

Rebuilding Coastal Fisheries Livelihoods after the Tsunami: Key Lessons from Past Experience

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Abstract

Fishing communities around the Indian Ocean were severely affected by the December 2004 tsunamis. Programs for rebuilding coastal fisheries livelihoods need to address the pre-tsunami situation that was characterized by overfishing and degraded natural resources. Adopting appropriate strategies to ensure sustainable livelihoods will require community involvement, as well as cross-sectoral, integrated planning and management at ascending government levels. Key recommendations from the WorldFish Center study Sustainable Management of Coastal Fish Stocks in Asia are presented to encourage discussion and debate.

Introduction

The scale of the 2004 tsunami and its impact on people, landscapes and livelihoods led to an unprecedented response from the global community to provide immediate emergency relief. Over 300 000 lives were lost and two million people made homeless (World Bank 2005). As the focus now moves to rehabilitation and reconstruction of the livelihoods of the affected communities, there is an urgent need to think about how we ensure that the medium and long-term rehabilitation programs provide these communities with a better and more sustainable future.

In Asia, the tsunami had the greatest impact on rural coastal communities, many of which were already in trouble. Most of the affected rural coastal communities were poor and dependent on natural resources for their livelihoods. In Sri Lanka, 27% of the rural population is below the national poverty line, while in Aceh an estimated 1.2 million people live in poverty (Table 1). The Asian Development Bank (2005) estimates that the tsunami may have pushed an additional two million people into poverty.

As Table 1 shows, these coastal communities were highly dependent on coastal fisheries for livelihoods and food security.

All the affected areas in Asia had substantial small and large-scale fishing fleets with significant landings. Capture fisheries produced 149 715 t in Aceh, 214 750 t in Sri Lanka and over 1.2 million tonnes in the affected Indian states annually. The affected areas also had large fishing communities. It is estimated that 16% of the coastal population in Aceh was directly employed in the fishery sector (MMAF 2005) and in the affected Indian states there were over 500 000 fishers. In addition to providing the livelihood for coastal communities, fisheries also contributed to food security in these countries, with fish accounting for over 40% of the animal protein consumed in Indonesia, Sri Lanka and Thailand.

These fishing communities were heavily damaged by the tsunami (Table 1). In Aceh, 15–20% of fishers died, with up to 64% of fishers lost in the northern part of the province. In Sri Lanka, an estimated 7 500 fishers died. In India, Malaysia and Myanmar the most affected communities were those dependent on fisheries. In Sri Lanka, nearly 77 000 members of fisher families were displaced and are living in temporary accommodation, with relatives or friends (FAO 2005). Aside from losing fishers, family members and housing, the fishing communities also lost their livelihood assets. A substantial proportion of the fishing fleets were damaged or

destroyed—in Aceh 65–70% of the small-scale fleet and in Sri Lanka over 54% of the entire fleet. The supporting infrastructure (ports, markets, ice-making plants) was also destroyed. The total damage to the capture fisheries sectors in the affected Asian countries is estimated at over US\$189.25 million.

There is a clear need to assist these affected communities to rebuild their assets and restart their livelihoods. It must be noted, however, that the natural resources that supported fisheries livelihoods were already severely depleted prior to the tsunami due to unsustainable practices and environmental degradation. Coastal fisheries resources throughout the region have been subject to severe over fishing and been depleted down to 10–30% of levels prior to the expansion of fishing in the 1970s (Silvestre et al. 2003). Environmental degradation is also likely to have reduced the productivity of coastal waters through pollution and degradation and destruction of the habitat. Even prior to the tsunami, the livelihoods of these fishing communities were threatened by the poor state of the resources.

It is critical that past mistakes are not repeated in the rush to rebuild communities and livelihoods. This is the time to adopt appropriate strategies

to ensure sustainable livelihoods for coastal communities. The rehabilitation efforts should be highly participatory with community-led, local processes central to all aspects, from impact and needs assessment to planning and implementation of interventions. The complexity of issues involved and the need to ensure long-term poverty reduction, increased resilience and sustainability of livelihoods require cross-sectoral, integrated planning and management.

