishing licenses and aquaculture operating licenses.
- Victims must have evidence of a damaged boat, supported by a certificate from the police station in that area.

It should be noted that few small-scale boats and aquafarms actually have DOF registered documents for boat operations, or fishing and aquaculture operations. Therefore, DOF has agreed to accept other supporting documents (i.e. a guarantee document from the village community committee) instead.

When there is no other evidence, the public announcement by a victim within the village is also acceptable evidence of damaged items in some provinces, if there is no objection for such a claim from any other villager.

It should be noted that some victims have still refused to report their claims because they do not want to be bothered with the burden of filling in all the necessary forms. In some cases victims might be afraid of income tax payment in the future if the value of reported activities exceeds the ceiling for tax exemption.

In some cases, inland farms were not located on titled land and therefore not legally recognized and cannot be registered.

It was observed that a large number of victims' claims were not eligible due mainly to late submission (more than 30 days after the tsunami struck).

Photographs of the damage to each claimed item was acceptable in some provinces.

Agriculture/ livestock: The affected farmers will be compensated by cash payment based on MOAC rules. Farmers will be paid on the basis of the damaged area of a specific crop, whereas in the case of livestock farmers will receive compensation on the basis of the number and type of dead and missing animals. Sick and affected surviving animals of the poor affected farmers are provided with drugs and hay as necessary.

b. Delivery mechanism

Fisheries: The DOF budget has been transferred to the Provincial Fisheries Offices of the six affected provinces. Compensation by cash has been or is being delivered to the victims at the District Administrative Office by the representative from the Provincial Fisheries Office under the supervision of the Chief District Officer and a representative from DOF Headquarters, Bangkok. In practice, the delivery was witnessed by village or district leaders in some districts.

Agriculture/ Livestock: Compensation has been or is being paid at the district office in the presence of the Chief District Officer, a representative of the District Administrative Organization (*Or-Bor-Tor*), and the village headman.

c. Role of concerned government agencies/local authorities

Fisheries: The implementing government agencies in this emergency compensation programme are the Department of Fisheries and Provincial Administrative Offices of the six affected provinces with support from the following concerned agencies:

- Ministry of the Interior
- Ministry of Labour
- Ministry of Social Development and Human Security
- Prime Minister's Office
- Royal Navy
- The Comptroller General's Department
- Department of Sea Transportation and Commercial Navigation
- An *Or-Bor-Tor* member or village leader may play a role individually as a member of a village committee in certifying the claims and witnessing the payment of compensation in some districts.

Agriculture/livestock: The implementing government agencies in this emergency compensation programme for the agriculture and livestock sectors are the DOAE and the DLD, respectively. The provincial and district DOAE and DLD officers with the support of the district office and District Administrative Organization, and the village headman who acts as a witness and assistants at the village level, certify the victims and distribute the compensation. The budget has been transferred in advance to the provincial government.

7. On-going and planned assistance

7.1 Coordination mechanism

a. Joint Sub-Committee on Post Tsunami Rehabilitation: The Government established this sub-committee in January 2005 aimed at strengthening coordinated efforts among all concerned agencies. Three Task Forces have been appointed by a Joint Sub-Committee on Post Tsunami Rehabilitation of Ecosystems and Livelihoods in the Tsunami Affected Areas with the participation of international organizations, donors and GOs/NGOs: (1) Taskforce I on coral reefs and coastal habitats; (2) Taskforce II on geo-hazards; and (3) Task Force III on land subsidence, saline intrusion and livelihoods. H.E. Mr. Nimit Damrongrat, Vice-Minister, Office of the Prime Minister, acts as the Chairman of the Joint Sub-Committee. Please find below details which were prepared based on the information available at the meeting on 8 February 2005.

b. Task Force I: The Task force (includes mangrove, forestry and environment) emphasizes the need for a quick clean-up of the marine and coastal areas. The Chairman of the Task Force has requested all interested parties who would like to propose specific areas for potential cooperation and partnership to submit their proposals. The Embassy of the United Kingdom (UK) will be available to undertake rapid assessments and prepare integrated coastal zone management plans that include GIS and remote sensing technology. IUCN offered to assist with management, rehabilitation, development, zoning and vulnerability assessment of Marine Protected Areas. A team of experts from IUCN is currently undertaking a field assessment on Ko Phrathong Island, Phang-Nga province. JICA will dispatch an expert on the sustainable management of coral reefs.

c. Task Force II: The interested areas of cooperation under Task Force II (including agriculture and soil salinity) are: affected coastal zone management, strategic plans for geo-hazards, geo-hazard mitigation, public education and awareness, sinkholes collapse and landslide, saline intrusion and sediment contamination. Foreign governments as well as international agencies have indicated their willingness to support field-base research activities and provide short-term and long-term expertise. The offers which were received from embassies and international agencies are in the areas of: expertise on sinkholes and early warning systems; saline intrusion; agricultural area; geo-hazards and geo-science; city planning; post-disaster assessment by using Land Sat data; ecosystem management; and environmental impact assessment.

d. Task Force III: The coordination of international cooperation for the post-tsunami rehabilitation of community livelihoods (including fisheries) was discussed with embassies, international agencies, and academic institutions. The areas of discussion are: (1) information systems; (2) developing livelihood plans with community participation; (3) funding micro finance mechanisms; (4) capacity building; and (5) technical expertise. The “WHO-DOES-WHERE” matrix of international organizations

and donors, as prepared by the task force dated 22 January 2005, identifies the following ongoing activities:

- Joint FAO/MOAC detailed damages and needs assessment mission.
- Emergency assistance to support rehabilitation in tsunami-affected areas — supported by FAO/TCP.
- Livelihoods recovery program coordination and the establishment of regional consortium — by FAO/NACA/ SEAFDEC.
- Procurement of humanitarian relief items upon request from the Thai Government using a rapid relief and recovery fund — supported by UNDP.
- Dialogue and capacity building to secure the rights of indigenous people to inhabit and subsist in marine and coastal national parks in Thailand — supported by UNESCO.
- Short-term immediate needs such as provision of new boats, materials for aquaculture reconstruction — supported by the German Embassy.
- Possible small and medium enterprise (SME) assistance such as tourism, fisheries, retailing, processing bank loan applications, and business advisory services — supported by USAID RDM/Asia.

7.2 On-going and planned assistance provided by other partners/donors

a. Coastal fishery/aquaculture

The ongoing and planned assistance in the fisheries/aquaculture sector provided by other partners/ donors/ NGOs (excluding FAO and DOF) as of 28 February 2005 are summarized as follows:

- The Cement Thai Group Foundation has supplied wood for boat repairs and building and established community shipyards at the most severely damaged villages.
- The American Refugee Committee (ARC) Thailand has launched a project on the restoration of livelihoods and village boat replacement through the supply of new 800 fibreglass and wooden boats (at least 275 boats within the initial three months). ARC also pays victims and their families for their labour when they help in boat building and in the assembly of fishing gears so that they will have money to meet their living expenses. The prototype of a fibreglass boat has been provided by the Ayutthaya College of Technology and Shipbuilding and tested in Ban Nam Khem village, Phang-Nga.
- NACA/STREAM provides recovery support to selected fishing villages in Phang-Nga.
- Many technical colleges in cooperation with Yanmar, Kubota, Honda and Yamaha engine companies have urgently repaired, without charge, some boat engines, air compressors and water pumps in small-scale hatcheries.
- SEAFDEC has provided immediate rescue services by mobilizing the M.V. SEAFDEC vessel and a 1 200 ton skip boat for boat retrieval, and food for

victims. SEAFDEC also assists in the compilation and sharing of information on the impacts of the tsunami in the fisheries sector.

- Many donors/NGOs/government agencies have recruited the victims at the rate of approximately baht 200/day to work in house and school reconstruction or boat repair/building programmes.
- It was also reported during the mission that the EU may provide 6 000-8 000 used fishing boats from Europe for the victims.
- Briggs & Stratton International Regional Office in Australia has proposed to provide some of their petrol engines for the smallest size boats under the ARC programme.
- There have been many self-reliant programmes, e.g. victims have borrowed money from village funds to repair their boats and cages.
- The Government of Japan, through FAO, committed to finance emergency assistance to tsunami affected fisher folk and farmers through the provision of fishing gears and other agricultural inputs (US\$ 240 000).
- ECHO through NGO Terre des Hommes – Italy plans to rehabilitate livelihoods for most vulnerable fishers.
- Asian Institute of Technology (AIT) plans to provide training to Government officers and fishers on natural disaster and sea safety.
- Norway intends to provide technical support on off-shore fish cage culture.
- Canada plans to provide technical support for fishing community development and fisheries through Chulabhorn Research Institute.
- Australia plans to assist coastal zone management and enhancing the capacity of Marine Research and Development Center for Andaman Sea (DOF, Phuket).
- Japan (Kochi Univ.) intends to provide technical assistance on aquaculture and fish toxicology.
- The Czech Republic plans to provide sawn timber to build homes of fisher folk.
- NGOs Network in Andaman Area provides boat repair, boat/shipyard building and revolving funds to fishing communities to purchase fishing gears and engines.
- USAID plans to start sustainable coastal communities programme (3 years).
- The EU/DOF Coastal Habitat and Resource Management (CHARM) Project in cooperation with the NGO network in Phang-Nga Bay has planned to contribute US\$ 513 000 for emergency assistance to fisheries to the 15 most affected villages.
- The Network of Cooperation on Community Rehabilitation in the Andaman Sea Coast (NGOs) has provided at least US\$82 700 for boat repairs and shipyard building in various sub-districts.
- The Crown Princess's Foundation plans to assist in fish cage construction in many severely affected villages.

- Rotary Thailand has also proposed to donate new boats to some non-registered victims in Phang-Nga.
- The Government of Italy has proposed, through FAO, to provide funds for emergency assistance (US\$650 000).
- UNDP/FAO have proposed the provision of fishing equipment and boat repair equipment and services capacity building.
- The German Embassy will provide new boats, materials for aquaculture reconstruction (at least Euros 24 000 have been allocated to a German NGO in Ranong).
- Italian funded TDH/Children of the Sea Project in Phang-Nga Bay plans to provide US\$ 25 650 for emergency assistance to damaged fishing villages.

b. Agriculture

The ongoing and planned assistance provided by other partners/donors/ NGOs in the agriculture sector is summarized as follows:

A seed company in Thailand has provided local vegetable seeds through the Department of Agricultural Extension to the affected farmers in Ranong, Phang-Nga, Phuket, Krabi, Trang and Satun. The amount has ranged from 300 – 500 kg per province. The Land Development Department, MOAC, will assist in the rehabilitation of salinity affected soils.

c. Livestock

No assistance has been proposed by partners/donors in the livestock sector so far, except for FAO. The anticipated areas of cooperation include the rehabilitation of grasslands for improved animal feed production.

d. Mangrove and other coastal forests

Under Task Force I: (1) the Embassy of the United Kingdom offered mobile field teams of experts that are available to undertake rapid assessments and prepare integrated coastal zone management plans using GIS and remote sensing technology; (2) IUCN offered to assist with the management, rehabilitation, development, zoning and vulnerability assessment of marine protected areas; (3) JICA offered to dispatch an expert on the sustainable management of coral reefs, and (4) ADB plans to assist the Ministry of Natural Resources and Environment in the preparation of a regional development plan which will include natural resources and environment rehabilitation.

e. Livelihoods support

A large number of livelihood support programmes to tsunami affected coastal communities are integrated under technical sector/sub-sector interventions such as coastal fisheries, aquaculture and agricultural rehabilitation.

Following on-going or planned livelihood support projects (which are not included in sector/sub-sector interventions or listed in section above b), c) and d) were identified in the WHO-DOES-WHAT matrix of Task Force III issued on 22 January 2005:

- DANIDA through the existing CODI project has proposed a project to promote decentralized community driven rehabilitation and environmental management in low income areas affected by the tsunami.
- France plans, through the Red Cross, to assist the reconstruction of a village.
- UNOP plans to provide micro financing services and capacity building support for community livelihood rehabilitation.
- JICA (Japan) intends to organize seminar and study on community disaster prevention and rural community rehabilitation.
- GTZ proposed to provide support to tsunami impacted SMEs.
- ILO plans to support employment promotion and small business management.

8. Potential areas for cooperation and partnership

The government compensation to the fishery sector, according to the data from DOF fisheries Rescue Coordination Centre as of 7 January 2005, was budgeted at 1 343 million baht (US\$ 34.5 million), which is much lower than the total estimated damage (US\$ 47.8 million) eligible for compensation to the victims in the sector. More assistance either from governments or other partners is required for tsunami-affected fisher folk and farmers to quickly restart income generation activities and restore their livelihood. Furthermore, medium-and long-term assistance for the rehabilitation of coastal village communities as well as sustainable and responsible natural resource management are necessary to built up disaster-resistant coastal communities.

8.1 Short, medium and long-term interventions

a. Fishery/ aquaculture

As the needs of the victims are urgent, there is a need to provide emergency assistance through the provision of essential inputs and equipment to restore their fishery/aquaculture activities. Most fisher folk and aquafarmers prefer to go back to their fishing/aquaculture activities as soon as possible instead of relying on donations. Thus, it is important to assist the affected population in the restoration and enhancement of self-reliance through the resumption of fisheries activities. The emergency assistance should cover the areas that have been identified in the section “Emergency needs in six affected provinces”.

The major focus of medium/long-term assistance should be the rehabilitation of the damaged coastal resources the may affect the fishery and aquaculture sector. For example, the damaged coral reef and the changes on the sea bed may affect the wild caught marine animals as well as their broodstock for aquaculture breeding. There should be a series of long-term studies on the impact of the tsunami on economic fish species such as black tiger prawn broodstock, grouper seeds and broodstock, lobster seeds and adults, mantis shrimp, swimming crab, squid, etc. In addition, an artificial reef programme should be heavily promoted for quick recovery of marine life.

In this connection, there is a need for enhancing capacity for coastal and fisheries resource assessment and rehabilitation, including mapping of fisheries resources and developing disaster damage mitigation plan.

The development of marine finfish culture in the abandoned shrimp grow-out ponds should be encouraged in order to find an alternative for victims who may not want to work in the sea. Development of grouper hatcheries and nurseries are also needed to solve the problem of wild seeds shortages. A training programme on the application of artificial feed to replace fresh feed should be arranged.

With help from external donors, including the United Nations, a tsunami/earthquake warning system should be jointly established, not only through official channels such as the Office of Civil Defence, Department of Local Administration or through public media such as radio, TV and local voice systems, but also through a compulsory

warning system installed on mobile phone and internet services. During this disaster, many fishers were able to escape and survive because they were warned through mobile phones by their relatives or friends living on the islands that the tsunami hit first.

b. Agriculture/ livestock

During the emergency/short-term assistance phase, assistance should be focused on the provision of agricultural inputs to enable the affected farmers to resume crop production that is salinity tolerant together with appropriate soil amendments such as organic fertilizer and gypsum. For the livestock sector, the emergency assistance should be directed at the provision of animal feed and health control.

The main aim of the medium/long-term rehabilitation process will be to restore the production capacity of farmers and ensure food security in the region. Farmers should become active participants in the development of appropriate management systems and should become the main originators of technical solutions to their environmental problems. Any management option considered should be field-tested under farmers' conditions.

The rehabilitation of salt-affected soils requires a combination of agronomic and management practices depending on a careful definition of the main production constraints and requirements. Therefore, an integrated management approach should be implemented. The main points to be considered are:

- Zoning of land to identify and implement appropriate reclamation measures – zones should be determined by the level of salinity;
- rehabilitation of irrigation and drainage infrastructure;
- provision of technical assistance and inputs for medium- to long-term rehabilitation of affected lands;
- possible modifications to cropping systems to suit the changed environments and taking into consideration the local agro-ecological conditions;
- reclamation of biodiversity; and
- training of extension workers and farmers to enable them to implement the above tasks.

c. Mangrove and other coastal forests

Strengthening the existing mangrove forest reserves programme will be the most logical and practical option to carry out the rehabilitation programme. The Chief of Kantang District DOAE Office in Trang Province has requested technical assistance for mangrove forest management because the farmers in the area are now earning money from Nipa leaves and fruits. This offers a good example on how the local communities benefit from the sustainable utilization and conservation of mangrove resources.

Recognizing several institutional barriers, the mission recommends either to expand the scope of the existing mangrove forest reserves programme to an integrated coastal forest resource management programme by including other coastal forests, or to locate it as part of such an integrated programme. Wherever the local conditions allow, a joint forest management system with the local communities should be promoted as a viable option in a new integrated coastal forest resource management strategy.

