

EVOLVING STRATEGIES FOR LONG-TERM REHABILITATION ON SHELTER & HABITAT DEVELOPMENT IN THE TSUNAMI AFFECTED AREAS OF TAMIL NADU



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1.0 INTRODUCTION

BACKGROUND:

A very severe earthquake measuring magnitude of 8.9 on Richter scale struck northern Sumatra, Indonesia at 00:58:50 UTC or 06:28 AM IST. The earthquake was also felt widely along the east coast of India. These earthquakes triggered off the Tsunami. In India the Tsunami caused massive destruction and casualties in the coastal regions of Tamil Nadu, Andhra Pradesh, Kerala and the Union Territories of Andaman & Nicobar Islands and Pondicherry. Tamil Nadu was one of the worst affected state due to Tsunami. The devastating tidal waves that lashed several coastal districts of Tamil Nadu (Chennai, Thiruvallur, Kancheepuram, Cuddalore, Nagapattinam, Tiruvarur, Thanjavur, Thoothukudi, Ramanathapuram, Tirunelveli and Kanniyakumari) on Sunday around 9.00 a.m. have left at least 7980 dead and rendered 130,000 families homeless.

Discussions between the Special Commissioner and Commissioner Revenue Administration (SC&CRA) and the Officer on Special Duty - Relief and Rehabilitation (OSD-R&R) of the **Government of Tamil Nadu (GoTN) and UNDP - India** led to identification of immediate areas where UNDP and other UN agencies could forward immediate support to the GoTN at this crisis period. Drawing up micro level model recovery plans was one area of support requested by the Government.



Map of Tamil Nadu showing the affected districts

Subsequently, a team of specialists in the shelter, livelihoods and vulnerability reduction areas from the UNDP - Orissa Hub having the necessary profiles and experience of working in various disasters for quite a number of years arrived at Chennai to meet the OSD - R&R. After discussions with the OSD - R&R, the case-study area for drawing up the micro level model recovery plan was finalised.

OBJECTIVES OF THE EXERCISE:

- To undertake an in-depth study of a few villages worst- affected in the tsunami and make observations, both from the specialists' viewpoint as well as through interactions with the various stakeholders, mainly the community;
- To analyse the scenario prior to the tsunami, the damages brought about by the tsunami and views about the possible rehabilitation measures that can be undertaken;
- To prepare a model recovery plan and evolve long-term rehabilitation strategies along with community participation with special focus on resettlement/ in-situ redevelopment and housing reconstruction and livelihoods restoration;
- To indicate areas wherein UNDP and other UN agencies could possibly play a role in the entire rehabilitation process.

SELECTION OF THE CASE-STUDY AREA:

Reconnaissance visit on Jan 9th, 2005

The team members, on reaching Chennai on 8th evening were briefed by Dr. Reuben Samuel, the UNDP focal point camping at Chennai and reached on the objectives of the assignment. The unanimous opinion was that a quick reconnaissance visit on Sunday (Jan 9th 2005) would help in developing a better understanding of the broader framework, detailed planning of the field activities for the preparation of the model micro level recovery plans and crystallise the issues to be discussed with the OSD-R&R on Monday. Hence 5 team members - 1 Disaster Management Specialist (Ms. Kalika Mohapatra), 1 Architect-Planner (Mr. Anindya Ku. Sarkar), 1 Civil Engineer (Mr. Manoranjan Sahoo), 1 Livelihoods specialist (Mr. Subodh Ranjan Das) and 2 Disaster Management Project Officers (Mr. Sachidananda Pati & Mr. Simanchal Patnaik) - set out to the nearest of the three worst affected villages of Nagapattinam district which was the worst affected district in the state and wherein the SC&CRA had suggested that the micro level recovery planning exercise may be carried out.

On reaching Nagapattinam district, the team interacted with the ADC, Mr. Ranbir Prasad Singh (in charge of coordinating all relief and rehabilitation efforts in Sirkali taluka) and finalised a few of the worst-hit villages of Pazhaiyar, Medavamedu and Chinakotaimedu for in-depth study. The three villages exhibited different social profiles of the community. While Pazhaiyar is an important nodal harbour point for the fishing populace of the local areas and a residence for the fairly rich, Medavamedu exhibits an array of all the economic classes. Chinakotaimedu definitely is the home for only a few poor fishermen families.

Key members of the team returned to Chennai for a thorough debriefing by Dr. Reuben Samuel and could get into dialogue with the Officer on Special Duty (Relief & Rehabilitation) and Principal of Mar Gregorious college, Chennai to mobilise a special team of volunteers – final year students of Masters in Social Works that would accompany the team to the field to help in understanding the issues and needs of the community, who could only express the same in the local language.

Profile of the Team constituted:

From UNDP Orissa Hub:

- Dr. Reuben Samuel, Focal Point
- Dr. Sanjoy Bandyopadhyay, Team Leader – UNDP Orissa Hub
- Ms. Kalika Mohapatra, Senior Programme Associate, UNDP Orissa Hub
- Mr. Anindya Ku. Sarkar, Architect Planner, Shelter Coordinator, UNDP – Orissa
- Mr. Manoranjan Sahoo, Civil Engineer specialist, Orissa Development Technocrats' Forum, Orissa
- Mr. Ramachandra Panda, Civil Engineer specialist, UNDP – Orissa
- Mr. Biranchi Ku. Choudhury, District Project Officer, Disaster Risk Management Programme, UNDP – Orissa
- Mr. Subodh Ranjan Das, District Project Officer, Disaster Risk Management Programme, OSDMA-UNDP Orissa
- Mr. Simanchal Pattanaik, District Project Officer, Disaster Risk Management Programme, OSDMA-UNDP Orissa
- Mr. Sachidananda Pati, District Project Officer, Disaster Risk Management Programme, OSDMA-UNDP Orissa

From Mar Gregorious college, Chennai:

Faculty:

- Mr. Vincent Vijaya Raj

MSW Student Volunteers:

- Ms. Vincy D'souza
- Ms. I. Mary Babiyola Pragasi
- Mr. K. Yogeshwaran
- Mr. B. Kaushik
- Ms. Christy Shoba J.
- Mr. Jacob Victor John
- Mr. Jaijith James
- Mr. W. John Bernad



The UNDP team in the field

The field team set out on the 10th evening to reach Sirkali in the night. The study, primarily aiming at a rapid assessment of the damages vis-à-vis observing the relief distribution and understanding the various stakeholders' views on long-term rehabilitation measures to be undertaken, could hence start precisely on the 11th Jan, 2005 after a fortnight from the date of the tsunami on the 26th of December, 2004.

Day 1: 11.01.2005

The team sat together to prepare a plan of action and discussed on the objectives of the exercise. A detailed checklist was prepared regarding collection of data relating to various sectors. It was decided that all information pertaining to situation of the village prior to the tsunami, the economic condition of the people, damages that have occurred in the tsunami and views of various stakeholders about long-term rehabilitation was to be collected through Community survey, Focussed Group Discussions (FGDs) and Household survey, PRA mapping, etc. The team first started for Chinakotaimedu, the smallest of the hamlets for an in-depth study. Chinakotaimedu village consists of 60 households, all belonging to the poorest class. All the tools mentioned above were applied to obtain useful data. A small team proceeded to Medavamedu to initiate the work there. The team returned to their place of stay to share with each other the major findings and observations. Information gaps were identified - those that needed to be collected the next day. The team was grouped and a plan of action got worked out for the next day assigning works to each small group.



A review meeting taking place in the evening

Day 2: 12.01.2005

A small group went to Chinakotaimedu village, while most of the team members started for Medavamedu village. At the Chinakotaimedu village, the PRA map was completed and the community was asked various questions to verify and refine the observations made by the team earlier. At Medavamedu, which is a fairly large village of 363 households, the team first asked the community to define the various economic

classes of the people. Rather than income, the villagers suggested that it is the possession of assets that should define the economic classes. Subsequently, relatively well-off, marginal poor, very poor and the destitute classes were identified and their settlement areas marked on the village map through PRA exercises. Now, the various groups started pursuing FGDs, community survey and PRA mapping, covering all households. One group concentrated on inspection of the settlement pattern and assessment of the damages incurred to it, while another got involved in detailed household survey of a sample number of households (the sampling was done in such a manner so that all the economic classes could be covered). Yet another group was in Pudhipattinam busy



A PRA map of the village being prepared by the community



A detailed household survey being carried out in the village

investigating the type of local building materials available in the locale and their market rates. In the evening, each team was too eager to share information pertaining to various works assigned and a rich set of information and observations could be acquired. The observations revolved primarily around the livelihood activities earlier practiced, impact on the same due to the tsunami and types of livelihood opportunities immediately available. The household surveys brought out the composition of the households, their use of spaces within the homesteads throughout a day and views on resettlement. The queries pertaining to resettlement in particular, when addressed to various classes of the community, brought out interesting viewpoints and revealed vested interests of each section of the community. At length, the team was again regrouped and the plan of action for the third day got worked out assigning works to each small group.