Before the tsunami, all the affected countries were engaged in initiatives aimed at improving the management of fisheries and sustainability of livelihoods. At the WorldFish Center, we believe that the rehabilitation and reconstruction activities should build on lessons from these previous initiatives within the affected countries. The aim of this article is to summarize the key lessons from the recent regional initiatives under a collaborative project entitled Sustainable Management of Coastal Fish Stocks in Asia. These lessons should be integrated into the rehabilitation plans in order to build on previous experience and avoid past mistakes.

Key Lessons from the Sustainable Management of Coastal Fish Stocks in Asia Project

Through the Sustainable Management of Coastal Fish Stocks in Asia project,¹ WorldFish collaborated with eight Asian countries, including India, Indonesia, Malaysia, Thailand and Sri Lanka, to assess coastal fisheries and develop draft national strategies with specific interventions for each country. In the light of the recent tragedy, the need to implement these interventions has become pressing. This paper summarizes the key issues in an effort to stimulate and encourage debate regarding the rehabilitation process.

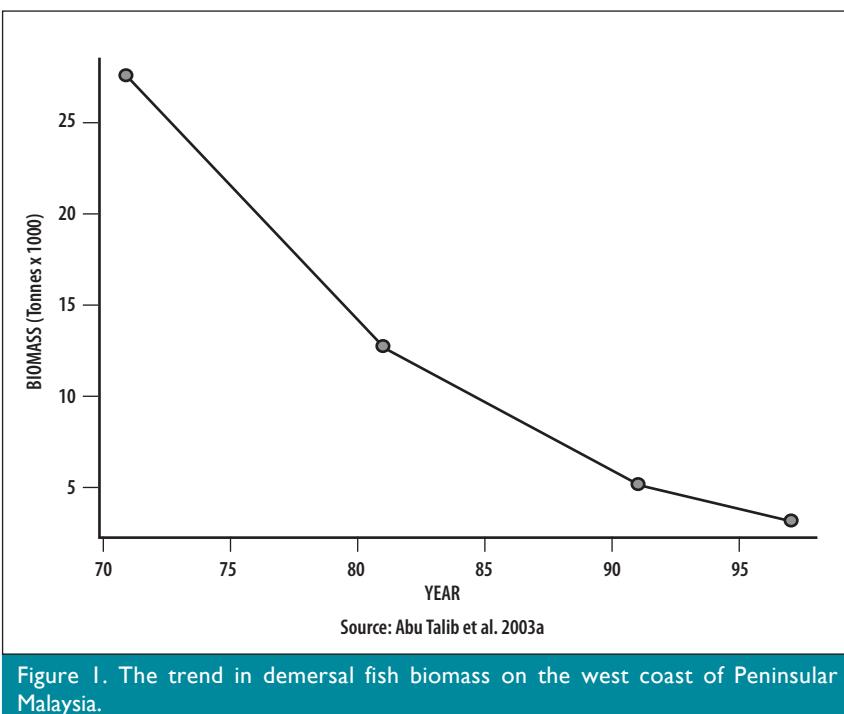
Key recommendations

Restructure fisheries to reduce fishing capacity to sustainable levels

Prior to the tsunami, too many boats taking too many fish in coastal fisheries had severely depleted resources—in some areas fish stocks have declined to less than 10% of their original levels (Table 2; Silvestre et al. 2003). Admittedly, data on fish stocks for the areas most affected by the tsunami are lacking (and badly needed) but trends in neighboring areas tell a sad story that almost certainly applies. Figure 1 shows the trends in overall biomass of demersal² fish in the Straits of Malacca off the west coast of Peninsular Malaysia at depths to 50 m. By 1997, fish biomass had declined to 11% of the level at the beginning of the 1970s. A similar trend is seen in the deeper waters of the Straits, in Indonesian fisheries in the Java Sea and in the Gulf of Thailand. There is every reason to believe that similar declines have occurred in the tsunami-affected areas. Bio-economic modeling of

fisheries across the region has also shown that biological and economic overfishing of coastal resources has occurred in all countries (Table 3). This provides a biological as well as an economic incentive for improved management of their fisheries. In the Gulf of Thailand, the demersal fisheries are losing a potential resource rent of US\$100 million annually (Ahmed et al. 2004).