Medium- and long-term rehabilitation assistance is required to improve environmental restoration, and increased awareness of the role of natural resource management both for natural hazard vulnerability reduction and for the protection of valuable coastal natural resources, including mangrove and other coastal forests. A Project Profile entitled “Responsive Assistance on the Rehabilitation of Natural Resources and Environmental Damages in the Affected Areas” (duration: 2 years) is shown in Annex 9.

d. Livelihoods support

For the sustainable restoration of the livelihoods of the affected coastal communities, medium- and long-term assistance in terms of capacity building at the institutional and grass roots levels, community-based sustainable natural resources management, and improving access to financial assets need to be addressed, in addition to the provision of production assets, such as fishing gears, infrastructure and seeds for re-stocking. Strengthening local community organizations, micro-finance, natural disaster insurance, training/education on community disaster prevention/ mitigation and rehabilitation of tourism will be required in this context.

Such interventions could aim at facilitating participatory community-based fisheries and natural resource management and sustainable human development in coastal communities in tsunami-affected areas, through awareness building, organization and empowerment of communities, promotion of alternative income generating activities, facilitating improved access to credit schemes as well as social and extension services, and strengthening linkages between community organizations and local government institutions and administration.

The primary purpose of the intervention would be to empower local community-level organizations and fishers’ organizations to manage their natural resources in a sustainable manner, to plan, implement and monitor development activities to address their concerns and needs and to gain better access to services. The Programme would be participatory in nature, in close collaboration with existing local NGOs, beginning with identification of needs, determination of solution options, planning, and implementation through to monitoring and evaluation.

9. Project proposals (summary)

Based on the damages and needs assessment, the following project proposals are recommended for partners to support the tsunami-affected communities.

This section shows the summary of the project proposals, both for an emergency project, which will be implemented in 6 – 12 month towards the end of December 2005, and a medium- and long-term project to be implemented in 1 – 5 years.

A detailed description of each project proposal is shown in Annex 5 to 12.

9.1 Emergency/ short-term projects (to be completed by December 2005)

a. Emergency supply of fisheries and agricultural inputs to tsunami-affected fisher folk and farmers

The overall objective is to assist the Government's efforts for a rapid re-establishment of sustainable income generating activities that were destroyed by the tsunami. The project beneficiaries are the poor artisan fishing and farming communities in the affected regions who lost their production assets and subsequently the means to support their livelihood and who are unlikely to meet the immediate food needs of their families without assistance.

The project will make available basic fishery and agriculture sector inputs such as wood for boat repair, gill net and fishing traps as well as fertilizer, seeds, animal feeds, etc. to start up activities in the worst affected areas for an approximate 4 000 beneficiaries in six provinces, namely, Phang-Nga, Ranong, Phuket, Krabi, Trang and Satun. Inputs will be delivered to beneficiaries within six months to quickly restart income generation activities and increase food security as well as to restore livelihoods.

The institutional and operational arrangement for implementation, criteria for beneficiary selection, distribution mechanism, and specification of inputs are described in Annex 5.

b. In-depth assessment of mangroves and other coastal forests affected by the tsunami in southern Thailand

The project will support the Government, in particular the Ministry of Natural Resources and Environment, with scientific information needed for enhancing coastal forest rehabilitation and management linked with the livelihoods of local communities and preparedness for future similar disasters.

It is reported that mangrove and other coastal forests had played an important role in protecting the communities behind them from the surge of tsunamis. Serious sand erosion caused many trees to be uprooted and their roots exposed. Various kinds of

animal species also appeared to have been affected in their habitats by the tsunami. As the negative impact of the tsunami has not been fully assessed yet, it is urgently required to conduct a series of scientific studies to enhance the ecosystem rehabilitation efforts.

The project will conduct in-depth studies on the damage to mangroves, beach forests, peat swamp forests and other coastal plantations affected by the tsunami. The obtained findings will be presented to the local communities, local authorities, NGOs, and civil societies, and recommendations will be made for better natural resources management with appropriate land use planning and environment impact assessment in coastal areas. It will also conduct environmental awareness and disaster prevention training programmes for the local communities.

Project profile is shown in Annex 10.

9.2 Medium- and long-term rehabilitation projects

a. Study on the long-term impact of the tsunami on economically important species of marine animals

The main objectives of the project are to assess the long-term environmental impact of the tsunami on coastal resources and ecosystem functioning, with emphasis on damages to the wild catch and aquaculture of selected economic species and to enhance the wild fish stock through widespread installation of artificial reefs.

It was observed that the tsunami affected the marine ecosystem including coral reefs, beaches and coastal forests. Such changes might lead to effects on phytoplankton productivity and the primary food chain, possibly due to the removal to the shoreline of seabed sludge or natural fertilizer.

Given the social and economic implications of changes in the ecosystem, the project will collaborate with the Department of Fisheries to assess the primary effects (seabed, coral reefs, coastal forests, etc.) as well as secondary effects (water transparency, water temperature, and primary productivity, etc.) and tertiary effects (catch and growth of selected economic marine species). The project will also lead to development of a plan to install artificial reefs as appropriate.

Project profile is shown in Annex 6.

b. Reclamation of salt affected soils after the tsunami

The primary objective of the project is to assist the Government in the reclamation of the salt-affected soils due to sea water intrusion caused by the tsunami.

It was reported that crops, fruit trees and oil palm in the tsunami-affected areas showed symptoms of salinity toxicity. As the impact of sea water intrusion in the tsunami-affected areas has not yet been fully assessed, it is required to conduct a survey on the levels of salinity for soil reclamation.

The project will survey the extent of soil salinity in the affected areas and conduct a field demonstration to establish methods for reclamation of the salt-affected soils.

Project profile of this project is shown in Annex 7.

c. Policy advice and institutional settings to establish a buffer zone along the coastal areas with tree planting

The Thai Government is now considering policy and institutional settings on how to establish a buffer zone along the coastal areas to protect the lands and human communities from the tropical storms, monsoon and tsunami waves. The objective of the project is to advise the Government in the subject areas of policy and institutional settings on coastal buffer zones (or green belts), and contribute to the planning of such zones with the most suitable tree species, including economic tree crop plantations, such as coconut palm, oil palm and rubber plantations.

The Project Profile is shown Annex 8.

d. Responsive assistance on the rehabilitation of natural resources and environmental damages in the affected areas

The project will support the Government to improve environmental restoration and increase awareness of the role of natural resource management both for natural hazard vulnerability reduction and for the protection of valuable coastal natural resources.

The project will assess the damages caused by the tsunami to various natural resources as well as the mitigation effects of these vegetations by their locations, shapes and sizes of areas, species composition and density and management.

By doing so, the project will provide the provincial authorities and local communities with scientific information on the production, protection and other environmental functions of natural resources and identify types of rehabilitation/interventions with the aim of restoration of agricultural production and livelihood of the people. It will also implement environmental awareness training, education and disaster vulnerability management programme.

Project profile is shown in Annex 9.

e. Community-based livelihoods rehabilitation and natural resource management in coastal fishing communities

This project will facilitate participatory community-based fisheries management and sustainable human development in coastal fishing communities in tsunami-affected areas, through awareness building, organization and empowerment of communities, promotion of alternative income generating activities, facilitating improved access to credit facilities and social and extension services, and strengthening linkages between local village organizations and local government institutions and administration.

The primary purpose of the project is to empower local community organizations to manage their natural resources in a sustainable manner, to plan, implement and monitor development activities to address their concerns and needs and to gain better access to services. The Project will be participatory in nature, beginning with identification of needs, determination of solution options, planning, and implementation to monitoring and evaluation.

The project profile is shown in Annex 12.

f. Promotion of vegetable cultivation in the tsunami-affected areas

The project was proposed by the provincial agriculture offices of Krabi and Ranong.

The project will support the tsunami-affected farmers to quickly rehabilitate their livelihood through the promotion of chemical-free vegetable and hydroponic vegetable production.

Training as well as necessary agricultural materials will be provided to farmers to start vegetable cultivation, which will enable them to obtain quick income to improve food security.

The details of the project inputs are shown in Annex 11.

10. Annex

List of Annexes

Annex 1	Members of Joint FAO/MOAC Mission
Annex 2	Terms of Reference
Annex 3	List of persons met and mission team
Annex 4	Itinerary
Annex 5	Project proposal “Emergency supply of fisheries and agricultural inputs to tsunami affected fisher folk and farmers”
Annex 6	Project profile “Study on long-term impact of the tsunami on economically important species of marine animals”
Annex 7	Project profile “Reclamation of salt affected soils”
Annex 8	Project profile “Policy advice and institutional settings to establish a buffer zone along the coastal areas with tree planting”
Annex 9	Project profile “Responsive assistance on the rehabilitation of natural resources and environmental damages in the affected areas”
Annex 10	Project profile “In-depth assessment of mangroves and other coastal forests affected by the tsunami in southern Thailand”
Annex 11	Training, material, and facilities required for vegetable growing
Annex 12	Project Profile “Community-based livelihoods rehabilitation and natural resource management in coastal fishing community
Annex 13	Report on damages to fisheries/aquaculture sector at province and district levels
Annex 14	FAO Guideline “A framework for reclamation action plan for affected soils”

Member of Joint FAO/MOAC Mission Team

Fisheries/ Aquaculture

1. Dr. Waraporn Prompoj, DOF Overall Coordinator, Fisheries Foreign Affairs
Department of Fisheries, MOAC, Bangkok
2. Mr. Sanchai Tantavanich, DOF Field Coordinator, National Co-Director, CHARM,
Department of Fisheries, MOAC, Bangkok
3. Mrs. Narint Songsichan, DOF Local Coordinating Team, Fishery Biologist
Phuket Coastal Fisheries R&D Centre, Muang District, Phuket
4. Mr. Visit Kwandee, DOF Local Coordinating Team, Fishery Biologist
Phang-Nga Coastal Fisheries R&D Centre, Phang-Nga
5. Mr. Arkorn Singhabun, DOF Local Coordinating Team, Fishery Biologist
Krabi Coastal Fisheries R&D Centre, Krabi
6. Ms. Patcharee Soonsan, DOF Local Coordinating Team, Fishery Biologist
Krabi Coastal Fisheries R&D Centre, Krabi
7. Mr. Siva Tanaphol, DOF Local Coordinating Team, Fisheries Officer
Trang Coastal Aquaculture Station, Trang
8. Mr. Krai-lerk Petchpong, DOF Local Coordinating Team, Fishery Biologist
Trang Coastal Aquaculture Station, Trang
9. Mr. Adul Mae-roh, DOF Local Coordinating Team, Fishery Biologist
Satun Coastal Fisheries R&D Centre, Satun
10. Mr. Yuthana Eraskarn, DOF Local Coordinating Team, Fishery Biologist
Ranong Coastal Aquaculture Station, Ranong
11. Mr. Hassanai Kongkeo, FAO Specialist (Fisheries)

Agriculture/ Livestock

1. Ms. Pitsimi Jirawat, DOAE Overall Coordinator, Planning Division, DOAE
2. Mr. Somchid Ratanawong, DOAE Field Coordinator, Songkhla DOAE Regional Office,
Songkhla
3. Mr. Somchai Wongsiriwut, DOAE Local Coordinating Team, Chief DOAE Provincial Office,
Phang-Nga
4. Mr. Aphicharti Kanchanaopas, DOAE Local Coordinating Team, Chief DOAE Provincial
Office, Phang-Nga
5. Mr. Surasak Suwanwong, DOAE Local Coordinating Team, Chief DOAE Provincial Office,
Krabi
6. Mr. Suthin Sripradet, DOAE Local Coordinating Team, Chief DOAE Provincial Office,
Trang
7. Mr. Aroon Khemarueg, DOAE Local Coordinating Team, Chief DOAE Provincial Office,
Satun
8. Mr. Chingchai Petchphirun, DOAE Local Coordinating Team, Chief DOAE Provincial
Office, Ranong
9. Mr. Praphas Weerapat, FAO Specialist (Agronomy)

Terms of Reference (Fisheries)

TERMS OF REFERENCE

National Consultant
(Coastal Fishery/Aquaculture)

Under the overall supervision of TCE and the immediate supervision of RAP/TAS, under the technical direction of RAP technical officers concerned (RAPI), and in close cooperation with the government counterpart officials, national and provincial authorities, the consultant will conduct a damage and emergency/rehabilitation needs assessment for coastal fisheries and aquaculture in the Tsunami affected provinces in southern Thailand. In particular, the consultant will undertake following duties:

1. Assess damages to coastal fisheries and aquaculture as well as livelihood of coastal communities through field visits and data collection including verification of available data, observation of affected areas and discussion with victims, concerned government officers and other relevant partners, including Department of Fisheries, Provincial Fisheries Office, Ministry of Environment and Natural Resources, and NGOs (World Vision, Wildlife Fund Thailand, Small-Scale Fisheries Association, YADFON, CHARM, etc.)
2. Identify the Government emergency and rehabilitation strategy and plan, and assess the areas to reinforce national response,
3. Assess the emergency as well as medium/long-term rehabilitation needs and their priority taking into consideration of long-term implication for future sustainable development and associated assistance, taking into account the impact on natural resources and rehabilitation plans of government and NGOs,
4. Identify necessary fisheries inputs and their specifications, and identify potential supply sources with emphasis on local suppliers,
5. Prepare the criteria for selecting beneficiaries and obtain concurrence of government counterpart on the selection criteria,
6. Identify an institutional mechanism for project implementation and inputs distribution at provincial and district level,
7. Prepare draft full project document(s) for emergency assistance for the affected fisherfolk for next 6 to 12 months (to be attached as the Annex of the mission report),
8. Prepare project proposal(s) for medium/long-term rehabilitation in coastal fisheries and aquaculture sector in the Tsunami affected areas (to be attached as the Annex of the mission report),
9. Prepare mission report and submit to DRR, RAP within 1 week after the completion of the assignment for technical clearance.

Duration: total 4 weeks

2 weeks for field mission plus 2 week for report writing starting from middle of January 2005.

Qualification

- Advanced university degree in fishery or aquaculture with minimum of 10 years' working experience.
- Good knowledge of English.
- Good knowledge of fisheries sector in Thailand, preferably in affected areas.

Terms of Reference (Agronomy)

TERMS OF REFERENCE

National Consultant

(Agronomy)

Under the overall supervision of TCE and the immediate supervision of RAP/TAS, under the technical direction of RAP technical officers concerned (RAPG), and in close cooperation with the government counterpart officials, national and provincial authorities, the consultant will conduct a damage and emergency/rehabilitation needs assessment for agriculture and livestock sector in the Tsunami affected provinces in southern Thailand. In particular, the consultant will undertake following duties:

1. Assess damages to agriculture and livestock as well as livelihood of coastal communities through field visits and data collection including verification of available data, observation of affected areas and discussion with victims, concerned government officers and other relevant partners.
2. Identify the Government emergency and rehabilitation strategy and plan, and assess the areas to reinforce national response.
3. Assess the emergency as well as medium/long-term rehabilitation needs and their priority taking into consideration of long-term implication for future sustainable development and associated assistance.
4. Identify necessary agriculture/livestock inputs and their specifications, and identify potential supply sources with emphasis on local suppliers.
5. Prepare the criteria for selecting beneficiaries and obtain concurrence of government counterpart on the selection criteria.
6. Identify an institutional mechanism for project implementation and inputs distribution at provincial and district level.

7. Prepare draft full project document(s) for emergency assistance for the affected farmers for next 6 to 12 months (to be attached as the Annex of the mission report).
8. Prepare project proposal(s) for medium/long-term rehabilitation in agriculture and livestock sector in the Tsunami affected areas (to be attached as the Annex of the mission report).
9. Prepare mission report and submit to DRR, RAP within 1 week after the completion of the assignment for technical clearance.

Duration: total 4 weeks

3 weeks for field mission plus one week of report writing starting from middle of January 2005.

Qualification

- Advanced university degree in agronomy with minimum of 10 years' working experience.
- Good knowledge of English.
- Good knowledge of agriculture/livestock sector in Thailand, preferably in affected areas.