Day 3: 13.01.2005

The first half of this day was used for acquiring additional information at Medavamedu village. A few more households were interviewed and impact on their livelihoods assessed. Another group interacted with the village women and women SHGs to discuss with them about the immediate alternate sources of livelihoods they could pursue. 2 members having lost their near and dear ones were given trauma counselling by Christy; their case-studies were documented, which revealed that the primary cause for the loss of lives was their settlement being too close to the sea and their houses built in a non-engineered manner, which had increased their vulnerabilities. The group that had studied the availability of local building materials now started interacting with the local masons/



Discussion with the "Urthaliveur" - leader of the fishermen community at the Medavamedu village

other construction workers to develop an understanding whether they were adequate in number as well as in skills so that the massive reconstruction programme once launched would not receive hurdles on way. This group also procured the Govt. Schedule of Rates so that proposed model construction works could be estimated.

In the afternoon, the team went to Pazhaiyar village of 1564 families. The interest to do a reconnaissance survey of this village was to identify the emerging issues in a big village with relatively rich population like this after the tsunami. In Pazhaiyar, there were a number of fishermen families owning trawlers. A team did household survey and got the opinion of the people regarding resettlement. Another group studied the livelihood aspects of the community. The team prepared a map of the settlement. In the evening after return, the observations were again compiled. All information and observations were presented to Dr. Bandyopadhyay, who had just arrived to help guide the team. Dr. Bandyopadhyay suggested that the team collect more necessary information specially relating to livelihoods assessment. However since Pongal was commencing the next day, the student volunteers left for Chennai. The UNDP team decided to stay and interact more with the communities.



Discussion with the ADC, Mr. Ranbir Singh, IAS

Day 4: 14.01.2005

The day started with interaction with the ADC Mr. Ranbir Singh to know his feedback on the first observations made by the team. There were interactions with the “*Urthaliyar*” (*Urthaliyar* is the head of a local informal institutional system in any village here developed by the fishing communities) and the GP President of the same Gram Panchayat of Pudhipattinam, wherein Pazhaiyar was. Next, there was a revisit along with Dr. Bandyopadhyay to all the three villages for seeking further information and making observations therein.

Day 5: 15.01.2005

This day was used to visit the neighbouring taluks of the same district Nagapattinam and to Kareikal taluk of the Union territory of Pondicherry. Reconnaissance survey was made to a few villages in these taluks to verify whether the type of information and observations made in the 3 case-study villages held good in general for the coastal settlements in Tamil Nadu. Some additional information was collected from the Collectorate at Nagapattinam and Kareikal.



Understanding the process of damage assessment by Govt.

Day 6-10: 16 - 20.01.2005

At Chennai, these days were used for analysis of the above information, collection of more secondary data from Govt. offices, preparation of reports, formulation of strategies and guidelines, etc. under the guidance of Dr. Reuben Samuel, Prof. A. R. Santha Kumar and Dr. Sanjoy Bandyopadhyay.

Day 11: 21.01.2005

A presentation was made before the CRA and the OSD – R&R, SPO of the GoTM to share the major findings of the intensive exercise conducted in the field and suggestions for the road ahead.

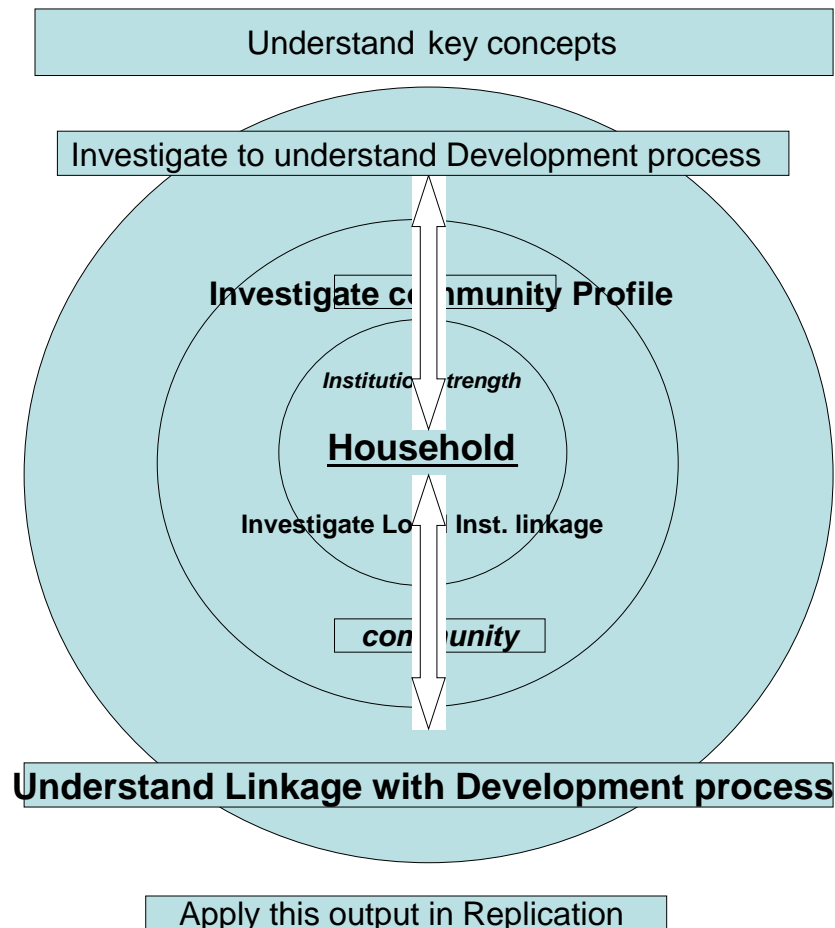
Day 12: 22.01.2005

A field visit to 3 worst affected villages in Cuddalore district was made by the team in consultation with the Collector, Cuddalore district to develop a better understanding of the situation there as well as interact with the communities, local NGOs and the district administration.

