

## **Socio-Economic Impact of Tsunami on Fisheries and Coastal Communities in Kerala**

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### **ABSTRACT**

The Indian Ocean tsunami of 26<sup>th</sup> December 2004 was a series of giant sea waves unleashed by the massive earthquake beneath the sea with its epicentre located about 250 km South East of Sumatra, Indonesia. The huge waves of tsunami lashed across thirteen countries of the world, one among the worst hit being India. Tsunami caused considerable destruction and casualties in the coastal regions of the states including Tamil Nadu, Pondichery, Kerala, Andhra Pradesh and Andaman & Nicobar Islands. In Kerala, 187 villages were affected, registering a death toll of 180 persons and huge damage to assets and livelihood. This study was conducted at different landing centres in the tsunami affected regions of Kerala. The impact of tsunami on the fisheries was catastrophic as in the case of other affected segments, impinging on the livelihood of already poverty stricken fisher households. Non-mechanized and motorized segments were the worst affected among different sectors of marine fisheries. Maximum reduction in landings was experienced by plank-built boats with gillnet (motorized) and country crafts with gillnets (non-mechanized). Prices of different species of fishes also slashed down by decline in demand due to tsunami related apprehensions and reduction in size of fish. The reduction in prices was at its maximum in the case of soles, crabs and tunas. The number of fishing trips in a month came down to less than half of that of the pre-tsunami situation and the most affected segment was motorized boats. Reduction in average income of boat owners and fishing labourers was highest in the case of non-mechanized sector (67 %). In the motorized category, the reduction in income was to the extent of 40 per cent. The rehabilitation related issues had to be given concerted effort in the light of various localized problems. Recouping the livelihood of the fisherfolk also remained a primary concern for the government as well as relief agencies in view of the damage to fishing related assets. The short term and immediate impact of tsunami are highlighted in this paper on the basis of the situation prevalent prior to and after the tsunami in the affected villages.

Keywords : Tsunami, coastal communities, boats, income

### **INTRODUCTION**

Tsunami of 2004 and its associated destruction constituted one of the worst affected tragedies in India. Although the entire world is shocked by the heavy damage caused by the calamity to several Indian Ocean brim countries, the micro level socio economic impact of this disaster is highly localized and felt more starkly

at the level of numerous affected communities. Tsunami caused substantial destruction and casualties in the coastal regions of the states including Tamil Nadu, Kerala, Andhra Pradesh, Pondichery and Andaman Nicobar Islands in India. In Kerala, 187 villages were affected by the roaring waves. The disaster devastated



communities with its high toll on human lives (171 persons), injuries, family networks, homes and livelihoods. Like all the other Tsunami affected states, women and children constituted majority of the victims in Kerala. Fisherfolk were the most affected segment, which endured damage due to loss on housing and livelihoods. An assessment of the damage to assets and losses in fisheries sector showed a total loss of about Rs 117.8 crore (Joint Assessment Mission Report, 2005<sup>1</sup>). The estimated value of loss of equipments in mechanized sector was Rs 64 crore, whereas it was Rs 16 crore in motorized and Rs 20 crore in non-mechanized sector. Further infrastructure losses include damage to 8 fishing harbours and 15 fish landing centres. Over 1924 ha of mangrove were affected (India Country Report<sup>2</sup>, 2005). The disaster may not have any serious macro impact on Kerala's GSDP growth. However, the loss of life, damage to physical infrastructure and economic foundations in the coastal districts has localized impact on the coastal economy. The short term and immediate impact of tsunami on marine fisheries, housing sector and overall livelihood of fisherfolk is discussed below.