These levels of decline and over fishing demonstrate that the coastal fisheries were in trouble even prior to the tsunami. Inappropriate and destructive fishing methods have also worsened the situation (Silvestre et al. 2003). Gear with small mesh nets that take juvenile fish have contributed to recruitment overfishing. Fishing methods such as dynamite fishing and push nets have damaged the habitat that fish depend on. Across the region, there is an urgent need to reduce fishing capacity to rebuild coastal fisheries resources, to improve their productivity and ability to provide sustainable livelihoods.



¹ Asian Development Bank Regional Technical Assistance 5766.

² Fish that are associated with the seabed, or pelagic fish that inhabit mid-water.

Table I. Fishery statistics and the impact on fisheries in the Asian countries affected by the 26th December tsunami.

Country and location	Marine fisheries production (t)	Value of marine fisheries production (USD)	Per cent of national GDP	Percentage of animal protein contributed by fish	Poverty level (%)	No. of fishers prior to tsunami	Tsunami Impact		
							Fishers who died	Affected fishing households	Fisheries related infrastructure damaged or destroyed
Indonesia: Aceh and North Sumatra	149 715 ¹	175M ¹	3 (in Aceh Province) ¹	53.1 ²	30 (2003) ³	58,000 fulltime and 35,943 part-time ¹	15-20% (64% in North Aceh Province (Kota Banda Aceh and Aceh Besar) ⁴		55% of harbours ⁴
India: States of Tamil Nadu Pondicherry, Andhra Pradesh and Kerala and Andaman and Nicobar archipelago	1 232 400 (India: 2.58 million) ⁶		1.21 ⁶		34.7 (India) ⁷	506 829 ⁶	220 784 families directly linked to fisheries sector were impacted, ⁶ in Tamil Nadu District 85% of people affected believed to be from fishing communities ⁸		80 landing centers ⁸
Malaysia (Kedah, Perlis and Penang states)	1 276 000 ⁹ (Malaysia)	1.18B ⁹	1.5 ⁹	34.5 ²	<2.0 ⁷	26 996 ¹⁰	14 ¹⁰	7 721 fishers affected ¹⁰	100 private and public jetties and landing sites ¹⁰
Maldives	103 000 ¹¹	356M ¹¹	9.3 ¹¹		43 ¹²	14 955 ¹³			
Myanmar	880 594 ¹⁴							95% of affected people were dependent on fisheries ⁴	
Sri Lanka	214 750 ¹⁶	198M ¹⁶	2.4 ⁴	54.3 ²	25 (rural areas 2002) ¹⁷	84 000 ¹⁸	7 573 ⁴	71 000 household members ⁴	10 out of 12 fisheries harbours and 25 anchorages, 28 cold storages and 18 ice plants damaged ⁴
Thailand - Andaman coast	709 192 ²⁰	312.6M ²⁰	1.9 ²¹	41.5 ²	< 2% ⁷	19 968 ²⁰		2 923 households ⁴	8 harbours severely damaged ⁴

¹ Ministry of Marine Affairs and Fisheries, Indonesia. 2005. Strategy and program for rehabilitation and reconstruction of the fishery sector in Aceh and Nias post earthquake and tsunami wave disaster

² Laureti (1999)

³ BAPPENAS and the Consultative Group on Indonesia, January 19-20, 2005, Indonesia: Preliminary damage and loss assessment, the December 26, 2004 natural disaster, 128 p. (<http://www.adb.org/Documents/Reports/Tsunami/damage-assessment.pdf>)

⁴ FAO Situation Reports - Regional - 25 April 2005, 25 p. (ftp://ftp.fao.org/FI/DOCUMENT/tsunamis_05/FAO_Agency_Reports/FAOAgencyReport25April.pdf)

⁵ Update on the World Bank response to the tsunami disaster, 22 April 2005, 18 p. (<http://siteresources.worldbank.org/INTTSUNAMI/Resources/sunamireport-042205.pdf>)

⁶ India Post Tsunami Recovery, Preliminary Damage and Needs, prepared by ADB, UN and World Bank, New Delhi India, 8 Mar 2005, 107 p. (<http://siteresources.worldbank.org/INDIAEXTN/Resources/295583110791780048/India-tsunami-na-mar14 2005-all.pdf>)