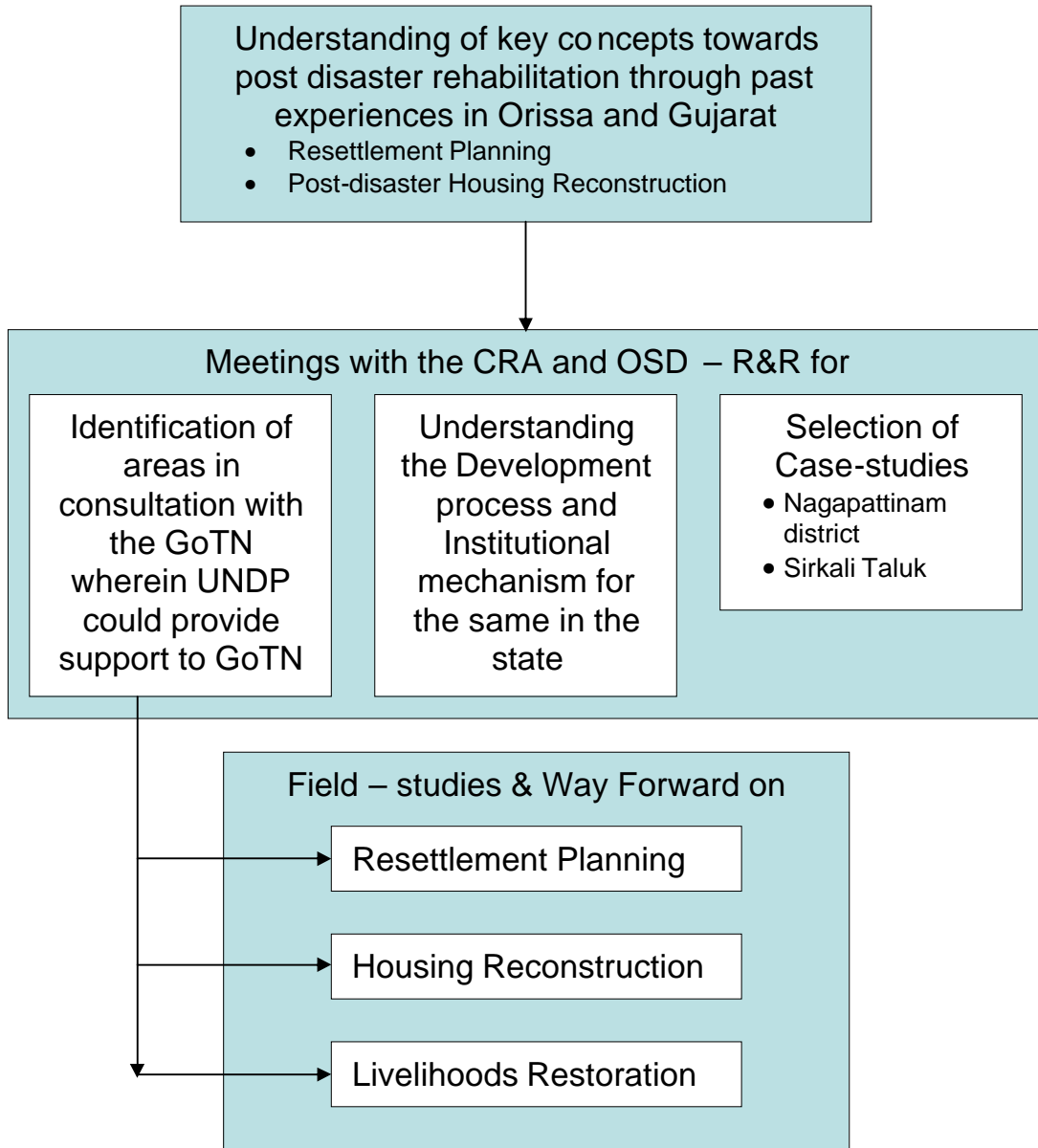
Day 13-15: 23-25.01.2005

A series of meetings with the OSD, PWD, Professors of Anna University and Director of SERC, Chennai took place to finally arrive at a set of house designs that are structurally safe incorporating multi hazard resistant technical features as well as architecturally and culturally sensitive to the needs of the fisher communities (which could be assessed through the intensive community interactions in field in the last few days). Guidelines have been worked out which could aid this massive reconstruction process to adhere to standards.

The **principle of approach** has been illustrated below. With an understanding of key concepts, the team came in to understand the development process in the state and went in to the community and individual households, who are the target groups and at the core of the rehabilitation/development process. Observations and analysis made therein helped in formulating the implementation strategies using the existing institutional setup.



METHODOLOGY

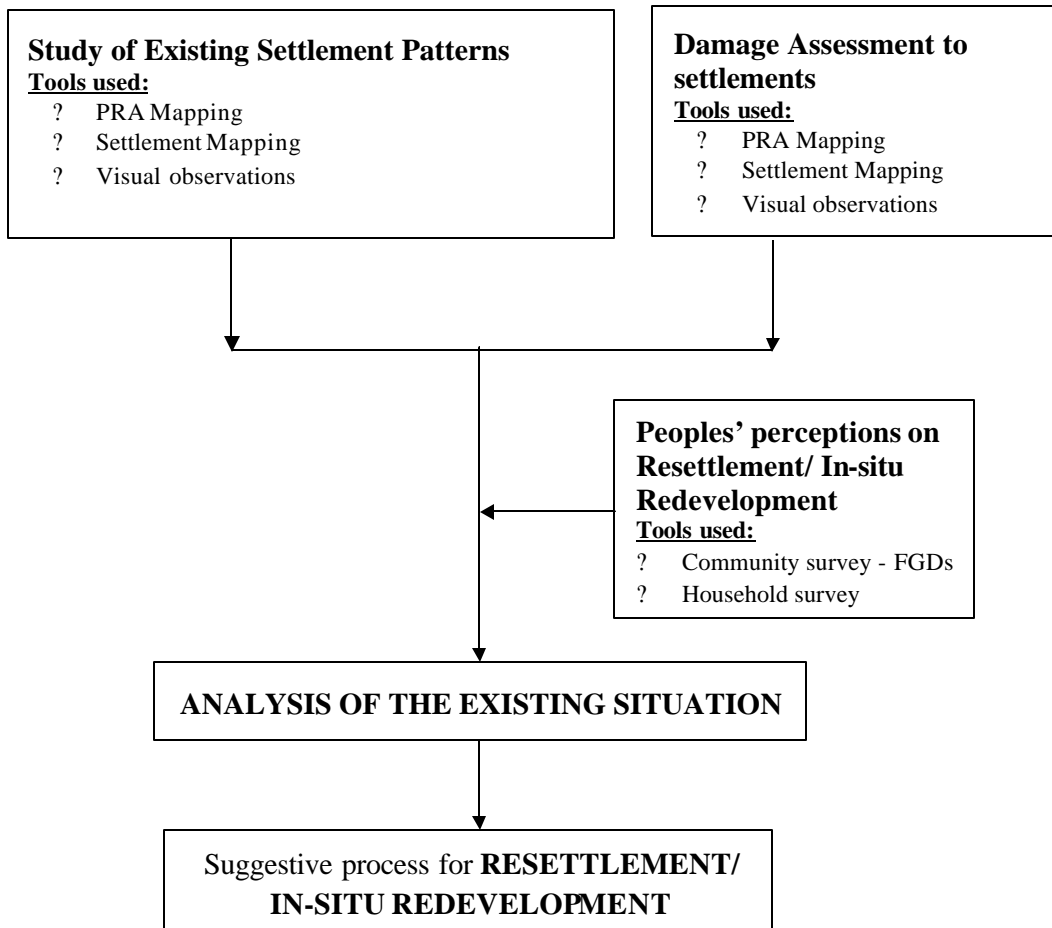


2.0 RESETTLEMENT / IN-SITU REDEVELOPMENT OPTIONS

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2.1 Methodology adopted for formulating strategies on RESETTLEMENT/ IN-SITU REDEVELOPMENT

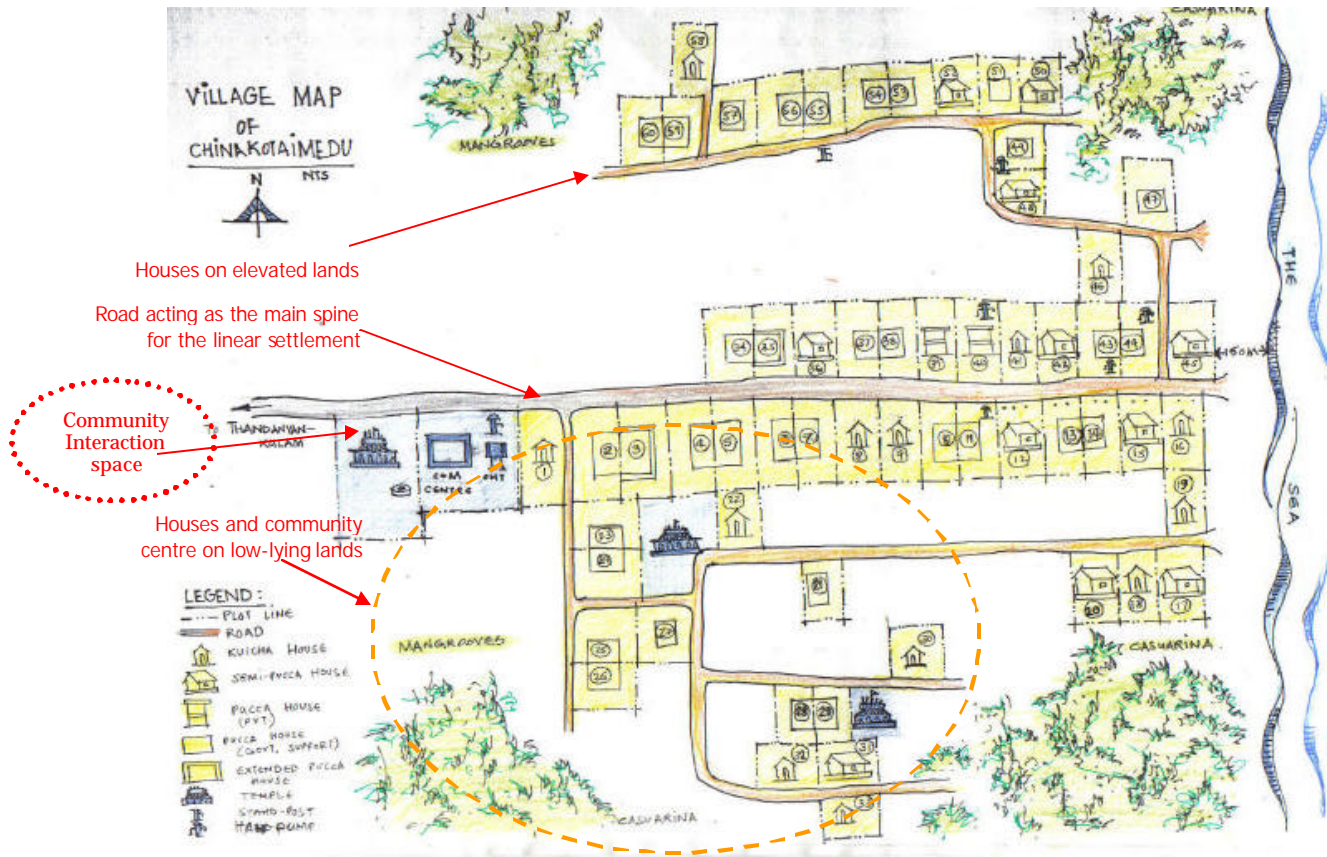


2.2 STUDY OF EXISTING SETTLEMENT PATTERNS

As mentioned earlier, detailed studies for 2 settlements were conducted to understand the patterns of existing settlements.