## **MATERIALS AND METHODS**

The study was conducted in the tsunami affected regions of Kerala namely, Alappad in Kollam district, Arattupuzha and Andhakaranazhi in Alappuzha district and Edavanakkadu in Ernakulam district. The study was conducted during the period of January–February 2005, without much delay after the tsunami hit the Indian coast and after the immediate rehabilitation measures were over. Primary and secondary data were used for the purpose of this study. Primary data were collected from the stakeholders by using a

schedule prepared for this purpose. Secondary data were gathered from published Government reports, reports of agencies like UNDP, World Bank and ADB. The data were tabulated and analyzed by using simple statistical tools. The assessment report consists of detailed analysis of impact of tsunami on the fisheries sector as a whole and issues related to rehabilitation and restoration of livelihoods.

## **RESULTS AND DISCUSSION**

### **Reduction in fishing trips and decline in catch rates**

It took a long time to restore normal living conditions and no fishing activities were undertaken immediately after tsunami. This was mainly due to loss of fishing equipments; fear of recurrence of tsunami and displacement from their original place of inhabitation to relief camps. The details of number of trips per month before and after tsunami are given in **Table1**. In this study pre-tsunami period indicates a time period of one month from 16<sup>th</sup> of November to 15<sup>th</sup> of December 2004 and post-tsunami period is from 16<sup>th</sup> of January to 15<sup>th</sup> of February 2005.

The number of fishing trips of boats in a month came down by 20 to 60 percent compared to the pre-tsunami situation. Fishing trips of motorized boats were more affected than the non-mechanized category. The number of fishing trips, which ranged from 20-25 days before tsunami, was reduced to the level 10-12 days. Maximum reduction of fishing trips was seen in the case of country crafts with gillnets and canoes with ringseines (60 %). In the non-mechanized category, the fishing trips were reduced by 20 per cent to 40 per cent. Utmost slump in fishing trips occurred for catamarans with gillnet.



**Table 1. Number of fishing trips per month for various craft-gear combinations**

Sl.	Type of craft-gear combinations	Number of fishing trips	
		Pre-tsunami Nov-Dec 2004*	Post-tsunami Jan-Feb 2005*
<b>Motorized</b>			
1	Plank built boats with gillnet	25	12
2	Plywood boats with gillnet	25	10
3	Catamarans with gillnet	22	12
4	Canoes with ringseines (out board)	25	10
5	Plank built boats with ringseines (in board)	20	10
6	Canoes with mini trawlnets	25	12
<b>Non-mechanized</b>			
1	Catamarans with gillnet	25	15
2	Small canoes with castnets	25	20
3	Country crafts with gillnet	25	20

\* For a preceding and succeeding month

Source: Socio Economic Evaluation and Technology Transfer Division (SEETTD), CMFRI, Kochi

**Table 2: Landings of Marine fishes in Kerala before and after tsunami**

Sl.	Type of craft-gear combinations	Number of fishing trips	
		Pre-tsunami Nov-Q (Kg)	Post-tsunami Q (Kg)
<b>Motorized</b>			
1	Plank built boats with gillnets	83	35
2	Plywood boats with gillnets	26	15
3	Catamarans with gillnets	75	50
4	Canoes with ringseines (out board)	650	490
5	Plank built boats with ringseines (in board)	875	625
6	Canoes with mini trawlnets	50	40
<b>Non-mechanized</b>			
1	Catamarans with gillnets	41	27
2	Small canoes with castnets	5	4

\* For a preceding and succeeding month

Source: Socio Economic Evaluation and Technology Transfer Division (SEETTD), CMFRI, Kochi



### Decrease in catch rates after tsunami

The average landing pattern of different fishing units before and after tsunami is given in Table 2. Immediately after the tsunami, fishing operations along the coastal regions came to a stand still. Few fishermen who went for fishing restricted their activities near to the shore. Hence there was drastic reduction in the per capita landings of all types of fishing units. As a whole, the average landings, pertaining to a month succeeding tsunami has recorded one-third reduction for all types of fishing units. A comparison between the average catch in a month before and after tsunami gives a clear decrease of landings.