⁷ Percentage of population on < USD 1 per day (www.developmentgoals.org)

⁸ CONSRN Situation Report - India - Tsunami - 16 March 2005, 14 p. (ftp://ftp.fao.org/FI/DOCUMENT/tsunamis_05/india/impact/05-03-16-India.pdf)

⁹ Abu Talib et al. (2003b)

¹⁰ CONSRN Situation Report - Malaysia - 10 March 2005, 7 p. (ftp://ftp.fao.org/FI DOCUMENT/tsunamis_05/malaysia/impact/05-03-10-Malaysia.pdf)

¹¹ FAO Fishery Country Profile - Maldives (www.fao.org/countryprofiles)

¹² ADB An initial assessment of the impact of the earthquake and tsunami of December 26, 2004 on South and Southeast Asia, January 2005, 12 p. (<http://www.adb.org/Documents/Others/Tsunami/impact-earthquake-tsunami.pdf>)

¹³ Republic of Maldives, Tsunami: Impact and Recovery. Joint needs assessment World Bank – ADB – UN System. 8 February 2005, 23 p. (<http://www.adb.org/Documents/Reports/Tsunami/joint-needs-assessment.pdf>)

¹⁴ FAO Fishery Country Profile - Myanmar (www.fao.org/countryprofiles)

¹⁵ CONSRN Situation Report - Myanmar - Tsunami - 9 March 2005, 9p. (ftp://ftp.fao.org/FI/DOCUMENT/tsunamis_05/myanmar/impact/05-03-09-Myanmar-country-report.pdf)

Tsunami Impact		
Vessels damaged or destroyed	Total damage to fisheries (USD)	Total rehabilitation cost (USD)
9 500 small-scale vessels ⁴	52M ⁴	6B ⁵
88 035 vessels ⁸ (5 000 mechanized boats, 7 933 fiber-reinforced plastic boats, 24 580 boats of other categories mostly motorized, 35 483 wooden catamarans) ⁶	567.8M ⁶	1.2B ⁵
3 626 (2 951 small vessels) ¹⁰	9.2M ¹⁰	
170 ⁴	25M ⁴	0.41B ⁵
230 ⁴	250K ¹⁵	> 400K ⁴
54% of total fishing fleet of 31 663 boats, 40% of small-scale vessels ⁴	96.8M ¹⁹	1.5-1.6B ⁵
5 397 boats, 75% of which are small-scale ⁴	16M ⁴	

¹⁶ Samarayanke (2003)¹⁷ Department of Census and Statistics, Sri Lanka. 2003. Poverty statistics/indicators for Sri Lanka¹⁸ World Resources Institute. 2004. Earthtrends database, www.earthtrends.wri.org¹⁹ World Bank - ADB - Japan Bank for International Cooperation - Sri Lanka. Preliminary damage and needs assessment, 2 February 2005.

(http://siteresources.worldbank.org/INTSRILANKA/Resources/233024-1107313542200/slinafull.1.pdf)

²⁰ FAO Fishery Country Profile – Thailand, www.fao.org/countryprofiles²¹ CONSRN Situation Report – Thailand. 13th January 2005. (Consortium to Restore Shattered Livelihoods and Communities in Tsunami-Hit Nations consisting of NACA/FAO/BOBIGO/SEAFDEC/WorldFish Center), CONSRN, 22p. (ftp://ftp.fao.org/FI/DOCUMENT/tsunamis_05/thailand/impact/05-01-13_14.00 Thailand.pdf)

Table 2. Declines in demersal biomass from trawl surveys in South and Southeast Asia.