2.2.1 Case Study 1: Chinakotaimedu

Location: Chinakotaimedu is the smaller hamlet (map below) located about 2 kms from the revenue village Thandavankulam towards the coastline. The sea is about 150 metres away from the nearest point of the settlement.

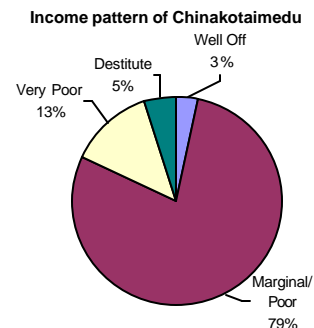


Pattern of the settlement: The settlement pattern is grid-iron, probably due to the planned intervention of the Fisheries Dept. while providing housing to the fishing communities. The approach road to the settlement continues as the main spine of the settlement (marked on map). The village has grown on both sides of the spine in an organic manner.

Socio-economic profile: Chinakotaimedu is the home of very poor families. Except for 2 households (3% of the population), all are marginally poor and very poor families. All the families belong to the same caste of *Pattanivar*. The settlement, being composed of households having fairly homogeneous socio-economic characteristics hardly displays any economic or social clustering of families. The seashore is used for drying the nets and segregation of fish.

Land and Housing characteristics: 55 of 60 households have *patta* i.e., legal rights of their land. They were provided pucca houses in the late 1980s by the Fisheries Dept. Each household owns roughly the same size of plot. There are 36 such houses. Most of them had been constructed with the proper orientation, i.e., with the shorter length of the walls facing the sea. However, there were a few with the longer side of the walls facing the sea, which bore the brunt of the tsunami. Further, there were some houses on relatively elevated lands, while some including the community centre were on low-lying lands (marked on map). The settlement is bounded by casuarina plantations to its left and right.

Physical Infrastructure: The village has an overhead water tank and a piped water supply system. There are 6 standposts and about 60 private handpumps, each owned by a household. The village has been



electrified. However toilets are not present at all. The men folk use the beach, while the women use the forests for defecation. However there is a both felt and expressed need for toilets. For cooking, people use firewood and very rarely kerosene. No provisions for drainage exist; the sandy soil soaks in all the rainwater. **Social Infrastructure:** The nearest primary school is at Thandavankulam 2 kms. from the village, the nearest high school is at Pudhipattinam 6 kms. away and the nearest college at Mellur 40 kms. away. However, there is a balwadi running in the village. The nearest ANM centre is at Thandavankulam and the nearest PHC at Nallur 15 kms. away. The nearest market facilities and police station are available at Pudhipattinam 6 kms. away and the post office is at Kaliyamankoil about 3 kms. away.

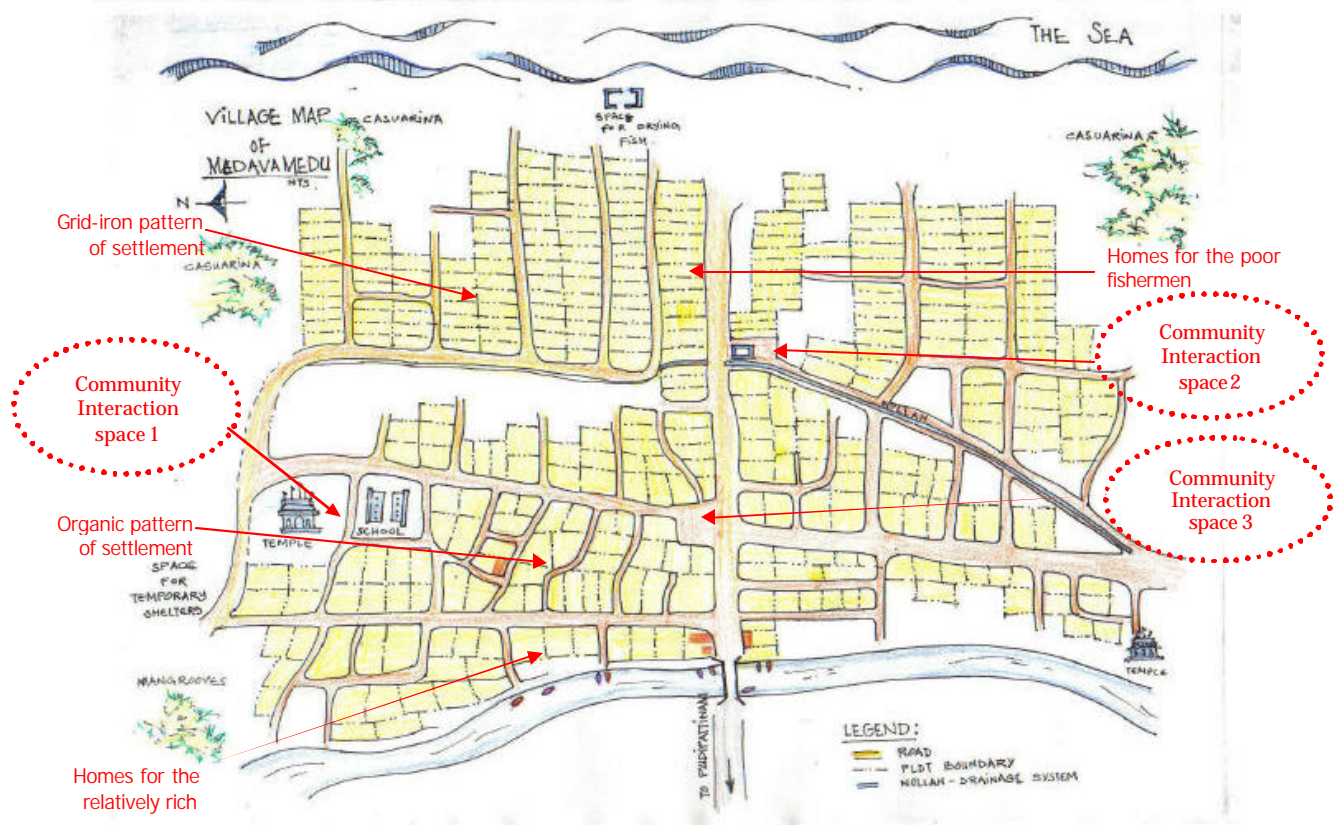
Community spaces: The community spaces are located at the entrance to the settlement. In fact, one is greeted by a temple, a community centre, an OHT (overhead tank), etc. at the entry to the settlement. The approach to the settlement is a 10' wide blacktop road, which continues as the main spine of the settlement and space for interaction among people.

Community based organizations: 3 women Self-Help Groups (SHGs) consisting of 53 women had savings upto Rs.10,000/- and had availed of loans, which they had invested in fishing.

Problems faced by the Community: The primary problems faced by the community in the order of decreasing priority include absence of public means of transportation facilities (2 kms. walk to Thandavankulam, the nearest bus stop), far-flung medical facilities especially in the time of emergencies, distant education facilities, no telephone facilities, etc.

2.2.2 Case Study 2: Medavamedu

Location: Medavamedu is a fairly large village (map below) located about 4 kms from the revenue village Pudhipattinam towards the coastline. The sea is about 200 metres away from the nearest point of the settlement.



Pattern of the settlement: The settlement pattern is organic at the entry and grid-iron towards the coast. This is so because the relatively affluent families in this settlement had chosen to live farther away from the sea and had had their houses built since more than 25-30 years ago while the lands closer to the sea had been developed in a grid-iron pattern by the Fisheries Dept. to provide housing to the poor fishermen families. The approach road to the settlement continues as the main spine of the settlement. The village has spread to quite an extent on both sides of the spine.

Socio-economic profile: Medavamedu is the home of an array of all economic classes of people. The graph alongside bears testimony to this, which has been prepared based on possession of assets and income classifying the community into the well-off, marginal poor, poor and destitute.

The settlement pattern clearly indicates clustering of households based on this. The fairly rich families have opted to settle on sites close to the backwaters (where they tie their FRP boats) and away from the sea on elevated lands, pushing the poor to the coast so that their houses act as the human shelter belt protecting them against the fury of the cyclones and tidal surges. There is distinct difference in the housing characteristics among these economic classes, as have been explained in the section on “Housing characteristics”. Many of the men members of these rich families work abroad in countries like Kuwait, Saudi Arabia, Singapore, etc. Some of the approach roads to these houses are of concrete in stark difference to those of sandy approach lanes to the houses of the poor.