In case of motorized boats, decline in fish catches was observed to the order of 25 to 68 per cent. In motorized category, plank built boats with gillnets experienced utmost decrease (58%) in catches compared to pre-tsunami period whereas in case of non-mechanized category, country crafts with gillnets was affected with maximum reduction (78%) in

landings. The decrease in landings is mainly due to destruction of fishing vessels as well as reluctance of fishermen to go to their usual fishing grounds.

### Shift in demand and price crash in the marketing system

The prices of marine fish also faced great setback immediately after the tsunami. This was mainly due to low demand for fishes in the market, due to apprehension of people, that fishes might have consumed carcasses of humans and animals floating in the sea after the tsunami. Another reason for low demand was the reduction in the size of fish after tsunami. The prices of selected species of fishes before and after tsunami are given in Table 3. In the case of most of the species, post-tsunami price was reduced to less than half of its pre tsunami price. The reduction in prices was at the maximum in case of soles (67 per cent), crabs (67 per cent) and tunas (66 per cent). Due to reduced demand for fish for consumption, the fish catches were dried and made use for making livestock feeds.

**Table 3: Average price for different species of marine fishes before and after tsunami**

Sl. No.	Type of craft-gear combinations	Number of fishing trips	
		Pre-tsunami Nov-Dec 2004*	Post-tsunami Jan-Feb 2005*
		Q (Kg)	Q (Kg)
1	Oil sardine	15	7
2	Mackerel	35	15
3	Anchovies	50	20
4	Soles	15	5
5	Tuna	35	12
6	Horse mackerel	20	8
7	Croakers	40	15
8	Crabs	30	10
9	<i>P. stillifera</i>	55	42
10	<i>M.dobsoni</i>	85	65
11	Seer fish	140	80
12	Barracuda	50	20
13	Shark	45	30
14	Caranx	60	25
15	<i>M. monoceros</i>	175	125

\* For a preceding and succeeding month

Source: Socio Economic Evaluation and Technology Transfer Division (SEETTD), CMFRI, Kochi



### Diminishing per capita income of boat owners and fishing labourers

Very likely as implied by the outcome of the **Tables 4 and 5**, the income levels of boat owners operating and non-operating as well as the crewmembers showed a steep decline. In the motorized category, the significant reduction in average value of catch per day of operation for different categories of craft-gear combinations was noticed. The average income of boat owners of motorized categories that varied from Rs 233 to Rs 3125 before tsunami came down to the range of Rs 167 to Rs 2250.

The maximum reduction in boat owner's income was in the case of plank built boats with gillnets (40 per cent) and minimum was in the case of canoes with mini trawl nets (21 per cent) in the motorized category. Pre-tsunami income of boat owners in the artisanal sector ranged between Rs. 57 and Rs. 162 while it reduced to the order of Rs 33 and Rs 105 in the post-tsunami period. In the artisanal sector, country crafts with gillnets suffered from 67 per cent reduction in income whereas small canoes with castnets had only 3 per cent reduction.

**Table 4: Average per capita income of the boat owners**

Sl. No.	Type of craft-gear combinations	Net income of Boat owners (Rs/day)	
		Pre-tsunami Nov-Dec 2004*	Post-tsunami Jan-Feb 2005*
<b>Motorized</b>			
1	Plank built boats with gillnets	317	192
2	Plywood boats with gillnets	233	167
3	Catamarans with gillnets	292	183
4	Canoes with ringseines (out board)	2333	1740
5	Plank built boats with ringseines (in board)	3125	2250
6	Canoes with mini trawlnets	647	510
<b>Non-mechanized</b>			
1	Catamarans with gillnets	162	105
2	Small canoes with castnets	57	55
3	Country crafts operating with gillnets	100	33

\* For a preceding and succeeding month

Source: Socio Economic Evaluation and Technology Transfer Division (SEETTD), CMFRI, Kochi

Fishing labourers, who share one third of the total revenue of the catch, suffered heavily with substantial wage losses due to decrease in catch after tsunami. The average income per

trip of fishing labourers in motorized categories that varied from Rs 58 to Rs 292 before tsunami came down to the range of Rs 42 to Rs 183.