List of persons met and mission team

Fisheries

Department of Fisheries, Bangkok

1. Dr. Jaranthada Karnasutra, Deputy Director General (Tel : 09-9686272)
2. Dr. Poonsub Viroonkul, Senior Expert on Fisheries Management (09-8333923)
3. Dr. Wimol Chantharothai, Senior Expert on Fisheries Foreign Affairs (09-9686281)
4. Mr. Niwat Sutteemeechaikul, Director, Fisheries Technology Development and Transfer Bureau and Director, Tsunami Rescue Centre for Fisheries Sector (09-4444003)
5. Mr. Surajit Indrachit, Director, Fisheries Planning (09-8345608)
6. Mr. Rangsan Chayakul, Director, Marine Fisheries R&D Bureau
7. Mrs. Sumalee Yuktanont, Region 11-17 Fishery Inspector (09-9686278)
8. Mr. Veera Pokaphan, Director, Deepsea Fishery R&D Institute (09-8345610)
9. Mr. Sompoch Kribkatok, Department Secretary (09-9686285)
10. Mr. Sompong Nimchua, Director, Fisheries Foreign Affairs (01-8185713)
11. Dr. Waraporn Prompoj, Fisheries Foreign Affairs and DOF Overall-Coordinator for the mission (01-6133978)
12. Mr. Sanchai Tantavanich, National Co-director, CHARM and DOF Field Coordinator for the mission (01-1731941)
13. Dr. Chul Sinchaipanich, DDG Secretary (01-6447018)

Phuket

1. Mrs. Praulai Nootmorn, Director, Andaman Marine Fisheries R&D Centre (01-2735837)
2. Mr. Vichien Vorasayan, Director, Phuket Coastal Fisheries R&D Centre (01-7978922)
3. Mr. Sinthi Daengsakul, Phuket Provincial Fisheries Officer (01-9565939)
4. Mr. Isara Busayarat, Deputy Provincial Fisheries Officer, Phuket (09-6505973)
5. Dr. Ive Henocque, EU Co-director, CHARM (06-0528164)
6. Mr. Jet Pimoljinda, CHARM (01-8925706)
7. Mr. Heiko Seilert, CHARM (01-9092422)
8. Mrs. Narint Songsichan, Fishery Biologist, Phuket Coastal Fisheries R&D Centre and DOF local coordinating team for the mission (04-0513636)
9. Mr. Chumporn Pholrak, Deputy Director General, Department of Local Administration (02-2419054)
10. Dr. Vilas Nitivattananon, Asst. Professor, AIT
11. Dr. Amrit Bart, Assoc. Professor and Coordinator for Aquaculture & Fisheries, AIT
12. Mr. Apimuk Sriyaphan, Lab. Supervisor & Tsunami Survey Team, AIT
13. Dr. Bhichit Rattakul, Senior Community Expert, NACA (01-6331144)
14. Mr. Thanoo Naebnian, WWF and Coordinator of Phang Nga NGOs Network (01-8915578)

15. Mr. Jerkee Tamlander, IUCN/CORDIO Asia (jet@iucnsl.org)
16. Mr. Somsak Soonthornnawaphat, Thailand Programme Manager, IUCN Asia Regional Office (02-6624061)
17. Mr. Mattias Rust, IUCN/CORDIO, Bangkok (mattiasrust@hotmail.com.th)
18. Mr. Guido Brockhoven, IUCN, Bangkok (01-9310846)
19. Mr. Piyawat Kanitabutra, Pollution and Environment Protection Foundation, Bangkok (02-6911571-4)
20. Mr. Pratchaya Jenchotisuwan, Pollution and Environment Protection Foundation, Bangkok (02-6911571-4)
21. Ms. Benjamas Chot-thong, Thailand Environment Institute (09-1572387)
22. Mr. Vinai Pohnoi, Or-bor-tor, Tambon Ra Wai, Amphur Muang
23. Mr. Sinchai Limsakul, Leader, Pah Lah village, Tambon Wichit, Amphur Muang (01-9701973)
24. Mr. Veeraphol Teerapattana, Manager, Ar-hur grouper farm, Tah Chatchai, Amphur Talang
25. Mr. Isaes, President, Shrimp Hatchery Group (09-8736486)
26. Mr. Alessandro Montaldi, Team Leader, Italian TDH Project (09-2909273)
27. Mr. Paulo Montaldi, Technical Officer, TDH Project

Phang Nga

1. Mr. Choochart Chairat, O-I-C Director, Phang Nga Coastal Fisheries R&D Centre (01-4423287)
2. Mr. Kavi Saranakomkul, Phang Nga Provincial Fisheries Officer (06-9402678)
3. Mr. Suchat Sangchan, Head, Phang Nga Marine Fishery Station (09-8728771)
4. Mr. Visit Kwandee, Fishery Biologist, Phang Nga Coastal Fisheries R&D Centre and DOF local coordinating team for the mission (07-2667726)
5. Mr. Viroj Kong-asa, Fisheries Biologist, Phang Nga Marine Fisheries Station (04-1976001)
6. Mr. Sanit Vorakij, Or-bor-tor President, Tambon Tai Muang, Amphur Tai Muang (01-5388988)
7. Mr. Boonchint Noo-ngam, Or-bor-tor President, Tambon Na Tuay, Amphur Tai Muang (01-8911654)
8. Mr. Niphon Ruansakul, Or-bor-tor, Moo 6, Tambon Koh Yao Noi, Amphur Koh Yao (06-2686551)
9. Mr. Sompong Noonuan, Chaiman of Village Fund, Moo 4, Tambon Koh Yao Noi, Amphur Koh Yao
10. Mr. Sathian Petchklieng, Leader, Nam Kem village, Tambon Bang Muong, Amphur Takua Pah (01-9707564)
11. Mr. Chamnong Saichuay, Leader of cage farmer group, Nam Kem village, Tambon Bang Muong, Ampur Takua Pah

12. Mr. Wimol Udee, Or-bor-tor, Tab Lamu village, Tambon Lam Kan, Amphur Tai Muang
13. Mr. Supares Panpuech, President, Fisheries Management Group, Ban Klong Kien, Ampur Takua Tung (01-0894533)
14. Mr. Adul Lawan, Leader, Moo 7 village, Tambon Klong Kien, Amphur Takua Tung (07-2728271)
15. Mr. Amornsak Machavej, Or-Bor-Tor, Moo 8, Tambon Klong Kien, Amphur Takua Tung (09-2902096)

Krabi

1. Mr. Paiboon Boonliptanont, Director, Krabi Coastal Fisheries R&D Centre (01-9688283)
2. Mr. Tawatchai Panprommin, Deputy Provincial Fisheries Officer, Krabi (01-9587432)
3. Mr. Arkom Singhabun, Fishery Biologist, Krabi Coastal Fisheries R&D Centre and DOF local coordinating team for the mission (09-2928250)
4. Miss Patcharee Soonsan, Fishery Biologist, Krabi Coastal Fisheries R&D Centre and DOF local coordinating team for the mission (01-3979782)
5. Mr. Kiattisak Kasamepunkul, Co-field Manager, CHARM (01-1731937)
6. Mr. Damrong Silpachai, CHARM (09-0036408)
7. Mrs. Amporn Laowapong, CHARM (09-5005373)
8. Mr. Victor Cowling, EU Expert, CHARM (06-2390513)
9. Miss Kasarin Kankeaw, Raksthai Foundation/CARE (04-0434539)
10. Mr. Chanyuth Tapa, Raksthai Foundation/CARE (01-9721056)
11. Mr. Chaiyuth Chaoharnkij, President, Koh Lanta Hotel Operators Club

Trang

1. Mr. Suparp Praipanapong, Head, Trang Coastal Aquaculture Station (06-9519089)
2. Mr. Sayun Aimrod, Trang Provincial Fisheries Officer
3. Mr. Jerdsang Boontae, Deputy Provincial Officer, Trang
4. Mr. Siva Tanaphol, Fisheries Officer, Trang Coastal Aquaculture Station and DOF local coordinating team for the mission (01-3261623)
5. Mr. Krai-lerk Petchpeng, Fisheries Biologist, Trang Coastal Aquaculture Station and DOF local coordinating team for the mission (01-5395372)
6. Mr. Sommai Suporntawee, Leader, Ban Huahin village, Tambon Bo Hin, Amphur Si Kao (01-1870944)
7. Mr. Kasem Boonya, Leader, Ban Pak Klong village, Tambon Bo Hin, Amphur Si kao (06-2834691)
8. Mrs. Nadda Boonma, Leader of women group, Ban Pak Klong village, Tambon Bo Hin, Amphur Si Kao
9. Mr. Anant Sanpetch, Leader, Moo 4 village, Tambon Suso, Ampur Pa Lien
10. Mr. Preecha Lua-daeng, Asst. Leader, Moo 4 village, Tambon Suso, Amphur Pa Lien
11. Mr. Lah Madwa, Asst. Leader, Moo 4 village, Tambon Kan Tang Tai, Amphur Kan Tang

Satun

1. Mr. Suphol Tansuwan, Director, Satun Coastal Fisheries R&D Centre (01-8975439)
2. Mrs. Suwande Kwanmuang, Head, Satun Freshwater Fisheries Station (01-5907422)

3. Mr. Kanchit Benjamapariyakul, Deputy Provincial Fisheries Officer, Satun (09-0010449)
4. Mr. Adul Mae-roh, Fisheries Biologist, Satun Coastal Fisheries R&D Centre and DOF local coordinating team for the mission (01-9599847)
5. Mr. Chareon Ohmanee, Ampur La-ngu Fisheries Officer (08-569539)

Ranong

1. Mr. Somprasong Kantom, Head, Ranong Coastal Aquaculture Station (092889564)
2. Mr. Suthorn Anekmetheeprueksa, Ranong Provincial Fisheries Officer
3. Mr. Samard Tongnuasuk, Fisheries Officer, Ranong
4. Mr. Yuthana Eraskarn, Fisheries Biologist, Ranong Coastal Aquaculture Station and DOF local coordinating team for the mission (06-6846883)
5. Mr. Chucherd Supa, Or-Bor-Tor President, Tambon Racha Krude, Amphur Muang
6. Mr. Kornee Ajharn, Leader, Moo 2 village, Tambon Naca, Amphur Sooksamran (07-8899359)

Agriculture/Livestock

Phuket

1. Dr. Waraporn Prompoj, Chief of Foreign Cooperation Group, Foreign Fisheries Division, Department of Fisheries, Bangkok
2. Ms.Pitsini Jirawat, Planning Division, DOAE, Bangkok, Coordinator for crops and livestock
3. Mrs. Pavalai Nuchtmon, Director Andaman Marine Fisheries R&D Center, Phuket
4. Dr. Somchai Tandavanitj, CHARM Project, Thai Coordinator, Fisheries Department Bangkok.
5. Mr. Yves Henocque, CHARM Project, EU Coordinator, Bangkok
6. Mr. Somchai Wongsriwiwut, Director, DOAE Phuket
7. Mr. Sittichoke Sarasuwan, Representative DOAE Ranong, DOAE Officer
8. Mr. Paan Jenkit, DOAE Officer, Phuket
9. Mr. Sommai Niamphan, DOAE Officer
10. Mr. Wiroj Hirunsombat, DOAE Officer, Krabi
11. Mr. Kasem Petchsung, DOAE Officer, DOAE Phang-Nga Office, Phang-Nga
12. Mr. Dejo Plaichum, DOAE Officer, DOAE Office, Trang
13. Mr. Somchid Ratanawong, DOAE Officer, DOAE Regional Office, Songkhla, mission team and field coordinator for crops and livestock
14. Mr. Mitree Cheewathannakorn, Livestock Officer, Livestock Office, Phuket

Phang-Nga

1. Mr. Aphicharti Kanchanaopas, Director DOAE Provincial Office of Phang-Nga Province
2. Ms. Sueksa Malakanchana, Director MOAC Office of Phang-Nga Province
3. Mr. Pairat Dejsiri, Livestock Officer, Phang-Nga Provincial, Livestock Office
4. Mr. Kasem Petchsung, DOAE Officer, Phang-Nga Provincial DOAE Office
5. Mr. Wichien Kasemsri, DOAE Tagua Pa District Officer
6. Mr. Phaiboon Thongsuk, Chief DOAE Tagua Thung District Office

7. Mr. Amnuay Chaiyanuwong, Chief DOF Tagua Thung District Office
8. Mr. Kasem Udom, Farmer, Ban Na Tai, Moo 6, Tambon Kok Groy, Tagua Thung
9. Mr. Prasit Khuanman, Mr. Somnuek Phoonsawadi, vegetables and coconut Farmers, Ban Na Tai Village, Moo 6, Tambon Kok Groy
10. Mr. Marid Gueythong, Farmer, Ban Tak Noon Village, Moo 7, Tambon Kok Groy

Krabi

1. Mr. Phaisal Rojsaranrom, Director, Krabi Extension and Agriculture Development Center (Horticulture), DOAE
2. Mr. Somdej Wongtung, DOAE Technical Officer, Krabi Extension and Agriculture Development Center (Horticulture), DOAE
3. Mr. Surasak Suwanwong, Chief of Provincial DOAE Office, Krabi
4. Mr. Sommueg Thongsai, Livestock Officer, Krabi
5. Mr. Narong Boonphan, Livestock Officer, Neua Klong District, Krabi
6. Mr. Yanyong Watanasri, SMS Officer, Provincial DOAE Office
7. Mr. Kampon Aiat-eua, Muang Krabi, DOAE Officer
8. Mr. Yothin Khao-khai-gaew, Ko Lanta District DOAE Officer
9. Mr. Wanachoke Ma-chew, Officer for Daily Rutine Work, Provincial DOAE Office
10. Mr. Sommart, Neua Klong, DOAE Officer
11. Mr. Wiroj Hiransombat, DOAE Krabi Provincial Officer
12. Mr. Chuang Chai Pao-in, Provincial Permanent Secretary

Trang

1. Mr. Nares Chitsutcharitwong, Trang Governor
2. Mr. Suthin Sriphadet, Chief DOAE Provincial Office, Trang
3. Mr. Therawut Phibunrataphong, Si kao District, Livestock Officer
4. Mr. Somsakdi Chitwisutiwong, Chief of Provincial Livestock Officer
5. Mr. Wiroj Sae-joo, Kantang District, Livestock Officer
6. Mr. Sukon Nuey-dee, Advisor to the Ko Sukorn Fisher Folk
7. Mr. Chaiyaporn Manaphairin, DOAE Officer, Provincial DOAE Office
8. Mr. Somchid Ratanawong, Regional Office of DOAE in the South, Songkhla
9. Mr. Manop Gaewkamporn, DOAE Officer, Provincial DOAE Office
10. Mr. Theeravej Srinuan, Haad Samrarn District Livestock Officer
11. Mr. Thamrongkiat Kessiri, Pa-lian District Livestock Officer
12. Mr. Somdej Plongphan, Fishery Officer, Provincial Fishery Office
13. Mr. Sombat Somphetch, Pa-lian District DOAE Officer
14. Mr. Dejo Plaichum, Officer, Provincial DOAE Office
15. Mr. Boonsong Phetchnetara, Haad Samrarn District DOAE Office
16. Mr. Thaweechoke Saengkam, Chief Kantang District Office
17. Mr. Surachai Nilratana, Chief Si kao District DOAE Office
18. Mr. Niphon Simanan, Chief Si kao District DOAE Office

Satun

1. Mr. Thanee Ploocharoen, Vice Governor, Satun Province
2. Mr. Aphicharti Khanom, Director, Satun Provincial Agriculture and Cooperative Office
3. Mr. Aroon Khemarueg–Ampon, Chief Satun Provincial DOAE Office
4. Mr. Somchai Wisanphong, Technical Officer, Satun Provincial DOAC Office
5. Mr. Nipat Ratana-ubon, Chief La-Ngu District DOAE Office, Satun

Ranong

1. Mr. Bandit Ratanasamphan, Vice Governor, Ranong
2. Mr. Chingchai Petchphirun, Chief of Ranong Provincial DOAE Office
3. Mr. Santi Plengsaeng, Technical Officer, Ranong Provincial DOAE Office
4. Mr. Wittaya Suwansawng, Livestock Officer, Ranong Provincial, DLD Office
5. Mr. Sitthichoke Sarasuwan, DOAE Officer, Ranong Prvincial DOAE Office
6. Mr. Kriangsak Boonchuay, Administrative Officer, Ranong Provincial DOAE Office
7. Mr. Chukiat Prasit, Chief of Kapur District DOAE Office, Ranong
8. Mr. Jedda Tae-Sakul, Chief of Muang Ranong District DOAE Office
9. Mrs. Phromporn Rachada, Home Economist, Ranong Provincial DOAE Office
10. Mr. Wicharn Lawpetch, Ranong Provincial DOAE Office

Itinerary

Fisheries

- 10 Jan ♦ Briefing at FAO RAP
- 11 Jan ♦ Fly Bangkok/ Phuket by TG 921 (0800-0920)
- ♦ Meeting with DOF Relief Team, Phuket provincial officers, CHARM, AIT, NGOs at Andaman Marine Fisheries R&D Centre
- ♦ Visit Phuket Provincial Fisheries Office
- ♦ Survey in Tambon Ratchada (Ban Lam Tuk Kae/Sireh village); Tambon Wichit (Klong Budong and Pah Lai villages); and Tambon Ra Wai, Amphur Muang
- ♦ Overnight in Phuket
- 12 Jan ♦ Survey in Tambon Pah Krok (Bang Rong village) and Tambon Mai Khao (Moo 2 village), Amphur Thalang, Phuket
- ♦ Survey in Tambon Koh Yao Noi (Moo 4, 5 and 6 villages), Amphur Koh Yao, Phang Nga
- ♦ Overnight in Phuket
- 13 Jan ♦ Visit Bodan Marine Fishery Station, Amphur Tai Muang, Phang Nga
- ♦ Survey in Tambon Koak Kloy (Ban Na Tai village), Amphur Takua Tung
- ♦ Survey in Tambon Na Tuey (Nai Rai and Bodan villages), Amphur Tai Muang
- ♦ Survey in Tambon Lam Khaen (Tab Lamu village and navy base), Amphur Tai Muang
- ♦ Survey in Tambon Bang Muong (Nam Khem (Moo 2, Laem Prakarang and Bang Sak villages), Amphur Takua Pah
- ♦ Overnight in Krabi
- 14 Jan ♦ Meeting with DOF officers, CHARM and CARE staff at Krabi Coastal Fisheries R&D Centre
- ♦ Survey in Tambon Lanta Yai (Moo 1, 3 and 7 villages), Amphur Lanta, Krabi
- ♦ Visit Queen's Crab R&D Centre, Tung Taleh Mangrove Forest, Amphur Lanta
- ♦ Overnight in Krabi
- 15 Jan ♦ Survey in Tambon Sai Thai (Moo 7 village and Krabi Ferry Jetty), Amphur Muang, Krabi
- ♦ Visit Krabi Provincial Fisheries Office
- ♦ Survey in Tambon Taling Chan (Moo 5 village), Amphur Nua Klong, Krabi
- ♦ Meeting with DOF officers at Trang Coastal Aquaculture Station