Land and Housing characteristics: All households have *patta* i.e., legal rights of their land. Most of the poor fishermen families were provided pucca houses in the late 1980s/ early 1990s by the Fisheries Dept. Most of these had been constructed with the proper orientation. The houses of the rich are flamboyant and exhibit use of expensive building materials. **However there seems to be a design and pattern followed by the rich poor alike, which is probably need-driven for these fishermen communities.** The settlement is bounded by heavy casuarina plantations to its left and right.

Physical Infrastructure: The village has an overhead water tank, a school and a grand temple located at its extreme left. There is a piped water supply system and almost each household has a hand-pump. The village has been electrified. However toilets are not present at all, except for a very few rich families and in families where members have been exposed to lives in cities and abroad. The men folk use the beach, while the women use the forests for defecation. There is a both felt and expressed need for toilets. For cooking, people use firewood and very rarely kerosene. Most of their kitchens are hence located within their homesteads and not integrated with the main structure of the house.

Social Infrastructure: All facilities of education and health are located at Pudhipattinam 4 kms. away, except the primary school which is present in the village.

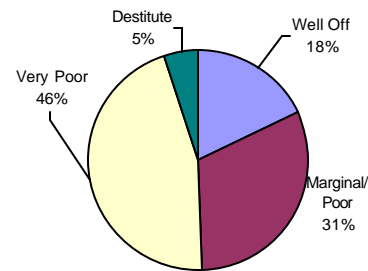
Community spaces: The community spaces are located in 3 clusters (marked on map). These are spaces where the communities congregate for day-to-day interaction and in times of festivals.

The approach to the settlement is a 10’ wide blacktop road, which continues as the main spine of the settlement and as the place for interaction among people.

Community based organizations: There are a number of Women Self Help Groups (SHGs) who have had savings and availed of loans, which they had invested in fishing. A local NGO, named SNEHA has been working in this village since the last 20 years, mainly towards women empowerment – involving the educated women in teaching the village children, etc.

Problems faced by the Community: The most important problem identified by the community is absence of public means of transportation facilities till Pudhipattinam.

Income pattern of Medavamedu

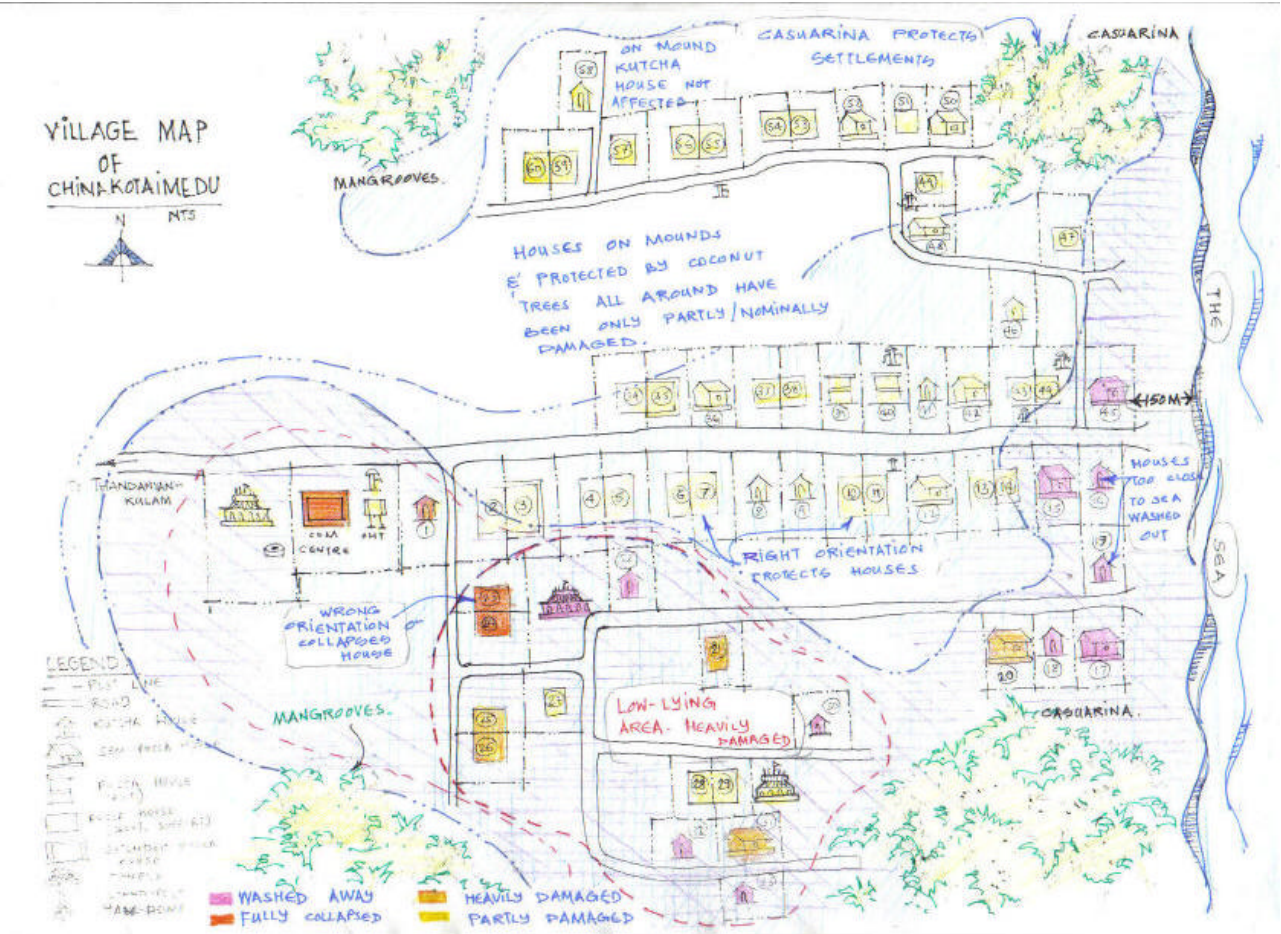


2.3 DAMAGE ASSESSMENT TO SETTLEMENTS

Nature and extent of damages due to the tsunami of Dec, 2004 have been assessed in these villages. The following section describes the damages that settlements suffered and analysis the causes behind them.

2.3.1 Case Study 1: Chinakotaimedu

The map below describes the situation in this village at the time of and after the tsunami.



The casuarina plantations on either side of Chinakotaimedu have protected the settlements to an extent. However, damages also have been intense because of the removal of these plantations at the mouth of the settlement to the sea.

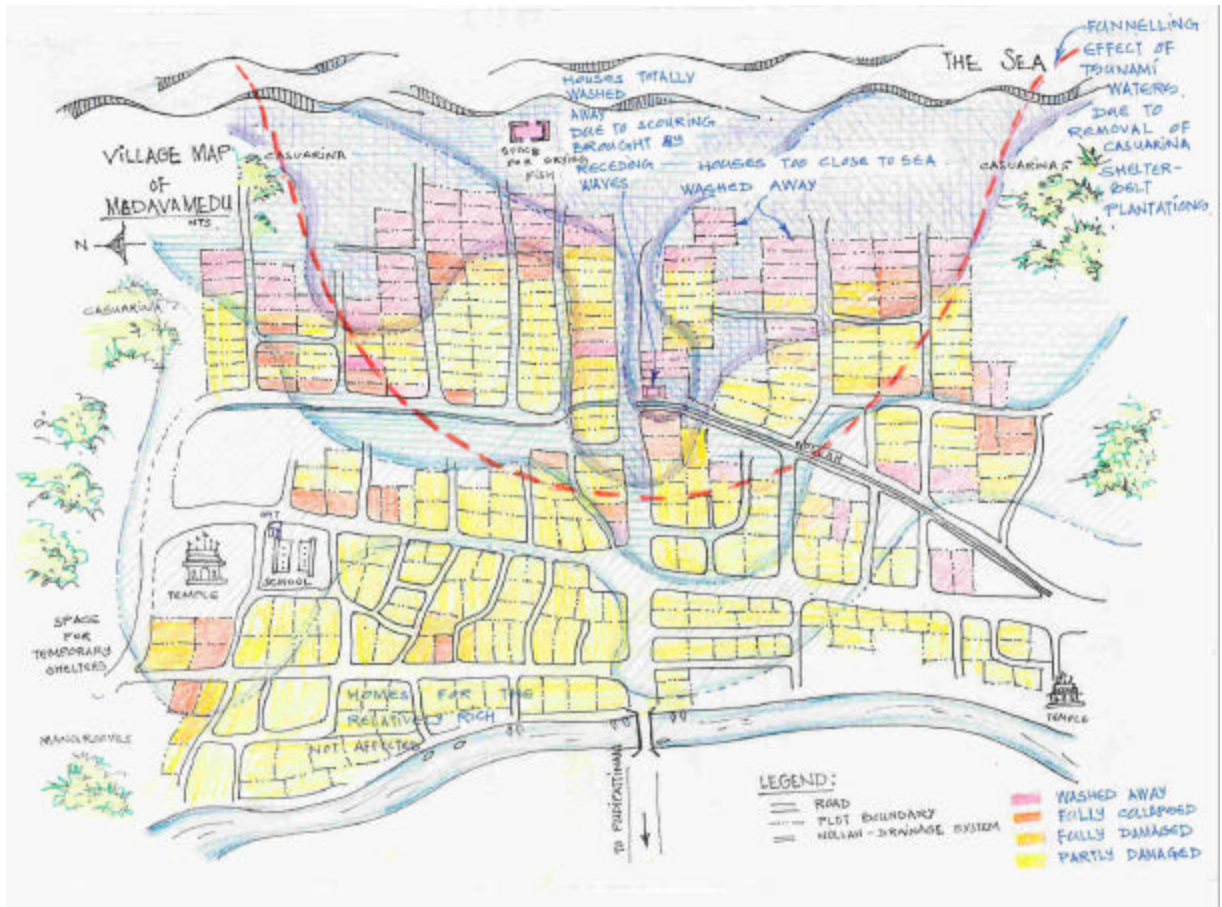
The houses too close to the sea have been washed away and there have been heavy casualties in the first line of houses. Close to the shore, the waters were of enormous height of about 20'. However with distance away from the sea within the settlement, the height of these waters dropped appreciably. They were of height about 4'-5' within the settlement; mostly children could not protect themselves and got drowned.