**Table 5: Average income of the fishing labourers**

Sl. No.	Type of craft-gear combinations	Net income of Boat owners (Rs/day)	
		Pre-tsunami Nov-Dec 2004*	Post-tsunami Jan-Feb 2005*
<b>Motorized</b>			
1	Plank built boats with gillnets	79	48
2	Plywood boats with gillnets	58	42
3	Catamarans with gillnets	292	183
4	Canoes with ringseines (out board)	69	51
5	Plank built boats with ringseines (in board)	69	50
6	Canoes with mini-trawlnets	216	170
<b>Non-mechanized</b>			
1	Catamarans with gillnets	41	26
2	Small canoes with castnets	57	55
3	Country crafts operating with gillnets	100	33

\* For a preceding and succeeding month

**Source:** Socio Economic Evaluation and Technology Transfer Division (SEETTD), CMFRI, Kochi

Maximum decline in fishing labourer's income was experienced for plank built boats with gillnets (40 %) and minimum was in the case of canoes with mini-trawlnets (21 %) in the motorized category. Pre-tsunami income of fishing labourers in the artisanal sector varied between Rs 41 and Rs 100, while it reduced to the order of Rs 26 and Rs 55 in the post-tsunami period. In the artisanal sector, country crafts with gillnets endured maximum (67 %) drop in income of fishing labourers whereas small canoes with castnets had only 3 % reduction.

Both categories, viz boat owners and fishing labourers are finding it difficult to meet their living expenses with the drastic reduction in their income. The fishing operations are gradually becoming non profitable due to diminishing returns and are not sufficient to meet

even the operating costs. Hence there was a tremendous drop in the average number of fishing days. Moreover, the fishing labourers who are already in the clutches of the moneylenders and traders from whom they had borrowed money are finding it difficult to cope up with the situation. The government is providing grants to the affected population in order to sustain the lives of fisherfolk in the absence of their livelihoods.

### **Damages to housing and infrastructure**

The tsunami caused widespread damage to housing and almost 1,54,000 houses were either destroyed or damaged (JAM Report, 2005). Almost all the affected houses in Kerala belonged to pucca category. Many huts and



temporary shelters used for marketing and fishing related activities along the coastline were not included in the initial assessment of losses. Following are some of the issues to be resolved

- A large number of affected households were living on the government land without title (encroachers). This has posed many problems associated with rehabilitation.
- As part of the protection from the disasters, a number of families were asked to relocate by strictly adhering to Coastal Zone Regulations (CRZ). But this issue invited opposition on the grounds that most of the fisher families live within the CRZ even before adoption of this measure and resettlement of all these families by strictly adhering to regulations would deprive of their traditional rights and privileges.
- Fishermen communities are reluctant to have their resettlement at more than 800 meters to 1 kilometre from the existing location or from the sea. Further the land availability is a problem as most villages are narrow strips of land between sea and backwaters, most of them having width of not more than 2 kilometres.
- Displaced households with legal title demanded that the government should provide them new land with title while allowing them to retain the rights to original property.
- The biggest problem in the affected area was the non-availability of drinking water. Following the disaster, wells were buried in sand and water in the wells that survived had turned saline. Also water pipe connection in temporary shelters did not serve the purpose forcing people to depend upon other sources of fresh water.
- Power supplies to these areas were disrupted which needed to be taken up with utmost priority.

Sandmining and related issues in the coastal belt of Alappad-Arattupuzha region also poses problems in designing and implementing rehabilitation packages. Comprehensive plans to construct seawalls and their dykes, boulders and bio-shields are to be decided in a participatory mode to avoid further conflicts. Government has introduced temporary rehabilitation arrangements by providing shelters made by Nirmiti Kendra using Galvanized Iron Sheets. But these dwellings turn extremely hot during daytime making it unable to live in. Also the sanitation arrangements made nearby are not sufficient and it is posing threat to health of inmates of temporary shelters.