- ◆ Survey in Tambon Bo Hin (Ban Hua Hin/Moo 6, Ban Pak Klong/Moo 9 and Ban To Ban villages), Amphur Si Kao, Trang
 - ◆ Survey in Tambon Kan Tang Tai (Ko Kium/Moo 4 village) and fishing harbour, Amphur Kan Tang
 - ◆ Overnight in Trang
- 16 Jan
- ◆ First week assessment
 - ◆ Overnight in Trang
- 17 Jan
- ◆ Visit Trang Provincial Fisheries Office
 - ◆ Survey in Tambon Suso (Nai Thon and Tah Klong villages) and Tambon Tah Kham (Tohn Han village), Amphur Pa Lian, Trang
 - ◆ Survey in Tambon Tung Wah (Tah Rua and Tah Oy villages), Amphur Tung Wah, Satun
 - ◆ Survey in Tambon Tung Burang (Moo 1,2,3,4 and 5 villages), Amphur Tung Wah
 - ◆ Meeting with DOF officers at Satun Coastal Fisheries R&D Centre
 - ◆ Survey and visit seabass nurseries in Tambon Pak Nam (Pak Bara village), Amphur La Ngu, Satun
 - ◆ Overnight in Satun
- 18 Jan
- ◆ Collect information at Trang Provincial Headquarters
 - ◆ Collect information at Krabi Coastal Fisheries R&D Centre
 - ◆ Visit Tambon Ao Nang (Ao Pra Nang and Noparat villages), Amphur Muang, Krabi
 - ◆ Prepare first draft of FAO Emergency Assistance Project
 - ◆ Overnight in Phuket
- 19 Jan
- ◆ Meeting with DOF officers at Phang Nga Fisheries Rescue Centre, Nam Khem village and visit victims at Tambon Bang Muong, Amphur Takua Pah, Phang Nga
 - ◆ Survey in Tambon Kura (Hin Lad village), Amphur Kura Buri, Phang Nga
 - ◆ Meeting with DOF officers at Ranong Coastal Aquaculture Station
 - ◆ Overnight in Ranong
- 20 Jan
- ◆ Visit Ranong Provincial Fisheries Office
 - ◆ Meeting with 56 victims at Or-Bor-Tor (Tambon Administrative Organization) Tambon Rachakrude, Amphur Muang, Ranong
 - ◆ Survey in Tambon Muong Kluong (Moo 2/Bang Bane village), Amphur Kapur
 - ◆ Survey in Tambon Naka (Moo 2 village), and Tambon Khampuan District (Moo 1/Ban Taleh Nok village) Amphur Sooksamran
 - ◆ Visit Coastal Resource Management Centre, Kasetsart University, Haad Prapass
 - ◆ Overnight in Phuket

- 21 Jan ♦ Survey in Tambon Klong Khian (Moo 1/Ban Klong Khian, Moo 7/Ban Had Sai, Moo 8/Ban Ao Makhamvillages), Amphur Takua Tung, Phang Nga
- ♦ Survey Tambon Kalai (Ban Sam Chong village), Amphur Takua Tung
- ♦ Meeting with DOF officers at Phang Nga Coastal Fisheries R&D Centre
- ♦ Visit Plectopomus grouper cage farm, Tah Chatchai, Amphur Talang, Phuket
- ♦ Overnight in Phuket
- 22 Jan ♦ Meeting with Italian TDH (NGO) team at Pearl Hotel, Phuket
- ♦ Contact suppliers for wood, net and float in Phuket and Phang Nga
- ♦ Overnight in Phuket
- 23 Jan ♦ Meeting with Deputy Director General of Local Administration and Or-Bor-Tor Leader.
- ♦ Wrap-up meeting with DOF officials, AIT, IUCN, CHARM and NGOs
- ♦ Overnight in Phuket
- 24 Jan ♦ Fly Phuket / Bangkok by TG 222 (1010-1135)

Agriculture/Livestock

- 11 Jan ♦ Depart Bangkok by TG 921 to Phuket
- ♦ Meeting with DOF, MOAC and DOAE at Andaman Marine Fisheries R&D Centre in Phuket
- ♦ Courtesy call on the Governor of Phuket
Mr.Udomsak Atsawarangkul
- ♦ Visit affected farmers at Ban Pa Rai, Moo3, Tambon Cha-long, Muang District, Phuket
- ♦ Stay overnight at Pearl Hotel in Phuket
- 12 Jan ♦ Depart Phuket to Phang-Nga Agricultural Extension Office
- ♦ Meeting with MOAC, DOAE, Livestock Officers at DOAE Provincial Office
- ♦ Courtesy call on Phang-Nga Governor Mr.Anuwat Metheevibulwut
- ♦ Visit Tagua Pa District at Ban Bang Muang and Ban Nam Kem, Tambon Bang Muang
- ♦ Visit Tambon Kueg Kat at Ban Bang Niang, Ban Khao Luk
- ♦ Stay overnight at Pearl Hotel in Phuket
- 13 Jan ♦ Depart Phuket to Tagua Thung district, Phang-Nga
- ♦ Meeting with Mr. Phaiboon Thongsuk, DOAE Tagua Thung district office, and meeting with Mr. Amnuay Chaiyanuwong, DOF Tagua

- Thung Officer
- ◆ Meeting with Mr. Suthin Srirat, Officer of Tambon Kok Groy Administrative Office
 - ◆ Visit farmer fields:
 - 1) Mr. Kasem Udom, Ban Na Tai Village, Moo 6, Tambon Kok Groy (oil plan and coconut plantation)
 - 2) Mr. Marid Gueythong, Ban Tah Noon, Tambon Kok Groy, Moo 7 (rubber seedling nursery and oil palm plantation of 2.5 years old)
 - ◆ Meeting with Mr. Phaisal Rojsaranrom, Director of Krabi Extension and Agriculture Development Center (Horticulture), DOAE, and Mr. Somdej Wongtung, DOAE Technical Officer
 - ◆ Stay overnight in Krabi
- 14 Jan
- ◆ Meeting with DOAE, Department of Livestock Officers at DOAE Office
 - ◆ Courtesy call on Mr. Chuangchai Pao-in, Provincial Permanent Secretary
 - ◆ Visit affected area in Neua Klong district, Ko Lanta island district, Krabi
 - ◆ Stay overnight in Krabi
- 15 Jan
- ◆ Meeting with DOAE Officers, Livestock Officer at DOAE, Trang provincial office
 - ◆ Courtesy call on Mr. Nares Chitsucharitwong, Trang Governor at his resident
 - ◆ Visit Ko Sukorn, Pa-liam district
 - ◆ Stay overnight in Trang province
- 16 Jan
- ◆ Review weekly report
 - ◆ Stay overnight in Trang province
- 17 Jan
- ◆ Meeting with DOAE Officers
 - ◆ Meeting at DOAE Thung Wa district office
 - ◆ Visit affected area in Ban East Khon Klang, Tambon Khon Klang, Thung Wa district
 - ◆ Meeting with DOAE officers at DOAE Ra-Ngu district office
 - ◆ Visit Ban Jed Luk, Moo 1, Tambon Pak Nam, Ra-Ngu district
 - ◆ Stay overnight in Satun province
- 18 Jan
- ◆ Courtesy call on Mr. Thanee Plookcharoen, Vice Governor, Satun
 - ◆ Meeting with
 - 1) Mr. Aphicharti Khanom, Director, Provincial Agriculture and Cooperatives Office, Satun
 - 2) Mr. Aroon Khemareug-ampon, Chief, Provincial DOAE Office, Satun
 - 3) Livestock Officers

- ◆ Meeting with Mr. Wiroj Hirunsombat, Krabi, DOAE Officer, and Mr. Aphicharti Kanchana-opas, Chief of Phang-Nga Provincial DOAE
- ◆ Stay overnight in Phuket

- 19 Jan ◆ Depart Phuket to Ranong province
- ◆ Meeting with Mr. Chingchai Petchphirun, Chief of Ranong Provincial DOAE Office
- ◆ Visit Lam Son National Park and farmers at Tambon Muang Kruang, Kapur district
- ◆ Stay overnight in Ranong

- 20 Jan ◆ Courtesy call on Mr. Bandit Ratanasamphan, Vice Governor, Ranong province
- ◆ Meeting with DOAE Officers from Muang Ranong, Kapur, Suk Samrarn districts
- ◆ Visit Ranong Mangrove Forest Research Centre, Muang district
- ◆ Visit Ban Thale Nawk and Ban Haad Sai Khao, Tambon Kampuan, Suk Samrarn district
- ◆ Stay overnight in Phuket

- 21 Jan ◆ Meeting with Mr. Aphicharti Kanchana-opas, Chief of Phang-Nga Provincial DOAE Office, and Mr. Kasem Petchsung, DOAE Officer, Phang-Nga province
- ◆ Stay overnight in Phuket

- 22 Jan ◆ Meeting with Mr. Somchai Wongsriwiwat, Chief of Phuket Provincial DOAE Office
- ◆ Visit Farmers in Phuket
- ◆ Stay overnight in Phuket

- 23 Jan ◆ Review weekly report
- ◆ Stay overnight in Phuket

- 24 Jan ◆ Return to Bangkok by TG 0222

Project Proposal “Emergency supply of fisheries and agricultural inputs to tsunami-affected fisher folk and farmers

I. Background

On 26 December 2004, coastal communities across South Asia and as far away as Somalia were severely hit by a powerful tectonic earthquake that was followed by a series of aftershocks that triggered tsunami at various places, leaving more than 150 000 dead, according to recent estimates. The countries hardest hit by the disaster are India, Indonesia, Malaysia, the Maldives, Sri Lanka, Thailand and Somalia.

In Thailand, the provinces of Ranong, Phang-Nga, Phuket, Krabi, Trang and Satun have been severely affected, with tens of thousands of stranded or displaced persons. More than 3 000 dead have been reported.

While the most pressing needs are for medical supplies, clean water, food shelter and sanitation, the affected communities, majority of which are heavily dependent on production assets such as fishing boats and gears and agricultural lands, need to restart productive activities as soon as possible in order to regain their livelihoods. These includes:

- Rehabilitation and reconstruction of coastal village communities and restoration of their livelihood;
- Rehabilitation of coastal fisheries including the repair of fishing boats and provision of fishing gears;
- Rehabilitation of coastal aquaculture and marine fish farming;
- Rehabilitation of damaged agricultural areas and infrastructures;
- Reclamation of salt affected soils for resumption of crop production;
- Repair of rural roads and bridges and other rural infrastructures;
- Permanent relocation of affected/vulnerable households, in cases where no *in-situ* livelihood alternatives can be identified;
- Dredging of silted waterways.

II. Project Objectives

The overall objective of the project is to assist the Government’s efforts for a rapid re-establishment of sustainable income generating activities that were destroyed by the earthquake and tsunami. The project beneficiaries are the poor artisan fishing and farming communities in the affected regions who lost their production assets and subsequently the means to support their livelihood and who are unlikely to meet the immediate food needs of their families without assistance.

The project will make available basic fishery and agriculture sector inputs such as wood for boat repair, gill net and fishing traps as well as fertilizer, seeds, animal feeds, etc. to kick start activities in the worst affected areas for an approximate 4 000 beneficiaries.

The lead national consultant will be responsible for overall monitoring of the project and drawing up final beneficiary selection criteria, in close consultation with relevant local authorities, in order to ensure that project interventions are focused on the most vulnerable tsunami-affected households and for ensuring that these criteria are applied in a fair, transparent and effective manner.

The main project outputs will be:

- restart income generation and increased food security for the most vulnerable disaster-affected families;
- restored livelihood of fish folk and farmers through the provision of production assets and means of income generation.

III. Work plan

1. Institutional and operational arrangements

Field level project activities will be executed in coordination with the Department of Fisheries (DOF), Department of Agricultural Extension (DOAE) and Department of Livestock Development (DLD) of the Ministry of Agriculture and Cooperatives (MOAC) with assistance from technical experts/consultants.

A Steering Committee will be established at project start-up or at soonest possible date thereafter consisting of Government counterpart focal points and implementing partners.

This Steering Committee will nominate the national project coordinator and a project national team responsible for counterpart project execution at both administrative and field technical levels.

2. Planning and implementation of project activities

Soon after project start-up, the project consultant will prepare a plan of operation in consultation with national, regional and provincial counterparts. The plan of operation will provide the basis for subsequent activities. It will review the proposed technical interventions and provide clear guidance on procurement and delivery actions and workplan.

3. Selection of beneficiaries

3.1 Establishment of Selection Criteria

The selection criteria will be agreed upon by Ministry of Agriculture and Cooperatives (MOAC) and implementing partners in line with the following principles:

Beneficiaries should:

- be tsunami-affected fisher folk and farmers who are recognized as tsunami victims (including registered and non-registered victims),
- be tsunami-affected small-scale fisher folk and farmers who have lost their production assets or had production assets badly damaged,
- be an owner of small boats with maximum length of 10 m registered as lost or damaged or an non-boat owner who have registered lost of fishing gears (for beneficiaries of fishery inputs)
- be small-scale farmers who have been identified as incurring agricultural losses
- be an individual small-scale fisher folk or farmer, not a commercial firm.

Priority is given to:

- family that lost their production assets and have no other means to restore their livelihood,
- family whose house is destroyed,
- family that lost the head of household,
- vulnerable household that has lost family member (s) of working age
- family that has not received other assistance, except government compensation.

3.2 Procedures for the selection of beneficiaries

The Director of concerned Provincial Offices of Department of Fisheries (DOF), Department of Agricultural Extension (DOAE), and Department of Livestock Development (DLD) will be the head of the Provincial Working Group who will be responsible for the submission of the list of beneficiaries for each input based upon the established criteria.

The beneficiaries for each input will be identified and selected by the representatives of the concerned communities, such as village heads and Tambon Administrative Organization (TAO), in close consultation and active involvement of the end stakeholders/villagers. The chief of District Offices of DOAE as well as Provincial DOF and DLD offices will prepare the list of beneficiaries for each inputs based on the identification and selection by the concerned communities and submit the list of beneficiaries for each input to head of the Provincial Working Groups after the endorsement by the village representatives and the certification by the concerned NGOs.

The list should include sufficient information including name, sex, age, address, occupation, lost/damaged production assets, and government compensation received. The list of beneficiaries will be submitted by the head of the Provincial Working Groups to MOAC National Project Coordinator for clearance, which will be further forwarded to an implementing partner for joint clearance.

3.3 Orientation to provincial/district/tambon officials and beneficiaries

The consultants of the project, jointly with DOF, DOAE and DLD, will provide first orientations to concerned Provincial/District/Tambon officers as well as to community leaders on the aims and the scope of the emergency project. Types of inputs, specification, distribution schedule, criteria of beneficiaries, and necessary preparation for receiving the inputs will be informed to concerned officers and community leaders, and their comments will be received at orientation meetings.

Once the list of beneficiaries are endorsed, the project consultants, jointly with the officials of the Provincial Working Groups, will hold second orientations to the beneficiaries on the aims of the project as well as distribution schedule and necessary preparation for receiving inputs.

The project consultants will verify the list of beneficiaries to ensure that the inputs will be delivered to the most needed people. NGOs which have good knowledge of local condition will also be involved in orientation where possible. The project consultants, in consultation with Provincial Working Groups, NGOs, and community leaders, will formulate Inputs Distribution Plan for each province/district/Tambon taken into consideration of local condition and needs expressed during orientation.

4 Distribution mechanism

4.1 Distribution to province/district/tambon level and to the beneficiaries

(a) Fishery inputs

The suppliers will deliver fishery inputs to the concerned Tambon offices, for which DOF will inform the implementing partner the details of destination. Concerned Provincial Fisheries officers/Head of Tambon offices will acknowledge receipt of inputs to the implementing partner and the suppliers. The government will be responsible for the transportation of inputs from the Tambon Office to the concerned villages/beneficiaries. Inputs will be handed to the beneficiaries by the Provincial Fishery Officer in charge of the concerned districts, in the presence of the representatives of TAO and village communities as well as NGOs where possible. The project consultants will oversee the distribution process and provide necessary advice as appropriate.