As explained earlier, Chinakotaimedu had low-lying areas as well as some shelters located on high mounds. Hence though a small settlement of 60 households, it portrays different degrees of damage to the houses and public infrastructure within the settlement. In areas extremely low-lying (marked on map), the tsunami washed away all the houses as well as the only community centre and a temple. A house with the wrong orientation in the low-lying area stands today with its foundations scoured and the long side of the wall facing the sea totally collapsed, while the remaining portion is hanging on loose soil.

The hand pumps have been severely affected by the tsunami and are now half sunk in the sand dunes, the levels of which have been raised after the tsunami. It is interesting to note that the tsunami has completely changed the topography of the area and the ground level has been elevated with sands deposited here. In some cases there has also been appreciable drop in the ground level with sands having been washed away.

2.3.2 Case Study 2: Medavamedu

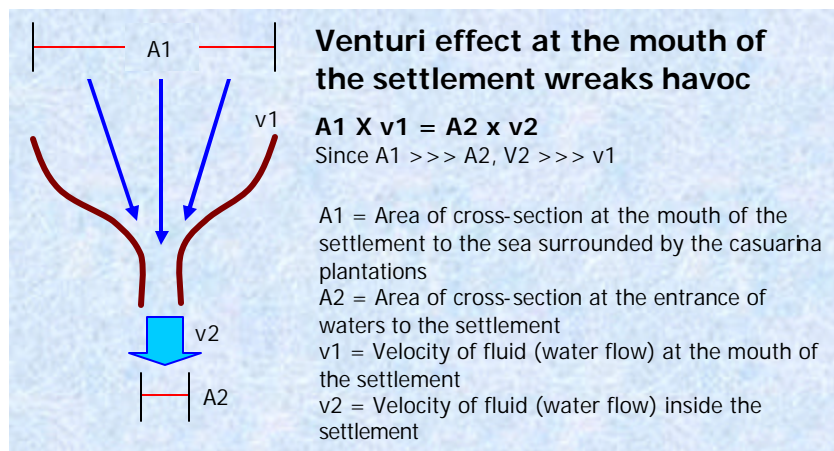
The map below describes the situation in this village at the time of and after the tsunami.



The tsunami came in the form of 4 waves, first one of height 6 metres and the next one more than 10 metres on sea. However within the settlement the height of the tsunami was some where between window sill and lintel levels.

The casuarina plantations on either side of Medavamedu had created a funnel for the tsunami to enter in. There was a “venturi” effect, in which the waters passed on through a small cross-section area and hence the velocity of flow increased, thus ravaging the settlement.

The speed of the receding tide was different in different



areas within the settlement depending on the topography of the area and on the availability of open spaces. In example, the waters that had entered into the open space (community space 2 on map) while receding scoured the foundation of the community centre, which was recently constructed, to such as extent that the entire structure collapsed. Further it washed away three pucca houses just beyond the community centre.

Shanthi, a 25 year old lady lived a peaceful life with her family of 4 kids and her husband in Medavamedu village. Her husband is a poor fisherman who worked as labourer in a catamaran. Her's was the first house that faced the sea and her children used to merrily play on the beach.

On the 26th of December morning, when she suddenly saw the sea waves rise, she gathered her little ones around her and took refuge in the only room in her home. The waves came one after another and she could see slowly the walls of her house collapse; her possessions flow with the tide. Suddenly she realized that she was also flowing with the tides and one by one her children was loosing grip of her. At that moment she was not able to judge whom to clasp and whom to let go. Her twin sons, one year old, she thought should receive her first priority. In her panic and struggle to save every one, she lost all her four children.

Today Shanthi has a blank look on her face. She perhaps is suffering from survivor guilt and post trauma stress. Her friends in the village are very supportive; they tell her that the sterilization surgery done one year ago could be reverted so that she can have a baby again.

Could her children still be with her if her house was not so close to the sea or her house built strong enough to resist the tsunami.



Shanthi ponders about her future with the team members and her friends in the village

As realized from the story above, the first row of houses facing the sea was completely washed away and many children who had taken refuge at their homes lost their lives. However many of the houses in the second and third line got saved due to the presence of the first line of houses with surrounding trees safeguarding them.

Most of the houses constructed by the Fisheries dept. were designed with the proper orientation but the quality of workmanship was low and hence they collapsed. The drinking water supply in the village has been severely affected with many of the hand pumps sunken while others providing saline water. The drainage system has been severely choked. In short the life of the village lies entirely paralysed.

2.4 PEOPLES' PERCEPTIONS ON RESETTLEMENT

The fishermen communities having faced the burnt of Tsunami are ready to shift where the Govt. would advise them. However since their economy depends on sea, they would not like to settle considerable distance inland. The resettled lands must not be more than a km from the sea and from their present settlement since they have to pursue their profession of fishing.

Different economic classes of people in the villages voiced different opinions. Given a choice none would like to give away the rights of their present land. When the communities were explained regarding the Govt.'s priorities to save lives first and hence the need to resettle them inland with shelterbelt plantations to be grown on their present lands, different people expressed different views. Some of the aged ones had developed sentimental attachments to their plots and would not like to resettle by forsaking their present plot. The relatively rich populace who have been wise enough to stay within the villages but as far away from the sea as possible and whose houses had hardly been damaged in the tsunami stated that they would not like to resettle if they had to forsake their present plot and house. They also said, specially the ones that owned the trawlers that their families would stay in the resettled lands, while the members of the family that went fishing would on and off stay in their present houses. In short, they would like to retain their present houses. Some of the rich also said that if all the poor fishermen families decided to stay on resettled lands then they would also resettle, since then they themselves would be the first ones to face the brunt of the sea in the absence of the present human shelter belt protecting them.