Permanent housing offered by various agencies are not yet completed or is still in the process or in the initial stages due to various issues related to rehabilitation including adherence to CRZ and reluctance of people to move away from their original habitats. The conditions in the temporary shelters provided further worsened in the rainy seasons.

The mobilisation of tsunami relief funds is not done in an efficient or foolproof manner. Number of agencies is involved in collection of funds and there is no accountability for the usage of funds. Unless the government is strictly implementing a policy for the collection of funds, multiple agencies will continue to reap benefits out of collection of disaster relief funds.

### **Livelihood issues**

Tsunami has resulted in income and wage loss of directly and indirectly affected households. The major activities of livelihood in the coastal areas, namely fishing, agriculture, livestock and non-farm activities were affected by the disaster.



Fisheries sector provides secondary employment opportunities apart from capture and culture fisheries. This includes net mending and weaving, supply and repair of fishing equipment and gear, boat building, provision of ice, marketing, processing and transporting of fish, fish exports etc. Labourers engaged in these activities seem to be in abject poverty, having no reserves to fall back upon. The damages to homes, destruction of village infrastructure and loss of lives of family members have compounded the problems. These damages are accentuated by prevailing issues in the fisheries sector that relate to rising input cost, especially fuel, declining profitability of small boat owners, inequitable distribution of market value of produce and in some instances depleting fishing stock.

The infrastructure losses in fisheries are not yet compensated/restored severely affecting the livelihoods of coastal population. However, government is continuously providing the basic necessities as to the requirements of food, shelter and medicines. A monthly grant of Rs 1000 is paid to the affected families in the temporary shelters as a provision for sustenance. However, people are developing a reluctant attitude to work due to delay in restoring infrastructure in fisheries sector. Building of permanent shelters is in the process and several agencies have come forward to provide their contributions.

A number of women-headed households are emerging after the tsunami due to loss of lives of male counter parts. They are having a tough time as they are the primary care takers of small children and do not have an alternative to go out for earning an income for the family. They have to deal with their own psychosocial

stress, loss of livelihood and care for their dependents.

Coastal community depends heavily upon various financial sources. They are highly indebted to categories like traders and village moneylenders that have accentuated the vulnerability of these communities. Livelihoods are not restored at least to the pre tsunami level or alternative avocations are not adopted successfully. However, Government is supplying a fixed contingency grant, which has imbibed a culture among the victims to wait for the government or other agencies to act. Fishing equipments, which is a prerequisite to restore normalcy is not yet replaced by Government and other agencies to bring back the economic activity of these villages. The fisher folk need to be given adequate awareness, so as to prevent them falling into the debt trap of moneylenders in their urgency to acquire fishing implements. Apart from the government supported measures, financial institutions should play a key role in this regard by providing easy credit to the fisherfolk

A considerable number of affected families, particularly women members were undertaking activities by involving in micro enterprises. These enterprises cater to the local markets and to the local population for both inputs and outputs. They have been severely affected through the loss of equipment and loss of other assets and loss of employment etc., that have deprived associated families of an additional income. Moreover these Self Help Groups had availed loans from financial institutions, and the repayment of such debt is under doubt due to extensive damage caused to the coastal community. The beneficiaries have appealed to the government to write off such debts as a relief measure.



Damage to agriculture and livestock is confined to immediate vicinity of the coast, which includes loss of standing crops and death of livestock, which has significant impact on the livelihoods of the poor, especially women. In addition, disturbances caused by the disaster to soil fertility will result in long-term negative impact on agriculture indirectly affecting those employed in this sector. Wage labourers, seasonal workers and other subsistence activities are undertaken by the most vulnerable section in the coastal community. Poverty incidence in such sections is also very high. Disaster has added to the vulnerability of such sections due to loss of employment.