(b) Agriculture/Livestock inputs

The suppliers will deliver agriculture/livestock inputs to the concerned Tambon offices, for which DOAE will inform FAO the details of destination. The head of District DOAE/Tambon offices will acknowledge receipt of inputs to implementing partner and the suppliers. The concerned Provincial DLD officers and District DOAE officers will jointly take charge of distribution from Tambon office to the beneficiaries. The Government will be responsible for the transportation of inputs from the Tambon Office to the concerned villages/beneficiaries. Inputs will be handed to the beneficiaries by the District DOAE officer and Provincial DLD officer in charge, in the presence of the representatives of TAO and village communities as well as NGOs where possible. The project consultants will oversee the distribution process and provide necessary advice as appropriate.

4.2 Certification of receipt by beneficiaries

The concerned Provincial or District offices will be responsible for the certification of receipt at Provincial and District level respectively upon the receipt of the inputs from the suppliers as stipulated above and send receipts to the implementing partner through MOAC.

On handing-over inputs, beneficiaries will give his/her signature or thumbprint on the list of beneficiaries as receipt. District Office/Tambon office will submit the original signed list of beneficiaries to MOAC through the head of Provincial Working Group and keep one copy for their record. MOAC will retain the original receipt and forward one set of the copy to the implementing partner.

5 Monitoring and follow-up

5.1 Technical advisory services

a) Implementing partner

Technical backstopping and monitoring of project operations will be provided by the implementing partner.

Project consultants will also be engaged directly in project monitoring and technical advisory services as indicated in the below Section 6.

b) Government

The National Project Coordinator has an overall coordinating role for the implementation and monitoring of the project. The Departmental Coordinators from Department of Fisheries, Department of Agricultural Extension and Department of Livestock will be responsible for coordinating implementation of the project at each department.

At provincial level, the Directors of Provincial Agriculture and Cooperatives as well as Directors of Provincial Offices of Department of Fisheries (DOF), Department of Agricultural Extension (DOAE), and Department of Livestock Development (DLD), as members of Provincial Working Groups, will be responsible for the coordination of technical advisory services and monitoring of the project progress in their respective Province, which will be carried out by provincial/district officers in close collaboration with implementing partner and project consultants.

5.2 Reporting

Upon project inception, project consultant, in collaboration with concerned government officers, will submit to the implementing partner an inception report outlining Plan of Operation of the project which includes work plan, priority inputs, specification and the list of potential local suppliers.

The project consultant will also be responsible for submitting two consolidated progress reports, based on the reports of other two national consultants, to the implementing partner for clearance. The first consolidated progress report will focus on the distribution status and will be submitted to the implementing partner upon the completion of the distribution of inputs (approximately 2 – 3 months after the inception). The second consolidated progress report will focus on the utilization of inputs and recommendations for further improvement, which will be submitted three months after the submission of the first progress report.

The project consultant will submit final report to the implementing partner in accordance with established guidelines and procedures.

6. Consultancy Inputs

6.1 National consultants

A lead national consultant with assignment of five months and two national consultants, one in fishery and one in agronomy with assignment of four months each, will assist project implementation as stipulated in the project documents, in close collaboration and coordination with National and Departmental Project Coordinator and Provincial Working Groups and under direct supervision of the implementing partner.

A lead national consultant will be stationed in Bangkok and will travel six provinces during distribution of inputs and for monitoring. A national consultant in fishery will be stationed in Phuket and a national consultant in agronomy will be stationed in Phang-Nga, and travel six provinces during distribution of inputs and for monitoring and technical advice.

The three national consultants will also oversee the implementation of other related projects and prepare necessary reports for these projects.

IV. Inputs

1.Coastal Fishery (US\$ 95,600)

a) Inputs for six affected provinces and cost estimates

	Wood	Gill net	Crab trap	Squid trap	Fish trap	Total
Ranong (US\$)	18 unit (2,304)	18 unit (1,800)	9 unit (1,386)	9 unit (1,728)	9 unit (1,386)	63 unit (8,604)
Phang Nga (US\$)	40 unit (5,120)	40 unit (4,000)	20 unit (3,080)	20 unit (3,840)	20 unit (3,080)	140 unit (19,120)
Phuket (US\$)	34 unit (4,352)	34 unit (3,400)	17 unit (2,618)	17 unit (3,264)	17 unit (2,618)	119 unit (16,252)
Krabi (US\$)	44 unit (5,632)	44 unit (4,400)	22 unit (3,388)	22 unit (4,224)	22 unit (3,388)	154 unit (21,032)
Trang (US\$)	34 unit (4,352)	34 unit (3,400)	17 unit (2,618)	17 unit (3,264)	17 unit (2,618)	119 unit (16,252)
Satun (US\$)	30 unit (3,840)	30 unit (3,000)	15 unit (2,310)	15 unit (2,880)	15 unit (2,310)	105 unit (14,340)
Total (US\$)	200 unit (25,600)	200 unit (20,000)	100 unit (15,400)	100 unit (19,200)	100 unit (15,400)	700 unit (95,600)

b) Specifications of inputs

- Wood for boat repair: = hard wood (preferable Takien Sai)
= 5 pieces of (1" x 8" with 11 m length) wood + 1 piece of (2" X 20" with 3 m length) wood
= additional to other donations
Estimated cost/unit = **US\$ 128**
- Gill net = no. 18 Trammel net with 4 cm mesh size
= ten pieces of 30 m nets/set
Estimated cost /unit = 5 sets X US\$ 20 (**US\$ 100**)
- Crab trap: = no. 6 net with 1.2" mesh size
= 6mm iron frame (30 X 50 X 30 cm²)
Estimated cost /unit = 100 pieces X US\$ 1.54 (**US\$ 154**)
- Squid trap: = no.9 net with 2.5" mesh size
= 1" X 1" wooden (Mai Ranaeng) frame (80 X 120 X 80 cm³)
Estimated cost /unit = 50 pieces X US\$ 3.85 (**US\$ 192**)
- Fish trap: = no.12 net with 1.0" mesh size
= 1" X 1" wooden (Mai Ranaeng) frame (50 X 80 X 30 cm³)
Estimated cost /unit = 30 X US\$ 5.13 (**US\$ 154**)

c) Government compensation plan

	Unit	Budget in US\$ (maximum)
Small boat	3,426 boats	6,676,308
Big boat	1,222 boats	7,050,000
Subtotal	4,648 boats	13,726,308
Bamboo trap	421 fishermen	107,949
Other traps	13,690 fishermen	3,510,256
Nets	1,871 fishermen	479,743
Subtotal	15,982 fishermen	4,097,948

2. Coastal Aquaculture (US\$ 214,100)

a) Inputs for six affected provinces and cost estimates

	Cage structure	Net & float	Seabass seed	Grouper seed	
Ranong (US\$)	40 unit (19,840)	40 unit (8,000)	20 unit (5,740)	20 unit (9,240)	120 unit (42,820)
Phang Nga (US\$)	58 unit (28,768)	58 unit (11,600)	29 unit (8,323)	29 unit (13,398)	174 unit (62,089)
Phuket (US\$)	20 unit (9,920)	20 unit (4,000)	10 unit (2,870)	10 unit (4,620)	60 unit (21,410)
Krabi (US\$)	36 unit (17,856)	36 unit (7,200)	18 unit (5,166)	18 unit (8,316)	108 unit (38,538)
Trang (US\$)	10 unit (4,960)	10 unit (2,000)	5 unit (1,435)	5 unit (2,310)	30 unit (10,705)
Satun (US\$)	36 unit (17,856)	36 unit (7,200)	18 unit (5,166)	18 unit (8,316)	108 unit (38,538)
Total (US\$)	200 unit (99,200)	200 unit (40,000)	100 unit (28,700)	100 unit (46,200)	600 unit (214,100)

b) Specifications of inputs

- Fish cage structure: 1 unit = 4 (3 X 3 m²) cages or 36 m² Frame
 = 24 pcs. of (2" X 4" X 4m) hard wood (Mai Teng)
 Platform = 24 pcs. of (1" X 8" X 4m) hard wood (Mai Teng)
 Estimated cost/unit = **US\$ 496**
- Fish cage net: 1 unit = 4 (3 X 3 X 2 m²) cages Poly-ethylene net (black)
 = no.18 with 1.5" mesh size Polystyrofoam floats
 = 9 pcs. of (24" X 24" X 48") foam
 Estimated cost /unit = **US\$ 200**
- Seabass seed: 1 unit = 4 X 400 (3"-4" size) pieces
 Estimated cost /unit = **US\$ 287**
- Grouper seed: 1 unit = 4 X 150 (5"- 6" size) pieces
 Estimated cost /unit = **US\$ 462**

c) Government compensation programme

	Farmer	Budget in US\$ (maximum)
Cage	27,828	14,270,769
Shrimp pond	42	21,538
Hatchery	573	293,846
Shellfish farm	80	40,770
Total	28,523	14,626,923

3. Crops (US\$ 200,826)

a) Gypsum for soil reclamation (Phang-Nga)

Province/district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Phang-Nga	- Natural gypsum - Containing CaSO ₄ , H ₂ O not less than 90% - pH 7 - Moisture content less than 5% by weight	300	60 kg/rai	4,122 rai	254,000	1,016,000

b) Organic fertilizer for soil reclamation (Phang-Nga, Phuket, Ranong)

Province/district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Phang-Nga	- Compost of crop residual and animal waste at 30:1 - Nitrogen 2.65% - Phosphorous 2.4% - Potassium 1.92%	300	1,000 kg/rai	378	378,000	1,209,600
Phuket	- pH 8.5 - C/N 10:1	10	2,000 kg/rai	25	50,000	160,000

c) Organic fertilizer for soil reclamation (Satun)

Province/district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Satun - La Ngu - Thung Wa	- Granule organic fertilizer - Size ranged 2-5 mm - Compost of chicken and bat waste at 1:1	172	1000 kg/rai	545	545,000	2,507,000

d) Organic fertilizer for coconut plantation (Ranong)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Ranong	- Organic fertilizer of crop residual and animal waste	8	50 kg/rai	2	800	7,833
- Muang		35		2	1500	1,617
- Kapur	- Granola form, diameter 4 mm	42		2	4200	22,916
- Suk Samrarn						
Total		85			6500	32,366

e) Coconut seedlings (Phang-Nga)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
- Muang	- Aroma water coconut variety	56	25	8	11,200	392,000
- Kapur		48	25	8	9,600	336,000
- Suk Samrarn	- 60 cm height	14	25	8	2,800	98,000
Total		118			23,600	826,750

f) Oil palm seedlings (Phang-Nga)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
- Muang	- Tenera variety	9	25	44	9900	643,500
- Kapur		5	25	44	5500	357,500
- Suk Samrarn	- 60 cm height	2	25	44	2200	143,000
Total		16			17,600	1,144,000

g) Cashew nut seedlings (Phang-Nga)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
- Taguapa	- Ranong variety	20	25	2	1000	25,000
- Tai Muang		24	25	2	1200	30,000
- Kuraburi	- 50 cm height	11	25	2	550	13,750
Total		55			2,750	68,750

h) Coconut seedlings (Ranong)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
- Muang Ranong	- Aroma water coconut variety	8	25	2	400	10,000
- Kapur		35	25	2	1750	43,750
- Suk Samrarn	- 60 cm height	42	25	2	2100	52,500
Total		85			4,250	106,250

i) Water melon seed (Trang)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Trang - Palian (Ko Sukorn)	- Ginnery C-29 Variety - Not less than 80% seed germination	70	250 gm/rai	1.5	26.25	196,87 5

j) Rice seed (Phang-Nga,Trang)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Phang Nga - Ko yao	- Pathumthani I variety - Not less than 90% germination	11	10 Kg/rai	3	330	4,950

k) Fertilizer for coconuts (Phang-Nga)

Province /district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Phang-Nga - Taguapa	- Fertilizer NPK = 16-16-8	56	50 kg/rai	2	5600	61,600
- Tai Muang		48	50 kg/rai	2	4800	52,800
- Kuraburi		14	50 kg/rai	2	1400	15,400
Total		118			11,800	129,800

l) Fertilizer for cashew nut (Phang-Nga)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Phang-Nga - Taguapa	-Fertilizer NPK = 16-16-8	20	50 kg/rai	2	2,000	22,000
- Tai Muang		24	50 kg/rai	2	2,400	26,400
- Kuraburi		11	50 kg/rai	2	1,100	12,100
Total		55			5,500	60,500

m)Fertilizer for oil palm (Phang-Nga)

Province/ district	Specification	Number of farmers	Rate of application	Amount (Kg)	Cost (baht)
- Taguapa	- Fertilizer NPK = 16-16-8	9	50 Kg/rai	2,200	24,200
- Kurabui		5	50 Kg/rai	1,250	13,750
- Tagua Thung		2	50 Kg/rai	500	5,500
Total		16			43,450

n) Organic fertilizer for coconut (Ranong)

Province /district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
- Muang	- Organic fertilizer of crop residual and animal waste, granule form, 4 mm diameter	8	50 Kg / rai	2	800	2,640
- Kapur		35	50 Kg / rai	2	1,500	11,550
- Suk Samrarn		42	50 Kg / rai	2	4,200	13,860
Total		85			6,500	28,050

o) Fertilizer for water melon (Trang)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Trang - Palian (Ko Sukorn)	- Fertilizer NPK = 13-13-21	70	100 Kg / rai	1.5	10,500	136,500

p) Fertilizer the rice production (Phang-Nga and Trang)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Phang-Nga	NPK = 16-16-8	11	50 Kg / rai	3	1,650	18,150
- Ko Yao		70	50 Kg / rai	3	10,500	115,500
Trang - Palian						
Total		81			12,150	133,650

q) Fertilizer for rice production (Trang)

Province/ district	Specification	Number of farmers	Rate of application	Area covered (rai)	Amount (Kg)	Cost (baht)
Trang - Palian	- Urea - NPK: 46 - 0 - 0	70	10 Kg / rai	3	2,100	27,720

4. Livestock (US\$ 27,036)

a) Concentrate for cattle (Phang-Nga)

Province/ district	Specification	Number of farmers	Kg/farmer	Amount Kg	Cost (baht)
Takuapa	- Concentrate for feeding cattle - 16% protein - 30 kg/sac	23	330	7590	57,684
Tay Muang		22	330	7260	55,176
Total		45		14,850	112,860

b) Concentrate for cattle (Satun)

Province/ district	Specification	Number of farmers	Kg/farmer	Amount Kg	Cost (baht)
La Ngu and Thung Wa	- Concentrate for cattle - 16% protein - 30 kg/sac	300	100	30,000	228,000

c) Mineral Blocks for Cattle, Buffaloes, Sheep (Phang-Nga)

Province/ district	Specification	Number of farmers	Pieces/ farmer	Amount (pieces)	Cost (baht)
Taguapa	- Mineral Blocks for cattle, buffaloes, sheep	23	11	15,180	15,180
Tay Muang	- 2 kg block	22	11	14,520	14,520
Total		45		29,700	29,700

d) Mineral Blocks for cattle, buffaloes, sheep (Satun)

Province/ district	Specification	Number of farmers	Pieces/ farmer	Amount (pieces)	Cost (baht)
La Ngu and Thung Wa	- Mineral blocks for cattle, buffaloes, sheep - 2 kg block	300	3	900	54,000

e) Mineral blocks for cattle, buffaloes, sheep (Ranong)

Province/ district	Specification	Number of farmers	Pieces/ farmer	Amount (pieces)	Cost (baht)
Muang Ranong	- Mineral Blocks for cattle, buffaloes, sheep	20	3	60	3,650
Kapur		39	3	117	7,020
Suk Samrarn	- 2 kg block	87	3	261	15,660
Total		146		438	26,280

f) Hay for buffaloes, cattle, sheep (Ranong)

Province/ district	Specification	Number of farmers	Pieces/ farmer	Amount (pieces)	Cost (baht)
Muang Ranong		20	62	1,240	62,000
Kapur		39	62	2,418	120,000
Suk Samrarn	- 15 kg block	87	62	5,394	269,700
Total		146		9,052	452,600

g) Animal drugs for Phang-Nga, trang, Satun, Ranong (US\$3,870)

Province/drugs	Specifications	Amount (bottles)	Cost (baht)
Phang-Nga:			
- Albendazole	- 1000 cc bottle	20	24,000
- Biokatalin	- 100 cc bottle	50	8,000
- Ivomak	- 200 cc bottle	10	25,000
Satun:			
- Albendazole	- 30 cc bottle	600	36,000
Trang:			
- Albendazole	- 30 cc bottle	377	16,965
Ranong:			
- Albendazole	- 30 cc bottle	1000	32,000
- Sulfadimetoxin	- 1 kg can	10 cans	9,000
Total			150,965

Note: Calculation is based on the conversion rate of Baht 39/US\$

Project profile: “Study on long-term impact of the tsunami on economically important species of marine animals”

1. Background and justification

The Tsunami on 26 December 2004 seriously devastated human lives, houses, fishing boats, and shrimp and fish farming areas along the western Andaman Sea coast in the six southern provinces of Thailand. Changes to the marine ecosystem arising from this severe event may have longer-term impacts on ecosystem functioning and the livelihoods of coastal people dependant on the Andaman sea ecosystem.