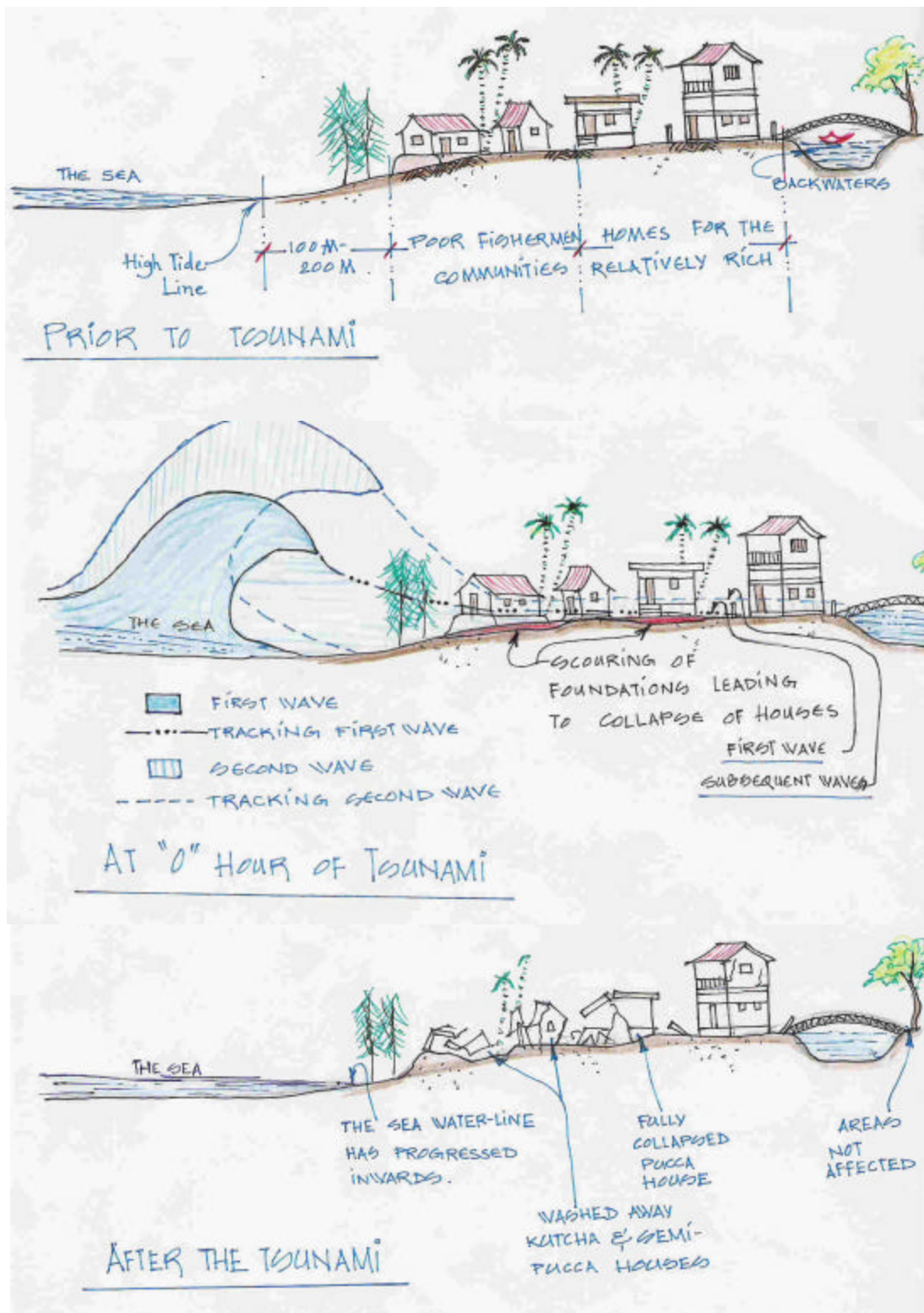
However in general, the poor fishermen families are all too keen to resettle. They expect the Govt. would provide them legal rights over their land and new houses. Some sections of the population suggested that the Govt. should give *patta* i.e., legal rights of the land jointly in the name of the husband and the wife. The plot size should be adequate enough for them to carry out the same pattern of living.

The resettled lands must be accessible through a main road where buses ply, since the communities invariably travel long distances for marketing their fish products. Their primary concern is that wherever resettled they would like to stay close to the backwaters and creeks which would enable them to tie their FRP boats, catamarans, etc. near their settlements. Alternatively they suggested that a shed be built at the location of their present to stack the boats and the catamarans. There will be need for drinking water facilities; the need for this has all the more been felt since the drinking water available in the present settlements has been salty for quite some time. The communities said that presently the men and children defecate on the beach, the women in the forests; on resettled lands, there would be no such facilities. Hence they should be provided with toilets in the new settlements. The community seems to be convinced about the use of toilets, but preferred toilets for individual households rather than community toilets.

The need for a primary school within the settlement is a must they all said. The people fear that there might be lack of adequate space in the resettled areas. They would need these areas for drying their nets, etc.

However some honestly acknowledged that they might now move to the resettled lands to return to their present lands later. The people of Chinakotaimedu said that they were a small cohesive group of 60 families and would not like to lose their identity and be clubbed with a larger fishermen community. Nor would they like to settle too close to Thandavankulam, since the community in the latter village hails from different castes and there has been caste related problems and feuds persisting between these two communities for quite a long time.

2.5 ANALYSIS OF THE EXISTING SITUATION



**SECTION OF A COASTAL SETTLEMENT IN TAMIL NADU
that bore the brunt of the tsunami**

2.6 Suggestive process for RESETTLEMENT/ IN-SITU REDEVELOPMENT

The suggestive process for resettlement/ redevelopment have been narrated in the following steps.

Step 1: A study is to be conducted to assess the extent of damage to housing and the willingness of the community to resettle. Based on this, three situations may arise.

1. Complete relocation of the entire village and resettlement of the entire community
2. Partial resettlement of the communities whose houses have been washed away or totally collapsed or who are willing to resettle.
3. Redevelopment of the existing settlement and reconstruction/ retrofitting of houses.

The above seems imperative, since the study carried out highlights the different classes of people voicing different opinions on resettlements and it might be an Herculean task to forcefully evict all sections of community who have been staying on these lands for more than 25 -30 years now and whose houses have not been damaged in the tsunami.

Step 2: For each village carry out a need assessment for resettlement. This kind of assessment has to be at micro level since this would mean land to be allotted for the same number of households and hence this quantum of land would have to be searched for.

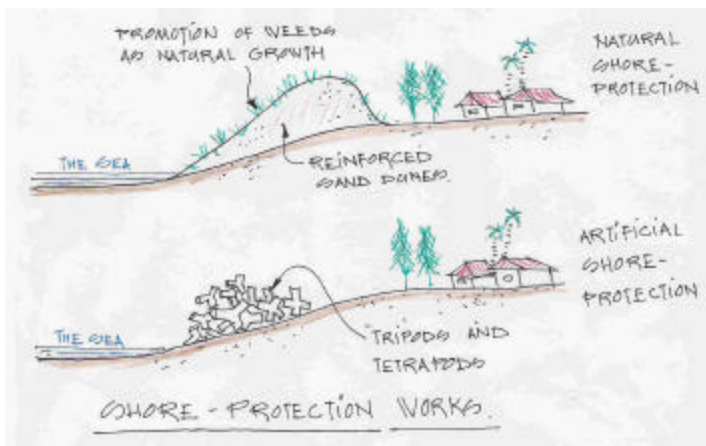
Step 3: Selection of appropriate sites for resettlement

Ask the community to identify potential areas where they would like to resettle. Consider them from the perspective of:

1. Vulnerability to hazards- tsunami, cyclone, flood, tidal surges, earthquakes, etc. This may be done through noting **the distance of these sites** from the sea and **the topography** of the area for elevation/ height of the site. Modern technologies/ tools may be used for this purpose, which include satellite maps, landuse maps, etc.
2. Proximity to the sea is also important so as to enable the people to carry on their fishing activities.
3. Current landuse the site has been put to - verifying whether it is ecologically sound, i.e., not on forest lands etc.
4. Ownership of the land, whether Govt. owned or private lands. If Govt. owned then under which department. Purchase of the land will be the next issue.
5. Legal issues of the CRZ. Whether the CRZ is to be followed strictly or not.

Step 4: Resettlement planning

1. While planning a new settlement, an in-depth study of the existing settlement pattern is necessary so as to recreate layouts and common spaces, which have evolved over time and are culturally sensitive.
2. However the above traditional layout pattern must necessarily be integrated with disaster mitigation aspects, so that risks are not again recreated.
3. Size and layouts of homesteads should provide space for carrying out the daily activities a fishermen household in coastal Tamil Nadu practice and should provide allowance for lateral and vertical growth.
4. Provisions for adequate lifeline infrastructure and common amenities like drinking water, sanitation, electricity, proper approach roads, school cum multi-hazard resistant shelters, etc. as appropriate depending upon the population have to be made.
5. Shore protection works – naturally eg. through sand dunes, coastal plantations like casuarina, mangroves, etc. and artificially eg. through tripods and tetrapods may have to be introduced specially in case of redevelopment for existing settlements.