Country/area	Year	Stock density (t km ⁻²)	Relative density (%)	Source
BRUNEI DARUSSALAM (waters within 0-50 m)	1979-80 1989-90	12.8 11.7	100.0 91.0	Beales et al. 1982 Silvestre et al. 1991
BANGLADESH				
Bay of Bengal	1973 1985-86	12.3 5.47	100.0 44.0	Khan et al. 2003
INDIA				
Goa	1973-74	161*	100.0	Joseph 1980
	1979-80	95*	59.0	
Mangalore	1973-74	141*	100.0	Joseph 1980
	1979-80	94*	66.7	
Cochin	1972-73	217*	100.0	Joseph 1980
	1979-80	126*	58.1	
Madras	1972-73	127*	100.0	Joseph 1980
	1979-80	82*	64.6	
INDONESIA				
Java Sea	1977	3.72	100.0	Dwiponggo and Badrudin 1978
	1998	2.20	59.1	Aziz et al. 1998
PHILIPPINES				
San Miguel Bay	1947	10.60	100.0	Warfel and Manacop 1950
	1980-81	2.13	20.1	Vakily 1982
	1992-93	1.96	18.5	Cinco et al. 1995
Lingayen Gulf	1949 1979 1987-88	92.1* 63.7* 31.8*	100.0 69.2 34.5	Ochavillo et al. 1989
Manila Bay	1949-52	4.61	100.0	Warfel and Manacop 1950
	1992-93	0.47	10.2	MADECOR (Mandala Agricultural Development Corporation) and National Museum 1995
MALAYSIA				
West coast	1971/72	2.44	100.0	Abu Talib et al. 2003a
	1987	1.59	65.2	
	1997	0.36	15.6	
East coast	1972	5.09	100.0	Abu Talib et al. 2003a
	1986	1.93	37.9	
	1998	0.20	3.9	
Sarawak	1972	3.90	100.0	Abu Talib et al. 2003a
	1986	1.17	30.0	
	1998	1.11	28.5	
Sabah	1972	12.52	100.0	Abu Talib et al. 2003a
	1986	1.52	12.1	
	1998	0.87	6.9	
THAILAND				
Gulf of Thailand	1961	6.70	100.0	Kongprom et al. 2003
	1991	0.55	14.2	

Source: Silvestre et al. 2003.

While the post-tsunami reconstruction efforts must enable communities to resume fishing and continue traditional livelihoods, long-term vision must guide the short-term rehabilitation. Allowing the levels of fishing to exceed those prior to the tsunami would have grave consequences for fish stocks and therefore the fishing communities. Immediate relief efforts to assist fishers to replace gear and rebuild boats should ensure that the numbers and capacity of boats do not exceed levels prior to the tsunami. In addition, less destructive and more sustainable fishing gears and practices should be adopted.

In the longer-term, ensuring the sustainability of fisheries requires effective control of, and reduction in, fishing capacity. The rehabilitation and reconstruction efforts after the tsunami provide an opportunity for strategic assistance by governments and donors to support assessment of fisheries and implementation of effective management practices. The aim would be to restore the resource base of the over fished fisheries to a level that can support increased production. Sustainable management of fisheries should be a core principle of the rehabilitation and reconstruction strategies, as seen in the Indonesian Strategy and Program for Rehabilitation and Reconstruction of the Fishery Sector in Aceh and Nias (MAAF 2005). Donors should coordinate their efforts with the national governments, particularly in terms of numbers of fishing boats supplied, to ensure that fishing capacity is limited to an appropriate level.

Provide alternative livelihood opportunities

The strong dependence on fisheries and limited livelihood alternatives increases the vulnerability of coastal communities to natural disasters, such as the December 26 tsunami. Rehabilitation and reconstruction should focus on strategic investments in the rural coastal communities to develop diversified and sustainable livelihood strategies. Many

Table 3. A summary of the evidence for biological and economic over fishing.

Country	Biological overfishing? (Y/N)	Biologically overfished? (Y/N)	Economic overfishing? (Y/N)	Economically overfished? (Y/N)
Bangladesh				
Shrimp	Y	N	-	-
Fish	Y	Y	-	-
Total	Y	Indeterminate	Y	Y
India	Indeterminate	Y	-	-
Indonesia	Y	N	Indeterminate	Y
Malaysia	Y	N	Y	N
Vietnam	Y	Indeterminate	Y	N

Source: Ahmed et al. (in prep.).