Environmental impacts included damage to coastal habitats, including coral reefs, beaches and mangroves. Preliminary studies indicate 3,146 Rai of coral reef slightly affected; 550 Rai of coral reef severely affected; 6,200 Rai of beaches affected; 1,860 Rai of mangrove slightly affected; 555 Rai of mangrove severely affected. However, these preliminary figures are from rapid underwater surveys in only some limited coral areas important for tourism. Wider investigations of the seabed, or coastal environment, which may significantly influence ecosystem functions, have not been conducted as yet.

Observations after the Tsunami incident also suggest that seawater has become clearer, similar to previous El Nino events. As a secondary effect, such changes might lead to effects on phytoplankton productivity and the primary food chain, perhaps related to the removal to the shoreline of seabed sludge or natural fertilizer normally utilized for plankton growth. Such events could be followed by rising seawater temperature (through increased transparency of water), further death of coral reefs (bleaching event), poor productivity water and further changes in the ecosystem.

Ecosystem changes may lead to further adverse effects on the productivity of the marine ecosystem, such as economically important marine animal species for fishing, or those that are subsequently used for aquaculture breeding and stocking of aquaculture facilities, such as black tiger prawn, grouper, lobster, as well as collection for the live fish trade such as mantis shrimp, swimming crabs and mangrove crabs.

Given the social and economic implications of such ecosystem changes, the primary, secondary and tertiary effects should be carefully studied. While they should be initiated urgently, such studies will need to be carried out over the long-term to understand the environmental impacts of the tsunami and environmental; management measures required to ensure recovery from this catastrophic event.

An implementing partner should corporate with the Department of Fisheries (DOF), particularly the Andaman Sea Marine Fisheries R&D Centre, to conduct a study of the long-term impact of the tsunami, and identify management solutions to address problems. In addition, an artificial reef programme should be explored as a means to promote rapid recovery of the ecosystem and recovery of the livelihoods of fishers dependant on the marine ecosystem. Another area of study could be the effect of near-shore seabed-sludge accumulation on fish cage culture sites. The sludge accumulation and shallower bottom may cause water pollution to fish cages, particularly during low tide.

2. Objectives

The main objective of the proposed study is to assess the long-term environmental impacts on coastal resources and ecosystem functioning, with an emphasis on damage to the wild catch and aquaculture of selected economic species. The second objective is to enhance the wild fishstock through widespread installation of artificial reefs.

3. Work plan

- 1) Survey on primary effects (seabed, coral reefs, mangrove nursery areas)
- 2) Survey and monitoring on secondary effects (water transparency, water temperature, primary productivity, coral bleaching, etc.)
- 3) Survey and monitoring on tertiary effects (catch and growth of selected economic marine species)
- 4) Monitoring of fish cages affected by accumulation of seabed sludge
- 5) Development of plan and installation of artificial reefs as appropriate

4. Inputs

- 1) Contributions by an implementing partner:
 - Equipment and material for survey on primary effects
 - Equipments and materials for analysis and monitoring on secondary effects
 - Equipments and materials for survey and monitoring on tertiary effects.
 - Computer system for monitoring over-all programme
 - Artificial reef materials
- 2) Government contributions; (through the Andaman Sea Marine Fisheries R&D Centre)
 - Research vessel and its routine operation costs
 - Laboratory and its routine operating costs
 - Staff costs
 - Transportation and installation costs for artificial reef

Project Profile: “Reclamation of salt affected soils”

1. Background and Justification

About 8 000 rai of land and soil were affected by sea water intrusion, making it saline and toxic to plants, thus causing crop damage. Soil reclamation is required on the basis of the level of salinity present. If the level of salinity is high, the application of organic fertilizer and gypsum will be required. Only coconut trees were damaged by direct contact with the tidal wave. Crops that were damaged over large areas include fruit trees, cashew nut, oil palm, coconut, vegetables and grass land.

2. Objective

The objective of the project is to assist the Government on the reclamation of the salt-affected soil due to sea water intrusion caused by Tsunami.

3. Work Plan

- a) survey the extent and level of soil salinity in the Tsunami-affected areas of the 6 provinces
- b) conduct field demonstration on soil salinity reclamation in the areas for dissemination of information and extension
- c) provide inputs for soil reclamation in a larger scale based on results of the above 2 activities

4. Expected Outputs

- a) methods for reclamation of the salt-affected soils will be established.
- b) salt-affected soils reclaimed
- c) crop productivity improved by the reclamation

5. Inputs Required

- a) Personnel
- b) Travel cost
- c) Inputs for soil reclamation and soil amendments
- d) Cost of training if necessary
- e) General operation costs

6. Budget

A total budget of US \$276,923 is required as follows:

- a) National consultant (3 working months) = B.300,000
- b) Travel cost = B.100,000
- c) Soil survey and soil analysis = B.200,000
- d) Inputs for soil reclamation in 3,000 rai by using gypsum, organic fertilizer, and legume seeds for green manure.
 - Gypsum = 3,000 rai x 250 kg/rai = 750,000kg
= 750tons x B.4,000/ton = B.3,000,000
 - Organic fertilizer = 3,000 rai x 1,000 kg/rai = 3,000,000kg
= 3,000,000 x B.3,200 = B.9,600,000
 - Legume seeds = 3,000 rai x 5 kg/rai = 15,000 kg
= 15,000kg x B.20/kg = B. 300,000

Project profile: “Policy advice and institutional settings to establish a buffer zone along the coastal areas with tree planting”

1. Background and Justification

As a result of preliminary damage assessments, it was found that some woody species, e.g. coconut palm and Casuarina, indicated a bio-physical tolerance against the tsunami waves and salinity. Rubber and oil palm plantations were also indicated as being potential buffers to absorb the physical energy of violent tsunami waves. The Thai Government is now considering policy and institutional settings on how to establish a buffer zone along the coastal areas to protect the lands and human communities from the tropical storms, monsoon and tsunami waves. In this context, it is timely and most appropriate to assist the Government on how to deal with this subject. This project would also play a complementary role with another project, “In-depth assessment of mangroves and other coastal forests affected by the tsunami in southern Thailand” in Annex 10.

2. Objective

The objective of the project is to advise the Government in the subject areas of policy and institutional settings on coastal buffer zones (or green belts), and contribute to the planning of such zones with the most suitable tree species, including economic tree crop plantations, such as coconut palm, oil palm and rubber plantations.

3. Work Plan

- a) Establish an advisory group on the buffer zone policy and institutional setting.
- b) Information collection and analysis through a series of dialogues with the local communities and authorities to better understand their socio-economic and environmental conditions.
- c) Prepare guidelines on a buffer zone policy and institutional setting through meetings with all of the stakeholders.
- d) Establish buffer zone models in Ranong, Phang-Nga, and other provinces to examine their size and shape, species composition, effectiveness to mitigate violent waves, erosive currents and winds, socio-economic benefits to the local communities, management systems, etc.
- e) Prepare a series of reports.

4. Expected Output

- a) Advisory services to the Government on the policy and institutional settings on buffer zone issues.
- b) Demonstrations of model buffer zones combined with the basic information collections and analysis.
- c) Promote public awareness on buffer zone functions and tangible benefits.
- d) Improve buffer zone management systems with the local communities and authorities.
- e) Enhanced protective measures against sea-born disasters toward the future.

5. Input Required

- a) Personnel
- b) Travel costs (excluding the study tours)
- c) Establishment of model buffer zones with the supply of selected tree species, if necessary
- d) Study tours to other countries
- e) Workshops and conferences
- f) Report editing and printing

6. Project Duration

Two years

7. Project partners

The project will be carried out by the Ministry of Natural Resources and Environment (MNRE), under the technical and operational support of FAO. A financial and coordination support of UNDP is expected. It is also encouraged to work together with UNEP and other donor-sponsored programmes that deal with the same or similar subjects.

8. Budget

a) Personnel:	US\$40,000
b) Travel costs:	US\$10,000
c) Establishment of model buffer zones:	US\$40,000
d) Study tours:	US\$20,000
e) Workshops and conferences:	US\$18,000
f) Report editing and printing:	US\$12,000

Total: US\$140,000

Project profile: “Responsive assistance on the rehabilitation of natural resources and environmental damages in the affected areas”

Natural Resources and Environment Rehabilitation			
FAO	Beneficiaries: Communities in 6 provinces affected by the disasters	Partners: Ministry of Natural Resources and Environment Academic team from local universities Local government	USD 730,000
	Project Title: Responsive Assistance on the Rehabilitation of Natural Resources and Environmental Damages in the Affected Areas (duration: 2 years)		
	Aim: Improved environmental restoration, and increased awareness of the role of natural resource management both for natural hazard vulnerability reduction and for the protection of valuable coastal natural resources.		

1. Background

The devastating Tsunamis caused by the 9.0 magnitude earthquake centred on the west coast of the Indonesian island of Sumatra on 26 December 2004 struck Asian countries surrounding the Indian Ocean, including Thailand. In Thailand, as of 12 January 2005, it is confirmed that 5313 have died (a half of them are foreigners from 36 countries), with a further increase of its toll. The foundation of people’s living was badly devastated in the affected provinces in the south, i.e. Phangna, Trang, Krabi, Phuket, Satun and Ranong.

It is reported that many fishing and farming communities in the areas have been completely destroyed by Tsunamis. In addition to the devastated damages in the fisheries and agriculture sector, the tourism sector has also been severely damaged. As those sectors provide the local communities with the main income sources, the devastating situation has threatened their livelihood directly in the affected coastal areas and indirectly in the surrounding unaffected coastal areas. All of the people making their living in these sectors depend on natural resources, including the attractive and beautiful tropical environment in the south.

The scale of damages and rehabilitation needs for natural resources and environment have not yet been assessed. The impact of damage caused by salinity is also the concern for the longer term rehabilitation in the agricultural sector.

Efforts of the Thai government as well as international community have so far focused on emergency humanitarian relief operations. Damage and needs assessment programmes on natural resources and environment may look different from emergency operations, but they can contribute rebuilding the communities to be a less vulnerable and safer place to live in.

2. Project Description

The project will assess the damages due to Tsunami on various natural resources, including 1) coastal vegetations (mangroves, rear-mangroves, freshwater forests, riparin forests, coconut palm plantations, natural and man-made casuarina stands, etc.) and 2) agricultural land and water resources in six southern provinces. At the same time, the

project will assess the mitigation effects of these vegetations by their locations, shapes and sizes of areas, species composition and density, and management, in comparison with artificially constructed objects, e.g. wave blocks.

In the agricultural sector, the main aim will be to rehabilitate the affected lands and to restore progressively the production capability and ensure food security and livelihood of the people. Rehabilitation options will depend mainly on severity and extent of damages (e.g. level of soil salinity due to sea water intrusion, physical and salt toxicity damages to standing crops, etc.), loss of farming capital and human capacity. Therefore, need assessment studies will play a major role in zoning or characterizing the damages, identifying the capacity of farmers and local community to restore the production capability and designing and scheduling appropriate interventions for short, medium and long term considering the local agro-ecological and socio-economic conditions.

The project will also conduct a biodiversity assessment in the inside and outside of marine and terrestrial parks or other types of protected areas in the Tsunami affected areas to obtain scientific information on the Tsunami impact on flora and fauna.

Vulnerability assessment against tsunamis will be investigated along with these mentioned surveys.

To identify the priority assessment areas, remote sensing (RS) and GIS technologies will be fully utilized in combination with the field observations. Selected areas will be surveyed by a group of experts.

The obtained findings are presented to the local communities, provincial government authorities, NGOs, university staff, and journalists for their questions and comments in a series of workshops. Based on the assessment results, a series of technical reports will be issued with recommendations and guidelines for better natural resource management with appropriate land use planning and environmental impact assessment (EIA) in coastal areas.

The project will also conduct environmental awareness and disaster prevention training programmes for the local communities, government officials, NGOs and school teachers by using the project reports or their simplified versions to increase public awareness on the productive and protective functions of natural resources to the fisheries and agriculture sectors. Similar information will be provided to the tourism sector as the attractive features of natural environment are the basic asset for this sector. Environmental education materials will be prepared for school children.

A number of international and national consultants as well as FAO/RAP technical officers specialized in forest ecology, geology, integrated crop, soil and water management, land use planning, remote sensing and GIS, disaster management, environmental education, etc. will visit the project areas, to conduct the project activities.

3. Objectives

- a) To provide the provincial government authorities and local communities with the scientific information on the production, protection and other environmental functions and services of natural resources, on the basis of various assessments and analysis of the results.
- b) To identify and prioritize the types of rehabilitation/interventions (short, medium and long term) with the main aim of restoration of agricultural production and livelihood of people in the affected regions
- c) To provide technical advise, guidance, training and supervision in order to improve natural resource management systems, including an early warning system, RS/GIS, EIA, rehabilitation of damaged natural resources, in close collaboration with concerned government agencies and local authorities.
- d) To implement environmental awareness training, education, and disaster vulnerability management programmes.

4. Expected impact

- a) Improvement of natural resource management systems for the sustainable natural resources utilization and conservation.

- b) Identification of integrated strategies for resumption of agricultural production in the affected regions
- c) Improvement of environmental awareness on the functions and services of natural resources.
- d) Improvement of disaster prevention and preparedness for the long-term livelihood security and prosperity for the local communities.
- e) Enhancement of technical capacities in the local government staff on the application of RD/GIS, EIA, early warning systems, land use planning, environmental education, etc.
- f) Promotion of the tourism industry based on environmental conscious tourism.

FINANCIAL SUMMARY	
BUDGET ITEMS	US\$
Personnel	400,000
Travel	50,000
Equipment and supplies	100,000
Training	80,000
General operating costs and others	100,000
Total	730,000

Project Profile: “In-depth assessment of mangroves and other coastal forests affected by the tsunami in southern Thailand”

Mangroves and other coastal forests			
FAO (UNDP/UNEP)	Beneficiaries: Communities in 6 provinces affected by the tsunami disaster	Partners: Ministry of Natural Resources and Environment	US\$: 170,000
	Project Title: In-depth assessment of mangroves and other coastal forests affected by the tsunami in southern Thailand		
	Aim: Project will provide MNRC with scientific information needed for enhancing coastal forest rehabilitation and management linked with the livelihoods of local communities and preparedness for future similar disasters.		

1. Background

The devastating Tsunamis caused by the 9.0 magnitude earthquake centered on the west coast of Indonesian Island of Sumatra on 26 December 2004 struck Asian countries surrounding the Indian Ocean, including Thailand. In Thailand, as of 24 January 2005 it is confirmed that 5323 have died 3,115 have lost and 8,457 have injured (nearly a half of them are foreigners from 36 countries, with a further increase of its toll. The foundation of people’s living was badly devastated in the affected provinces in the south, i.e. Ranong, Phangnga, Phuket, Krabi, Trang and Satun.

It is reported that mangrove and other coastal forests had played an essential role in protecting the communities behind them from the surge of tsunamis. The damage to the mangrove areas in Ranong, Phangnga and Satun was assessed as about 310 ha. In fact, however, other types of forests, especially on sandy beach forests and peat swamp forests seem to be more severely affected. Serious sand erosion caused many trees uprooted and their roots exposed. In addition, some freshwater plant species appeared to be killed by the exposure to saline water. Various kinds of animal species appeared to have been affected in their habitats by the tsunami. As negative impact has not been assessed yet, it is urgently required to conduct a series of scientific studies to enhance the ecosystem rehabilitation efforts.

2. Project description

The project will conduct in-depth studies on the damage to mangroves, beach forests, peat swamp forests and other coastal plantations affected by the tsunami. The subjects covered will include: 1) physical damage to those forests by forest types, species composition, location, shape and size of a stand, tree height and density, etc. 2) ecological damage and sensitivity (by forest type, species, etc.) and long-term effects on biodiversity; and 3) socio-economic damage to tree farm plantation, such as coconut, rubber trees, cashew nut, etc.; 4) the effectiveness of coastal woody vegetation to mitigate damage to local communities. Findings will be used for better planning of rehabilitation strategies, ecosystem management, and disaster prevention for the local communities.

To identify the assessment areas, remote sensing (RS) and GIS technologies, will be fully utilized in combination with field observations. Areas will be surveyed by group of experts.

The obtained findings will be presented to the local communities, provincial government authorities, NGOs, university staff, journalists, seminars and workshops. Based on the assessment results, a series of technical reports will be issued with recommendations and guidelines for better natural resources management with appropriate land use planning and environment impact assessment (EIA) in coastal areas.

The project will also conduct environmental awareness and disaster prevention training programmes for the local communities, government officials, NGOs and school teachers by using the project reports or their simplified versions to increase public awareness on the productive and protective functions of natural resources to the fisheries and agriculture sectors. Similar information will be provided to the tourism sector as the attractive features of natural environment are the basic asset for this sector. Environmental education materials will be prepared for school children.

A number of national consultants specialized in forest ecology, geology, soil and land management, land use planning, remote sensing and GIS, disaster management, environmental education, etc. will visit the project areas, to conduct the project activities.