### **Conclusion and Policy Implications**

The socio-economic impact of tsunami on the coastal communities in general was appalling and particularly impinging on the livelihood of already poverty stricken fisher households. Non-mechanized and motorized segments were the worst affected among different types of fishing units in terms of reduction in landings.

The number of fishing trips came down to less than half of pre-tsunami situation in the succeeding month and the most affected segment were motorized units. The number of fishing trips, which ranged from 20-25 days before tsunami, was reduced to the level 10-12 days. Maximum reduction of fishing trips was seen in the case of country crafts with gillnets and canoes with ring seines (60 per cent) in the motorized category. In the non-mechanized category, the fishing trips were reduced by 20 per cent to 40 per cent, maximum reduction being experienced by catamarans with gillnet. Decline in fish catches was observed to the order of 25 to 68 per cent. In case of motorized sector, plank built boats with gillnets

experienced utmost decrease (58 per cent) in catches compared to pre-tsunami period whereas in case of non-mechanized category, country crafts with gillnets was affected with maximum reduction (78 per cent) in landings.

Prices of different varieties of fishes also faced heavy decline in demand due to tsunami related apprehensions and reduction in size of fish. Maximum reduction in prices was observed in the case of soles, crabs and tuna. The reduction in prices was at the maximum in case of soles (67 per cent), crabs (67 per cent) and tunas (66 per cent). The average income of boat owners of motorized categories that varied from Rs. 233 to Rs. 3125 before tsunami came down to the range of Rs. 167 and Rs. 2250. The average income of fishing labourers of motorized categories varied from Rs. 58 and Rs 292 per trip before tsunami came down to the range of Rs. 42 and Rs. 183 per trip. Pre-tsunami income of boat owners per trip in the artisanal sector ranged between Rs 57 and Rs 162 while it reduced to the order of Rs 33 and Rs 105 in the post-tsunami period. Pre-tsunami income of fishing labourers per day in the artisanal sector varied between Rs 41 and Rs 100, while it condensed to the order of Rs 26 and Rs 55 in the post- tsunami period.

The rehabilitation related issues had to be given concerted effort in the light of various localized problems like adherence to CRZ norms and reluctance of people to move far away from the sea. Recouping the livelihood of the fisher folk also remained a primary concern for the government as well as relief agencies in view of the damage to fishing related assets. Labourers engaged in fishing and fishery related activities appeared to be in abject poverty, having no reserves to fall back upon.



The damages to homes, destruction of village infrastructure and loss of lives of family members have compounded the problems. These damages are accentuated by prevailing issues in the fisheries sector that relate to rising input cost, especially fuel, declining profitability of small boat owners, inequitable distribution of market value of produce and in some instances depleting fishing stock.

One of the issues that have to be taken up after the recent tsunami is the need for adequate disaster management system and disaster preparedness plan under the auspicious of the state and district level authorities. Experiences with the natural disasters indicate that some of the most effective risk management actions both anticipatory (reducing future risks) and compensatory (preparedness to respond) need to be taken at the local level. As a right step in this direction, the State has set up a disaster management department headed by a secretary-level officer. In addition, a comprehensive environmental, multi-hazard, coastal zone management need to be developed. Above all, focussing on the early warning systems based on vulnerability assessment and hazard analysis, preparedness and relief, recovery and rehabilitation should be given emphasis.

In order to reinstate the standard of living of the fisher population, necessary back up designed towards capacity building, by empowering the fisher folk, providing facilities like alternative income generating avocations and adequate support to restore fishing activities should be undertaken by the Government and other agencies. Livelihoods are not restored at least to the pre-tsunami level if alternative avocations are not adopted successfully. However, Government is supplying a

contingency grant of fixed amount, which has imbibed a culture among the victims to wait for the government or other agencies to act.

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