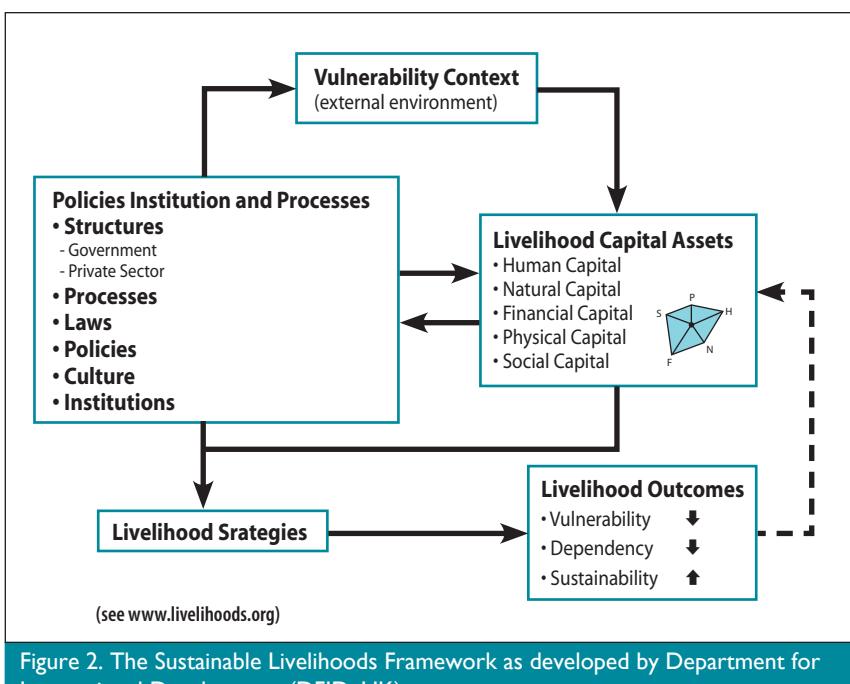


Figure 2. The Sustainable Livelihoods Framework as developed by Department for International Development (DFID, UK).

agencies involved in the rehabilitation have adopted the Livelihood Framework Approach (Figure 2), which involves assessing and strengthening the livelihood assets of communities. Through a holistic livelihood approach, it may be possible to assist communities to develop more diverse livelihood strategies and reduce their dependence on fishing. Creating alternative livelihood opportunities will help to reduce the fishing capacity in coastal fisheries and increase the resilience of these communities in the face of natural disasters in the future.

Rehabilitate critical coastal habitats

Prior to the tsunami, coastal habitats across the region were already degraded and less productive as a result of human activities. One of the clearest examples is the destruction and clearing of coastal mangrove systems. All the countries affected by the tsunami have lost significant proportions of their mangroves (Silvestre et al. 2003). In Sri Lanka, 50% of the mangroves were cleared by logging and development of the coastal areas (Samarayanke 2003). This habitat loss

has a direct impact on the fish species that used them as nursery and feeding areas. The coastal areas have also been subject to increasing development and pollution caused by coastal communities and intensification of agriculture (Silvestre et al. 2003). These factors have reduced the productivity of coastal ecosystems and degraded the natural resource base on which coastal communities depend for their livelihoods. There should be direct interventions to restore critical coastal habitats and address factors causing the degradation. Establishment of aquatic protected areas will also assist in maintaining critical habitats and coastal ecosystems. The restoration of community livelihoods should include plans to rebuild and protect the natural resource capital.

Implement Integrated Coastal Fisheries Management

The establishment of Integrated Coastal Fisheries Management (ICFM), centered on the development of management plans that incorporate social, economic and biological objectives, is a key to sustainable resource use in the long-term. The coastal sector has increasingly become the scene of competition between different user groups (fishers, developers, tourists, etc.). ICFM can explicitly address the impacts and interactions of the different users. The ICFM initiatives should be developed within a co-management framework, with strong involvement of the local communities and other stakeholders. ICFM would enable communities, stakeholders and governments to look explicitly at the distribution of benefits from the coastal resources, thereby maximizing the contribution of fisheries to poverty reduction. The rehabilitation strategies should work towards establishing a framework for ICFM within the affected communities to ensure long-term improvements in management of the fisheries.

Reduce post-harvest losses

As the production of coastal fisheries

is limited by the natural resources, interventions should focus on increasing the value of the available production. Post-harvest losses are an issue in all these countries. In Sri Lanka, over 20% of fish catches are spoilt by poor post-harvest handling (Samarayanke 2003), thereby reducing the availability of food and lowering fishers' incomes. The tsunami has damaged and destroyed infrastructure and processing facilities (Table 1), placing an even greater burden on poor fishers. In rebuilding these facilities and creating new ones, there is an opportunity to focus on ways to minimize post-harvest losses and add value to catches. These investments also have the potential to provide alternative livelihoods, particularly for women who are traditionally involved in the processing and marketing of fish.