3. Objectives

- a) To provide in depth assessment of mangroves and other coastal forests affected by the tsunami to provincial government authorities, local communities, universities and school.
- b) To provide technical advise, guidance, training and supervision in order to improve forests, in close collaboration with concerned government agencies and local authorities.
- c) To implement mangroves and other coastal forests ecosystem awareness training, education, and disaster vulnerability management programmes.

4. Expected outputs

- a) Improvement of forest management systems for sustainable utilization and conservation.
- b) Improvement of public awareness on the functions and services of mangroves and other coastal forests to mitigate damage by tsunamis and typhoon waves.
- c) Improvement of local community livelihood security systems.
- d) Enhancement of technical capacities in the local government staff on the application of land use planning, forest ecosystem management and environmental education programmes.
- e) Promotion of the ecological and environmental conscious tourism industry.

Financial Summary	
Budget Items	US \$
Personal	80,000
Travel	20,000
Equipment and supplies	20,000
Training	30,000
General operating cost and others	20,000
Total	170,000

Project Profile: Training, material, and facilities required for vegetable growing

1. Training of farmers and facility for hydroponic vegetable growing (Krabi)

a. Training cost for 40 farmers including (resource persons, materials)	= 500 x 40	= 20,000 Baht
b. Food and accommodation of 40 farmers for 2 days	= 200 x 40 x 2	= 16,000 Baht
c. Transportation from home to training station of 40 persons	= 100 x 40	= 4,000 Baht
d. Cost of building facilities for hydroponic vegetable growing, with the size of 2.5 m x 7.2m room for 4 sets	= 35,000 x4	= 140,000 Baht
e. Variable cost including seed, mineral solution, spongy foam, for the 4 sets	= 1,000 x 4	= 10,000 Baht
Total		190,000 Baht

Training will be provided by Krabi Extension and Agriculture Development Center (Horticulture), DOAE, Krabi Province

2. Vegetable cultivation in net-house in Ranong for 30 houses in 3 Tsunami affected districts

<u>Materials</u>	<u>Amount/house</u>	<u>Cost/house (Baht)</u>	<u>Labour cost/house</u>	<u>Total cost/house</u>
1. Iron pipes (3/4 inch in diameter, 4 meter long)	45 pieces	13,275	5,000 Baht *** For 30 houses	
2. Iron pipes (1/2 inch in diameter, 4 meter long)	2 pieces	460		
3. Nylon net (16-40 net/inch)	180 m ²	4,399		28,294
4. Plastic sheet (200 micron thick with UV 7%)	120 m ²	2,720		28,294 x30
5. Pragab	190 pieces	1,520		848,820
6. Concrete 1:2:4	0.4 m ²	920		
Total		23,294		

3. Curriculum of Farmers Training on Hydroponically Vegetable Growing in Krabi

First Day

- 13:00 – 16:00 hr - Registration
 - Stay overnight at the training centre

Second Day

- 8:00 – 8:30 hr - Opening ceremony
 8:30 – 10:30 hr - General information on hydroponically vegetable growing
 10:30 – 10:45 hr - Break
 10:45 – 12:00 hr - Elements required for plant growth
 12:00 – 13:00 hr - Lunch
 13:00 – 14.30 hr - Cropping system by hydroponic technique
 14:30 – 14:45 hr - Break
 14:45 – 17:30 hr - Materials and chamber for hydroponic vegetable growing
 18:00 hr - Dinner and stay overnight at the centre

Third Day

- 8:30 – 10:30 hr - Steps in hydroponically vegetable growing
- 10:30 – 10:45 hr - Break
- 10:45 – 12:00 hr - Cont. steps in hydroponically vegetable growing
- 12:00 – 13:00 hr - Lunch
- 13:00 – 14:45 hr - Working on hydroponically vegetable growing
- 14:45 – 17:00 hr - Cont. working on hydroponically vegetable growing
- 17:20 hr - Closing session

Project Profile: “Community-based livelihoods rehabilitation and natural resource management in coastal fishing community”

1. Background

Emergency needs for fisher folk and farmers have been addressed by government as well as donors/partners, although there is still more assistance needed for tsunami-affected victims to restore their livelihood. In addition to the restoration of production assets, more attention should be given to long-term sustainable rehabilitation of the livelihood of coastal communities as well as responsible natural resource management and community empowerment to mitigate potential damages caused by natural disasters.

2. Objectives

This project aims to facilitate participatory community-based fisheries management and sustainable human development in coastal fishing communities in tsunami-affected areas, through awareness building, organization and empowerment of communities, promotion of alternative income generating activities, facilitating improved access to credit schemes as well as social and extension services, and strengthening linkages between community organizations and local government institutions and administration.

The primary purpose of the project is to empower local community-level organizations and fishermen’s organization to manage their natural resources in a sustainable manner, to plan, implement and monitor development activities to address their concerns and needs and to gain better access to services. The Project will be participatory in nature beginning with identification of needs, determination of solution options, planning, implementation and through to monitoring and evaluation in close collaboration with existing local NGOs.

3. Expected outputs

- a) Constraints and problems in improving livelihood and sustainable natural resource management will be identified by the community.
- b) Strengthened managerial capacity of village-level organizations/fishermen’s organizations
- c) Increased access in coastal fishing communities to selected social services, credit schemes and alternative income generation opportunities
- d) Established community based and stakeholder management of fisheries resources towards sustainable fisheries.
- e) Improved public awareness on disaster mitigation.
- f) Improved capacity of coastal fishing communities to cope with natural disasters and their aftermath.

4. Inputs

- a) Personnel
- b) Training to local officers, community organizations/fishermen's organizations
- c) PRA / Workshop
- d) Micro-credit scheme
- e) Study tour (in-country)
- f) Equipment and materials

5. Duration

2 years

Report on damages to fisheries/aquaculture sector at provincial and district levels

1. Report of Basic Damages of Tsunami Disaster Victims by Provinces (latest damage collection on January 10, 2005, at 15:00 hours)									
<u>Province</u>	<u>Damaged Boat (units)</u>		<u>Retrieval (units)</u>		<u>Fishing gears (units)</u>		<u>Aquaculture production areas</u>		
	Large	Small	Large	Small		Cage(m ²)	Pond (rai)	Hatcheries (m ²)	Concession (rai)
Ranong	204	314	13	27		567,577	10.05		170.92
Phang Nga	322	754	124	46		129,798	105.50	10,718.14	400.00
Phuket	490	642	157	41		44,134	36.48	76,100.00	362.58
Krabi	147	804	1	54	46,133	77,834	114.00		30.37
Trang	1	648				23,660			5.25
Satun	35	552	6	49	930	78,526			
Total	1,199	3,714	301	217	47,063	921,529	266.03	86,818.14	969.12

2. Estimated Value of Basic Damages of Tsunami Disaster Victims by Provinces (latest damage collection on January 10, 2005, at 15:00 hours)							
<u>Province</u>	<u>Boat retrieval (baht)</u>	<u>Fishing gears (baht)</u>	<u>Aquaculture production</u>				<u>Total</u>
			<u>Cages (baht)</u>	<u>Ponds (baht)</u>	<u>Hatcheries (baht)</u>	<u>Concession (baht)</u>	
Ranong	480,900		171,810,707	-	-	3,643,915	175,935,522
Phang Nga	35,706,300		155,799,589	15,278,000	125,393,000	-	332,176,889
Phuket	73,500,090	-	120,238,010	483,000	20,028,500	31,992,450	246,242,050
Krabi	751,500	58,381,920	124,299,742	6,889,000	-	-	190,322,162
Trang	-	-	41,966,200	-	-	330,000	42,296,200
Satun	800,300	24,000	179,570,620	-	-	15,050,000	195,444,920
Total	111,239,090	58,405,920	793,684,868	22,650,000	145,421,500	51,016,365	1,182,417,743

3. Report of Basic Damages of Tsunami Disaster Victims by Districts (latest damage collection on January 10, 2005 at 15:00 hours)

	Damaged area		Registered boats		Damaged boats (units)		Retrieval (units)		Fishin g gears	Aquaculture production area											
			>10 m	<10m	>10 m	<10m	>10m	<10m		Cages (square meters)			Ponds (rai)			Hatcheries (square meters)			Concession area (rai)		
	Sub-district	Village	Large size	Small size	Large size	Small size	Large size	Small size	Units	Registered cages	Farms	Damaged cages	Registered ponds	Farms	Damaged ponds	Registered hatcheries	Farms	Damaged hatcheries	Registered areas	Farms	Damaged areas
<u>Ranong</u>	7	22	587	1,408	204	314	13	27				567,577			10.05						
Muang	2	11	445	843	54	87	2	6				93,446									
Kapur	2	7	57	351	47	98						57,389									
Suk	3	4	85	214	103	129	11					416,742									
Samran																					
Minor-district																					
Phang	15	78	825	2,782	322	754	124	46				129,798			105.50			10.718.14			
Nga																					
Takua	4	14	231	213	168	72	63	19				16,259			74.00			3.012.00			400.00
Pah																					
Takua	2	12	68	714		47		5				18,495									
Tung																					
Tai	2	8	144	102	138	176	55	1				10,985			5.00			2.000.00			
Muang																					
Koh Yao	2	14	133	576	14	212	6					31,270			6.50						
Kura	4	25	190	518	14	212	6					31,270			6.50						
Buri																					
Muang	1	5	59	659	2	244		18				40,110			20.00			5.706.14			
<u>Phuket</u>	8	79	574	676	490	642	157	41		26,025	315	44,134	2.214	294	36.4800	228.000	285	76.100.00	707.75		362.58
Muang	6	40	422	411	390	432	157	39		13,492	174	30,109	482.07	88.00	35.0000	100.000	125		452.75	5.00	358.00
Ka Thu	2	11	27	11	23	27				402	4		4.58	12							
Thalang		28	125	254	77	183		2		12,313	137	14,025	1.727	194	1.4800	128.000	160		255.00	2.00	4.58
<u>Krabi</u>	23	126	312	2669	147	804	1	54	46,133	32,039		77,834	13.009		114.00	60			7.723.0		30.37

	Damaged area		Registered boats		Damaged boats (units)		Retrieval (units)		Fishing gears	Aquaculture production area												
			>10m	<10m	>10m	<10m	>10m	<10m		Cages (square meters)			Ponds (rai)			Hatcheries (square meters)			Concession area (rai)			
	Sub-district	Village	Large size	Small size	Large size	Small size	Large size	Small size	Units	Registered cages	Farms	Damaged cages	Registered ponds	Farms	Damaged ponds	Registered hatcheries	Farms	Damaged hatcheries	Registered areas	Farms	Damaged areas	
Muang Klong Thom	6	34	167	674	7	179	1		15,427	5,562	40	24,174	1,426	187	65	60				900.00		
Nuea Klong	5	19	26	364		7		20	119	8,827	102	5,669	2,073	250	5					1,500.00		
Ao Luek Koh	4	21	44	830		182		34	21,035	7,589	50	30,258	2,659	256	1							
Lanta	3	18	55	345	12	34			83	5,472	107	12,213	1,798	154	40					700.00		
Trang	5	36	20	456	128	402			9,469	4,589	60	5,520	5,053	74	3					4,623.00		30
Kan	12	54	626	2,365		648				241,936		23,660	45,743	1,910		699,200	144					5.25
Tnag	4	13	577	1,019	1	393				7,360	67	9,772	41,049	959		470,400	103					2
Si Kao	3	12	31	476		96				73,152	139	10,432	1,063	217		224,000	40					3
Pa Lien	3	16	7	463		30				132,800	163	3,008	2,277	521		4,800	1					0
Hat-Samran Minor-district	2	13	11	407		129				1,624	24	448	1,355	213								
Satun	9	39	783	2,172	35	552	6	49	930	34,360	960	78,526	1,393			123.04	49.00			8,909.00	17.00	1,000.00
Muang	5	17	460	1,165	1	162	1	19		15,488	343	8,625	880	467		48.89	19.00			8,909.00	17.00	1,000.00
La Ngu Tung Wah	4	22	323	1,007	28	343	5	30		18,872	617	58,859	512	807		74.15	30.00			0	0	0
Tha Pae	3	12			6	47						11,042										
Total	74	398	3,707	12,072	1,198	3,741	301	217	47,063	307,360	1,275	921,529	62,358	2,204	266	927,383	476	86,818		17,340	17	1,398

Remarks: Phuket Province, collected the 87 large size cruiser boats, small size 75 units, this number shall be deducted from damaged boats of other provinces, to be all fishery boats

4. Report of Estimated Values for Basic Damages of Tsunami Disaster Victims by Districts
(latest damage collection on January 10, 2005, at 15:00 hours)

	<u>Boat retrieval</u>		<u>Aquaculture production</u>							
	<u>(units)</u>									
	Total	Value	Cages		Ponds		Hatcheries (m²)		Concession	
	Bosts	(Baht)	Area (m²)	Damaged value	Area (rai)	Damage d value	Area (rai)	Damaged value	Area (rai)	Damaged value
<u>Ranong</u>	19	480,900	567,577	171,810,707	3,643,915.00				170.92	3,643,915
Muang	8	7,800	93,446	65,411,430	1,691,665.00				105.02	1,691,665
Ka Pur	-	3,000	57,389	31,772,657	492,300.00				11.40	492,300
Suk Samran	11	470,100	416,742	74,626,620	1,459,950.00				54.50	1,459,950
Minor-district										
<u>Phang Nga</u>	173	35,706,300	148,388	155,799,589	112.00	15,278,000	10,718.14	125,393,000		-
Takua Pah	82		16,259	47,596,840	74.00	13,200,000	3,012.00	93,756,000		
Takua Tung	5	110,300	18,495	10,277,000		-		-		
Tai Muang	56	11,845,000	10,985	14,640,000	5.00	1,400,000	2,000.00	20,000,000		-
Koh Yao	6	397,000	31,270	17,872,303	6.50	139,000		-		-
Kura Buri	6	397,000	31,270	17,872,303	6.50	139,000		-		-
Mueang	18	523,000	40,110	47,541,143	20.00	400,000	5,706.14	11,637,000		-
<u>Phuket</u>	198	73,500,090	44,134	120,238,010	36.48	483,000	76,100.00	20,028,500	362.58	31,992,450
Muang	196	49,709,530	30,109	98,938,970	35.00	350,000	35,300.00	14,165,900	358.00	31,812,000
Ka Thu	-	5,102,800	-	-		-		-		-
Tha Lang	2	18,687,760	14,025	21,299,040	1.48	133,000	40,800.00	5,862,600	4.58	180,450
<u>Krabi</u>	55	751,500	77,834	124,299,742	114.00	6,889,000	15,179,200.00	-		-
Muang	1	50,000	24,174	32,443,972	65.00	2,840,000				
Klong Thom	20	363,800	5,669	10,330,620	5.00	19,000				
Nuea Klong	34	337,700	30,258	23,037,150	1.00	30,000				
Ao Luek	-	-	12,213	27,768,000	40.00	4,000,000	931,000.00			
Koh Lanta	-	-	5,520	30,720,000	3.00	-	14,266,200.00			
<u>Trang</u>	-	-	23,660	41,966,200		-			5.25	330,000
Kan Tang	-	-	9,772	20,184,900		-			2.00	100,000
Si Kao	-	-	10,432	14,250,000		-			3.00	130,000
Pa Lien	-	-	3,008	4,381,300		-			0.25	100,000
Hat-Samran	-	-	448	3,150,000		-				-
Minor-district										
<u>Satun</u>	55	800,300	67,754	179,570,620		-			1,000.00	15,050,000
Muang	20	125,300	8,625	12,088,120		-			1,000.00	15,050,000
La Ngu	35	531,000	58,859	166,882,500		-				-
Tung Wah	-	120,000	270	600,000		-				-
Tah Pae	-	24,000	-	-		-				-
Total	500	111,239,090	929,348	793,684,868	3,644,177.48	22,650,000	15,266,018.14	145,421,500	1,538.75	51,016,365

Remark: Estimated losses from Provincial Fishery Office not yet completed

5. Summary Report of Basic Damages of Tsunami Disaster Victims by Department of Fisheries

Serial No.	Province	Damaged boats (units)				Total	Aquaculture production				Fishing gears			Estimated damaged value (baht)	DOF Compensation (baht)
		Fishing boats		Eco-tourism boats			Cages (farms)	Shrimp ponds (farms)	Hatcheries (farms)	Shellfish (farms)	Bamboo trap (units)	Nets (units)	Fish-trap		
		Large size	Small size	Large size	Small size										
1	<u>Ranong</u>	191	297	-	-	488	22,907	-	-	-	-	191	297	3,456,809,320	528,567,00
2	<u>Phang Nga</u>	377	618	3	1	999	3,008	17	180	-	-	477	514	1,464,665,080	206,554,000
3	<u>Phuket</u>	478	639	87	76	1,280	315	2	209	72		491	463	1,532,607,400	202,955,000
4	<u>Krabi</u>	147	785	151	236	1,319	389	23	-	6	150	347	575	844,965,640	163,726,00
5	<u>Trang</u>	-	594	-	-	594	243	-	144	2	-	182	412	271,523,680	58,864,000
6	<u>Satun</u>	29	493	-	-	522	966	-	40	-	271	183	11,429	646,969,160	182,943,000
	Total	1,222	3,426	241	313	5,202	27,828	42	573	80	421	1,871	13,690	8,217,540,280	1,343,609,000

Source: The calculation was based on database collected from the DOF Fisheries Rescue Coordination Centre on January 7, 2005.