Improve governance of fisheries

The inadequacies in fisheries management and policy, lack of institutional capacity and infrastructure, and the low level of stakeholder involvement have resulted in unsustainable fisheries. This problem will become even more acute after the tsunami with the loss of local leaders and disruption of existing institutional structures. The rehabilitation programs can develop institutions that are responsible for managing the sustainability of the fisheries. This will require targeted interventions to assist local communities to participate in the management of coastal fisheries and to enable governments to facilitate the development of effective institutions to manage the fisheries. These long-term goals require strategic investments in capacity building.

In the wake of the tsunami tragedy, the affected countries are starting to articulate the need for a long-term vision and coherent strategy to ensure sustainable livelihoods for the affected communities (e.g., MMAF 2005). In the case of fisheries, the lessons from the pre-tsunami situation should be integrated into these strategies to reduce the vulnerability of the coastal communities. The long-term aim should be to establish

resilient communities with sustainable and diversified livelihoods.

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This is available at <http://www.worldfishcenter.org/trawl/publications/assessment/assessment.asp>

References

- Abu Talib,A., M.M. Isa, M.S. Ismail and S.Yusof. 2003a. Status of demersal fishery resources in Malaysia, p. 83-137. In G. Silvestre, L.R. Garces, I.C. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C.Z. Luna, L. Lachica-Alino, P. Munro, V. Christensen and D. Pauly (eds.). Assessment, management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 110 p.
- Abu Talib,A., G.H.Tan, and A.H.Yasin, 2003b. Overview of the national fisheries situation with emphasis on the demersal fisheries off the west coast of peninsular Malaysia, p. 833-914. In G. Silvestre, L.R. Garces, I.C. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C.Z. Luna, L. Lachica-Alino, P. Munro, V. Christensen and D. Pauly (eds.). Assessment, management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 110 p.
- ADB (Asian Development Bank). 2005. An initial assessment of the impact of the earthquake and tsunami of December 26, 2004 on South and Southeast Asia, January 2005.

- Ahmed, M., P. Boonchuwongse, W. Dechboon and D. Squires. 2004. Overfishing in the Gulf of Thailand: policy challenges and bioeconomic analysis. Working Paper, WorldFish Center, Penang, Malaysia.
- Ahmed, M., A. Abu Talib, C.P. Ean, L.C. Fong, M. Muhammad-Isa, K. Salim, M.S. Haque, S.M. Khan, K.N. Kurup, M. Srinath, V.N. Pillai, E. Vivekanandan, N. Long, B.E. Priyono, D. Squires, R.A. Valmonte-Santos, B.H. Yeo and I.C. Stobutzki. Sustainable management of coastal fisheries in tropical Asia: a bioeconomic analysis. *Fisheries Research* (In press).
- Aziz, K.A., M. Buer, J. Widodo, N. Naamin, M.H. Amarullah, B. Hasjim, A. Djamali and B.E. Priyono. 1998. Potency and the exploitation rate of marine fishery resources in Indonesian waters. National Committee for Marine Fisheries Resources Assessment, Jakarta.
- Beales, R., D. Currie and R. Lindley. 1982. Investigations into fisheries resources in Brunei. Brunei Museum. Brunei Museum Monograph (5), Brunei Darussalam.
- Cinco, E., J. Diaz, R. Gatchalian and G. Silvestre. 1995. Results of the San Miguel Bay trawl survey. In G. Silvestre, C. Luna and J. Padilla (eds.) Multidisciplinary assessment of the fisheries in San Miguel Bay (1992-1993). ICLARM Technical Report 47 (CD-ROM).
- Dwiponggo, A. and M. Badrudin. 1978. Demersal resources survey in coastal areas of the Java Sea, 1977. Contribution of the demersal fisheries Project No.5. Marine Fisheries Research Institute, Indonesia.
- FAO. 2005. FAO Situation Reports - Regional - 25 April 2005, 25 p. (ftp://ftp.fao.org/FI/DOCUMENT/tsunamis_05/FAO_Agency_Reports/FAOAgencyReport25April.pdf)
- Joseph, K.M. 1980. Comparative study of the demersal fishery resources of the Indian waters as assessed by the 17.5 m trawlers. Bulletin of the Exploratory Fisheries Project No. 10, Bombay, India.
- Khan M.A.A., N.U. Sada, and Z.A. Chowdhury. 2003. Status of the demersal fishery resources of Bangladesh, p. 63-82. In G.T. Silvestre, L.R. Garces, I.C. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C.Z. Luna, L. Lachica-Alino, P. Munro, V. Christensen and D. Pauly (eds.) Assessment management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 110 p.
- Krongprom, A., P. Khemakorn, M. Eiamsaard and M. Supongpan. 2003. Status of demersal fishery resources in the Gulf of Thailand, p. 137-152. In G.T. Silvestre, L.R. Garces, I.C. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C.Z. Luna, L. Lachica-Alino, P. Munro, V. Christensen and D. Pauly (eds.) Assessment management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 110 p.
- Laureti, E. (Compiler). 1999. Fish and fishery products: world apparent consumption statistics based on food balance sheets 1961-1997. FAO Fisheries Circular No. 821 Revision 5. FAO, Rome.
- MADECOR (Mandala Agricultural Development Corporation) and National Museum. 1995. Fisheries sector program, resource and ecological assessment of the Manila Bay. Final Report.
- MMAF (Ministry of Marine Affairs and Fisheries). 2005. Strategy and program for rehabilitation and reconstruction of the fishery sector in Aceh and Nias post earthquake and tsunami wave disaster. Ministry of Marine Affairs and Fisheries, Government of Indonesia.
- Ochavillo, D., H. Hernandez, S. Resma and G. Silvestre. 1989. Preliminary results of a study of the commercial trawl fisheries of Lingayen Gulf, p. 31-42. In G. Silvestre, E. Miclat and T.E. Chua (eds.) Towards sustainable development of the coastal resources of Lingayen Gulf, Philippines. ICLARM Conference Proceedings 17.
- Samarayanke, R.A.D.B. 2003. Review of national fisheries situation in Sri Lanka, p. 987-1012. In G.T. Silvestre, L.R. Garces, I.C. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C.Z. Luna, L. Lachica-Alino, P. Munro, V. Christensen and D. Pauly (eds.) Assessment management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 110 p.
- Silvestre, G.T., N.B. Armada and E.A. Cinco. 1991. Assessment of the capture fisheries of Lingayen Gulf, Philippines, p. 25-36. In L.M. Chou, T.E. Chua, H.W. Khoo, P.E. Lim, J.N. Paw, G.T. Silvestre, M.J. Valencia, A.T. White and P.K. Wong (eds.) Towards an integrated management of tropical coastal resources. Proceedings of the ASEAN/US Technical Workshop on Integrated Tropical Coastal Zone Management 28-31 October 1988, Temasek Hall, National University of Singapore, Singapore. ICLARM Conference Proceedings 22, 455 p.
- Silvestre G.T., L.R. Garces, I.C. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C.Z. Luna, L. Lachica-Alino, P. Munro, V. Christensen and D. Pauly (eds.) 2003. Assessment management and future directions for coastal fisheries in Asian countries. WorldFish Center Conference Proceedings 67, 1 110 p.
- Stobutzki I.C., G.T. Silvestre, A. Abu Talib, A. Krongprom, M. Supongpan, P. Khemakorn, N. Armada and L.R. Garces. Decline of demersal coastal fisheries resources in three developing Asian countries. *Fisheries Research*. (In press)
- Vakily, J. 1982. Catch and effort in the trawl fishery, p. 65-94. In D. Pauly and A. Mines (eds.) Small-scale fisheries of San Miguel Bay, Philippines: biology and stock assessment. ICLARM Technical Report 7. ICLARM, Manila, Philippines.
- Warfel, H. and P. Manacop. 1950. Otter trawl exploitations in Philippine waters. Research Report 25. US Fish and Wildlife Service, Department of the Interior, Washington D.C., USA.
- World Bank. 2005. Update on the World Bank response to the tsunami disaster, April 22, 2005.