6. Comparative summary between the former compensation for rehabilitation of the fisheries activities and the compensation to the Tsunami victims in the six southern provinces.

<u>Criteria on providing assistance complying with the regulations of Department of Fisheries on aid payment to the aqua-farmers or the fishermen who suffered from the natural disaster in 1998.</u>	<u>Criteria on providing assistance and improvement, according to the resolutions of the Aid and Solution to Problems Committee to the Tsunami disaster victims in the six southern provinces on 10 January 2005.</u>
<p>1. Fishing boats</p> <p>1.1 Small boats with the maximum length of 10 m.</p> <ul style="list-style-type: none"> - Actual cost of retrieval but not exceeding 10,000 baht per boat. -Actual cost of repair but not exceeding 20,000 baht per boat. -Lost boat not exceeding 56,000 baht each. <p>1.2 Large boats with the minimum length of 10 m and up.</p> <ul style="list-style-type: none"> -Actual cost of retrieval but not exceeding 25,000 baht. -Actual cost of repair but not exceeding 70,000 baht. -Lost ship not exceeding 200,000 baht. <p>2. Fishermen or crew</p> <ul style="list-style-type: none"> - The owner or crew of a ship died or missed would be paid for the funeral rites at 10,000 baht each. - The owner or crew of a ship that was injured would be paid for hospitalization 1,000 baht each. <p>3. Fishing gears, traps, bamboo traps and nets</p> <ul style="list-style-type: none"> - None. <p>4. Aquafarmers</p> <p>4.1 For coastal aquaculture, the victims will receive by cash for compensation as follows ;</p> <ul style="list-style-type: none"> - All kinds of fish in an earth pond at the rate of 1,400 baht/rai each but not exceeding 5 rai -Prawns, crabs and shellfish at the rate of 3,800 baht/rai each case but not exceeding 5 rai. <p>5. Qualifications of the victims who suffered from the disaster with the right to receive aid.</p> <ul style="list-style-type: none"> -Being a fisherman/aquafarmer registered at the Provincial Administration Office. -Being the victims who suffered from the disaster that Kor Chor Por Or, Kor Chor Por Kor Or and Kor Chor Por Jor certified and submitting the their claims to the provincial governors. -They must submit the claims within 15 days from the date of the suffering. -Having registered with Department of Fisheries. In case of a fishing boat, must have a boat operating license, fish operating license, evidence on damaged boat supported by the report to police station in the area for the damage. 	<p>1. Fishing boats</p> <p>1.1 Small boats with the maximum length of 10 m</p> <p style="text-align: center;">The same.</p> <p>1.2 Large boats with the minimum length of 10 m and up</p> <p style="text-align: center;">The same.</p> <p>2. Fishermen or crew</p> <p>Based on the help criteria of Ministry of Interior.</p> <p>3.Fishing gears, traps, bamboo traps and nets</p> <ul style="list-style-type: none"> -Paid at the actual cost with a limit of 10,000 baht in each case. <p>4. Aquafarmers</p> <p>4.1 Fish cages:</p> <ul style="list-style-type: none"> -Pay at the actual cost but not exceeding 20,000 baht in each case. <p>4.2 Shrimp ponds:</p> <ul style="list-style-type: none"> -Pay at the actual cost but not exceeding 20,000 baht in each case. <p>4.3 Shellfish farms:</p> <ul style="list-style-type: none"> -Pay at the actual cost but not exceeding 20,000 baht in each case. <p>4.4 Hatchery operators:</p> <ul style="list-style-type: none"> -Pay at the actual cost, but not exceeding 20,000 baht in each case. <p>5. Qualifications of the victims suffered from the disaster who are eligible for emergency assistance:</p> <ul style="list-style-type: none"> -Having reported damage to the government agency in the 6 southern provinces within 30 days from the incident. -Being the victims, who have been certified by Kor Chor Por Or and Kor Chor Por Jor. -Having registered with Department of Fisheries for boat operating license, fishing license, aquaculture operating license, -requiring evidence for damaged boat supported by a report to the police station in that area.

7. Budgets for DOF Compensation Plan to rehabilitate the fishery and aquaculture activities (adjusted to the resolutions of the Tsunami Victims Committee in the six southern provinces No. 2/2548 dated 10 January 2005)

	Number	Count	Maximum Payment (Baht)
Fishing boats	4,648	units	535,326,000
-Small	3,426	units	260,376,000
-Large	1,222	units	274,950,000
Aquaculture areas	28,523	cases	570,450,000
-Floating net cage	27,828	cases	556,560,000
-Shrimp pond	42	cases	840,000
-Shrimp hatchery	573	cases	11,460,000
-Shellfish concession area	80	cases	1,590,000
Eco-tourism boats	554	units	78,013,000
-Small	313	units	23,788,000
-Large	241	units	54,225,000
Fishing gears	15,982	cases	159,820,000
-Bamboo trap	421	cases	4,210,000
-Seine nets	1,871	cases	18,710,000
-Traps	13,690	cases	136,900,000
Total			1,343,609,000

Source: Calculation from the database of the fishing victims from the DOF Fisheries Rescue Coordination Center on 7 January 2005

FAO Guideline “A Framework for Reclamation Action Plan for Affected Soils”

Agricultural affected lands need to be quickly rehabilitated to restore the production capacity of farmers and ensure food security in rural areas. A framework of intervention is proposed to ensure that the next cropping season can start in fairly good conditions for medium to low damaged areas and that for badly affected areas rehabilitation works or plans for reorientation of production are carried out soon.

Reclaiming field/soils affected by the tsunami will depend on the severity of the damage and the resilience of the system. FAO proposes to confront this crisis with an approach developed in three steps:

1. Classifying and zoning the damages and the resilience of the system.
2. Identifying the capacity of farmers and local communities in restoring progressively their production capability.
3. Designing and scheduling a consistent set of targeted interventions for the short and long term, for each zone, considering the above as well as the agro-climatic constraints (rainfall, agricultural calendar and usual practices)

Given the extreme dispersion of sites to be investigated and rehabilitated, it is critical that local expertise is engaged and strengthened to deal with the diagnosis and remediation.

Therefore FAO aims to help governments and regional authorities in increasing the local capacity through:

- a massive consistent training program of local staff;
- by making available cheap salinometers (at least 100 per country for a start); and
- assist farmers in reaching their pre-disaster agricultural production capacity or reorient them towards diversified production activities.

1. Assessing the needs

Damages differ by nature:

- Direct crop destruction by uprooting, salt poisoning, flood, etc...
- Erosion and scouring that modifies the topography, land levelling and the elimination of bunds (for paddy fields)
- Soil fertility losses when upper layer is washed away
- Deposition of salted sediment
- Salt infiltration
- Trash and debris accumulation.

or by intensity which depends on three main characteristics of the particular location:

- the energy of the flood,
- the type of soil coverage and vegetation, and
- the soil hydraulic properties including drainage capacity¹.

FAO proposes a simple classification for assessing the damages based on 3 main subsets:

- Field level
- Infrastructure
- Farming capacity

¹ The presence of high, and/or saline, ground water tables will negatively affect the hydraulic and drainage properties.

Methodology

Rationale: The level of support and the specific set of interventions required to return to normal situation in affected areas depend on damages intensity, capacity of main infrastructure to allow remediation, the farming capacity both human and material to reengage in agricultural activities and reclamation works when required.

It is proposed to quantify the damages through ranked indicators for each subset using the following tables.

FIELD DAMAGES
(see table 1)

characterises the gravity of damages at field level

INFRASTRUCTURE CAPACITY **indicates the constraints faced at system levels that may impede carried out civil works and field works (land levelling and watering) and returning to a normal situation (see Table 2).**

Physical damages preventing from recovering the field production capacity are related to irrigation and drainage infrastructures, but also to transportation infrastructure. Drainage networks can be destroyed, silted or plugged, while irrigation structures may have been damaged or destroyed. Irrigation networks may be silted up; no longer able to feed by gravity; or fields may be unserviceable due to a significant increase of their elevation as a result of sedimentation.

Table 1.

FIELD DAMAGES	Low	Medium	High	Suggested ranking
Trash and debris	1	2	3	<i>1 low or nil 2 medium scattered 3 massive impeding restart of field works</i>
Erosion	1	4	6	<i>1 small erosion here and there 2 medium erosion that needs some resurfacing light works 3 major erosion problems such as erased bunds, land levelling disturbances and/or soil top layer washed out that requires major intervention for restoring capacity/fertility</i>
Sedimentation	1	4	6	<i>1 several centimetres 4 more than 10 centimetres 6 more than 20 centimetres</i>
Flood duration	1	4	6	<i>1 limited to several hours, 4 flood lasted more than one day 6 flood lasted more than one week</i>
Infiltration(*)	1	2	3	<i>(**) 1 Clay soil 2 medium 3 high vertical hydraulic characteristic (well drained soil)</i>
Total	Between 5 and 24			<i>below 8 = Low damaged area between 8 and 16 =Medium damaged area above 16 = High damaged area</i>

(*) Infiltration rate of upper soil layer influences the quantity of salt that contaminates the soil profile. Of course this aspect also influences the ability for remediation, highly infiltrating soil such as the sandy soils in Maldives are likely to be quickly leached and cleaned with fresh water.

(**) The ranking given here is considering the damages resulting from a small duration flood which makes sandy soils more damaged than clay soils and more impacting the shallow fresh water aquifers.

For long duration floods, the damage intensity on soil is the reverse and so should be the ranking: clay soil will store much more salted water and fix much more salt than sandy soils which can be easily leached out by fresh water. [Reverse ranking for long duration floods: 1 sandy (high drainage); 2 medium (medium drainage); 3 clay-silt (low drainage)].

Table 2.

INFRASTRUCTURE CAPACITY	Low	Medium	High	Suggested ranking
Irrigation network	1	4	6	<i>1 supply from irrigation network is operational 2 supply is interrupted but can be restore with minor interventions 3 supply is stopped and needs major interventions</i>
Drainage network	1	4	6	<i>1 surface drainage capacity is operational 2 surface drainage is not functional but can be restore with minor interventions 3 surface drainage is stopped and needs major interventions</i>
Transport and access to fields	1	2	3	<i>Access to fields and irrigation and drainage infrastructures for farming equipment and machinery is: 1 operational 2 non operational and requires short term rehabilitation works to be re-established 3 non operational and requires major long term rehabilitation works to be re-established</i>

FARMING CAPACITY indicates the ability of farmers to re-engage in cultivation (see Table 3)

Farmers, extension workers, staff of agricultural services may have suffered a lot from the tsunami. Some are among the many that lost their lives, while many of survivors are in a state of chock and trauma. In the worse stricken areas it might take some time for farmers to go back to normal life and affected fields.

Furthermore draught animals, equipments and tools may be lost or damaged by the tsunami as well and need to be quickly replaced.

The program of reclamation should give full consideration to this aspect and favour as much as possible guidance to farmers with a set of practical actions on the fields, aiming at restoring the full capacity wherever it is possible. The time horizon for attaining full capacity will differ from one category to the other.

Table 3.

FARMING CAPACITY	Low	Medium	High	Suggested ranking
<i>Production means</i>				
Household labour capacity (as fraction of pre-disaster capacity)	1	2	3	1 Capacity unchanged or slightly decreased (greater than 90 % of pre-disaster) 2 Capacity is significantly reduced to 75-90 % 3 Capacity is highly reduced to below 75%
Drought animals, equipment and tools for farming	1	2	3	1 Capacity unchanged or slightly decreased 2 Capacity is significantly reduced constraining the cropping calendar 3 Capacity is highly reduced impeding cultivation
Agricultural inputs availability	1	2	3	1 Availability is unchanged 2 Availability is decreased 3 Availability is significantly decreased or nil
Local/regional labour and equipment capacity for rehabilitation	1	2	3	1 Capacity is sufficient 2 Capacity is insufficient but rehabilitation works can be carried out with minor external inputs 3** Capacity is nil and requires strong external inputs to complete rehabilitation works.

2. Zoning the field damages

2.1 The zoning is made firstly with consideration on the Field Damages indicators.

Important: *there is no a priori methodology to give the right weighting factors of the criteria used in previous tables. The ranking of indicators and the weighting should be revised after preliminary tests on the ground.*

This note provides a preliminary guesstimate about the ranking and the weights each aspect should be given. Officers in the field should revise them and report to AGLW for further refinement and possibly homogenisation, if needed.

Class A “Low damaged area = below 8 ”. In this category there is no major obstacle to a rapid reclamation and salt leaching either through rainfall or through some special allocation of surface water. The restoration of capacity in this category should be monitored carefully but obtained without major intervention before the beginning of the next cropping season in April and May 2005.

Class B “Medium damaged area = between 8 and 16”. This category requires specific and significant interventions to reclaim soil, to restore land surface properties (land levelling, trash, sediment). Salt leaching would require high quantities of water either through rainfall or through some special allocation of surface water. Farmers can do most if not all the rehabilitation works themselves possibly on a “work for food program” provided that the farming capacity has not been too much reduced.

Class C “Highly damaged area = above 16”. For this category there are major obstacles to a rapid reclamation and probably the next cropping season is out of reach. In some cases, the return to cultivation might even be discussed and alternative production activities from natural resources use and management (eco-systems) may be sought for these coastal lands, while compensating current landowners and helping them reorienting/diversifying their activities on other land or other productive activities.

3. Remediation work plans

3.1. Water leaching

Leaching of salt in the upper soil profile is obtained from excess water on surface that provoke percolation below the top soil layers, flushing out of the profile salt water. This excess water results from a positive balance of [Rainfall+ irrigation- Evaporation].

In monsoon areas the rainfall is regularly greater than evaporation and the excess is thus positive. But this is not true everywhere and all the time.

The net water balance [Rainfall+ irrigation- Evaporation] should be roughly assessed for affected areas in order to estimate the leaching occurred.

A significant positive net water balance decreases the FIELD damages and for instance can pull field from Class B to Class A (but not from C to B).

3.2. Determining a set of actions

3.2.1. Class A fields

It is expected that for this situation recovery is likely to be obtained without major intervention. More likely net water balance between January and April, will be enough to flush out the salt and cultivation with normal crops can resume for the next cropping season in March and April. The existing farming system and production are able to recover quickly and no specific precaution for crops are required.

It will still be required to monitor upper soil salinity, to ensure that good conditions are met for the next cropping season and convince farmers to return to normal cultivation.

3.2. Class B fields.

For this type of situation recovery will take some more time and more specific interventions, at least one full cropping season and/or a full monsoon season will be required to recover. We cannot expect to restore full capacity before the start of the next cropping season, but farmers should be able, and encouraged, to crop at least partly their lands.

In this situation we may have to consider:

- Salt tolerant varieties of usual crops to allow cropping in not fully cleaned soils
- Delayed start of the season with varieties having shorter period of growth
- Temporary changes in the production system to compensate for the expected losses of food production and incomes in the coming seasons.

For the coming campaign and possibly the following one, farmers should receive support for seeds, inputs and advice. Their food security should also be assured by compensating them for expected reduced yields, and by providing them easier access to credit.

3.3. Class C fields

To reclaim these fields major works of rehabilitation/reclamation are required either within the field or in the near-by infrastructures.

For some of these fields, mostly very close to the sea shore, alternatives land use and production services might be sought within the context of a comprehensive agro-eco-systems rehabilitation. Abandoning land cultivation can then be a viable option if affected farmers and landowners are well compensated with alternatives productions means.

For the major part of these fields return to cultivation cannot be reached immediately and solutions must be found to allow farmers to temporary cultivate in other un/less affected lands; and to diversify land and natural resources management in order to provide them with alternative means of production and food security.

In the coming weeks specific prototypes for cropping pattern plans and production diversification will be suggested for the last two categories by FAO-AG department.

It is likely that this C class will be further subdivided into two classes:

- C1 Agriculture vocation is maintained
- C2 Ecosystem services are preferable.

Table 4. Summary of rehabilitation plans

	Situation	CROPS/farming	Agronomic support required
Class A “Low damaged area”.	Return to normal expected for the next season starting in APRIL 2005	Usual crops	Monitoring salinity Seeds and inputs supply, equipment supply if needed
Class B “Medium damaged area”.	Delayed return to normal to allow enough time for specific interventions	Cultivation of salt tolerant rice varieties recommended.	Support for seeds and inputs Compensation for reduced yields Support for diversification.
Class C “Highly damaged area”.	No return to normal this year. Major rehabilitation works needed Possible reorientation of land uses	Major temporary or permanent diversification of farming system	Compensation for land abandon [C2] Support to diversification