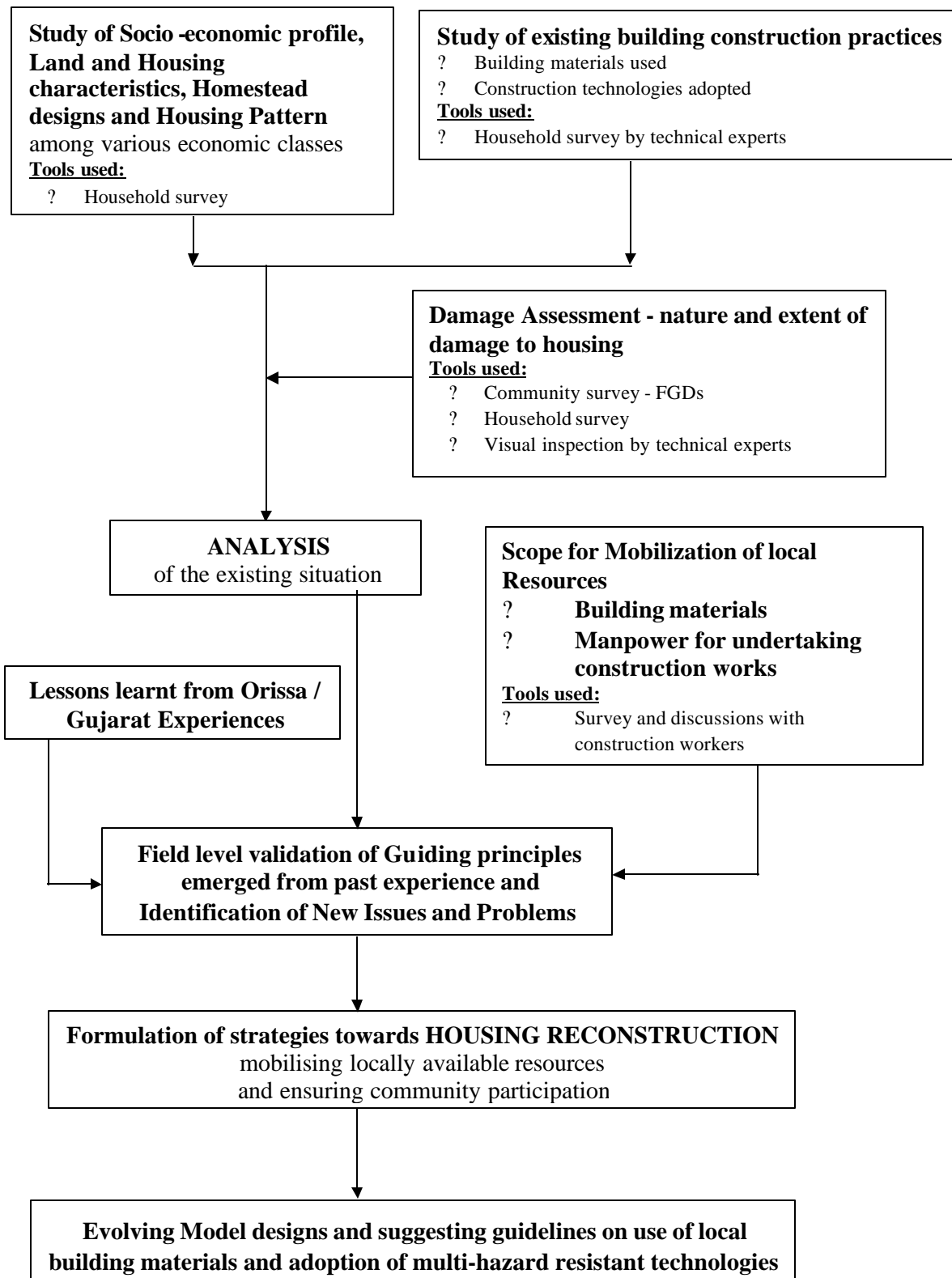


3.0. HOUSING RECONSTRUCTION

CONTENTS

- 3.1 METHODOLOGY ADOPTED FOR FORMULATING STRATEGIES ON HOUSING RECONSTRUCTION**
- 3.2 SOCIO-ECONOMIC AND DEMOGRAPHIC PROFILE OF THE COMMUNITIES, LAND CHARACTERISTICS, HOUSING CHARACTERISTICS - HOMESTEAD DESIGNS AND HOUSING PATTERN**
- 3.3 STUDY OF EXISTING BUILDING CONSTRUCTION PRACTICES**
 - ? BUILDING MATERIALS USED
 - ? CONSTRUCTION TECHNOLOGIES ADOPTED
- 3.4 DAMAGE ASSESSMENT - NATURE AND EXTENT OF DAMAGE TO HOUSING**
- 3.5 ANALYSIS OF THE EXISTING SITUATION**
- 3.6 SCOPE FOR MOBILIZATION OF LOCAL RESOURCES**
 - ? BUILDING MATERIALS
 - ? MANPOWER FOR UNDERTAKING CONSTRUCTION WORKS
- 3.7 IDENTIFICATION OF ISSUES AND PROBLEMS**
- 3.8 STRATEGIES ON HOUSING RECONSTRUCTION**
- 3.9 EVOLVING MODEL DESIGNS AND SUGGESTING GUIDELINES ON USE OF LOCAL BUILDING MATERIALS AND ADOPTION OF MULTI-HAZARD RESISTANT TECHNOLOGIES**

3.1 Methodology adopted for formulating strategies on HOUSING RECONSTRUCTION

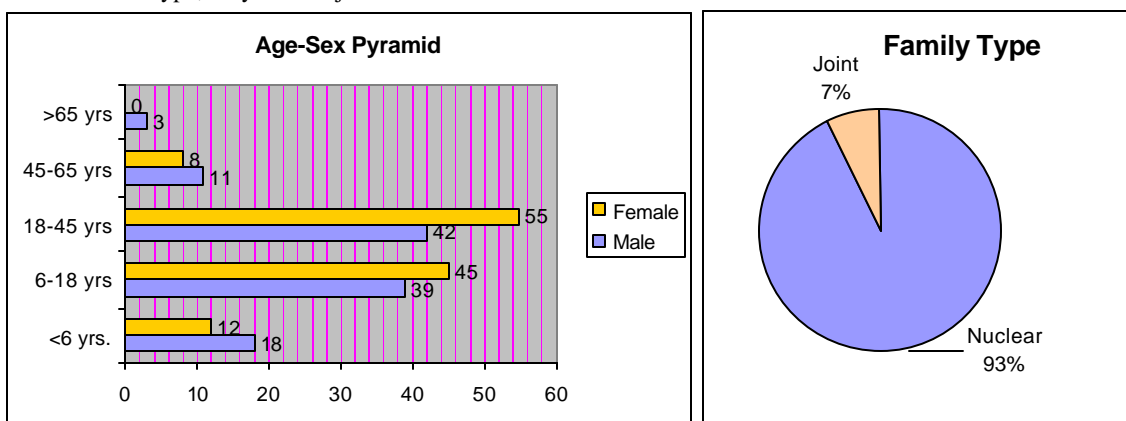


3.2 Socio-economic and Demographic profile

3.2.1 Demographic characteristics

Villages	Population	No. of Households	Male	Female
Medavamedu	1505	363	780	725
Chinakotaimedu	233	60	113	120
Total	1738	423	893	845

Chinakotaimedu is a small hamlet of 233 population and 60 families, while Medavamedu is a fairly large village with 1505 population and 363 families. The average household size is 4.1. The sex ratio is 946 females per 1000 males. The ethnic distribution of the villages show that 100% of the total population is fishermen communities of the caste "Pattanivar". As per observations from primary survey, 93% of the families are of nuclear type; only 7% are joint families.



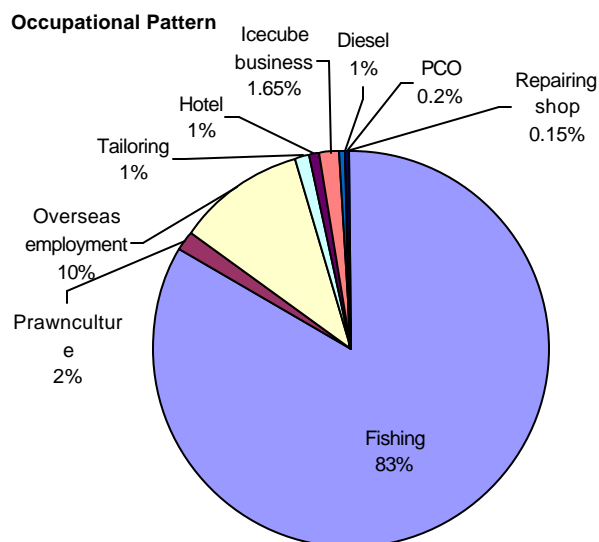
3.2.2 Socio-economic Characteristics

3.2.2.1 Occupational Pattern

Occupation Pattern of the village												
Village/ Hamlets	No. of househ olds	Non-fishing										Total
		Fishing	Prawnc ulture	Overseas employment	Tailoring	Hotel	Ic cube business	Diesel	PCO	Repairing shop		
Chinakotaimedu	60	60	0	0	0	0	0	0	0	0	0	0
Medavamedu	366	330	5	8	10	2	5	4	1	1	1	36
Pallayar	1564	1270	28	200	13	15	25	8	3	2	2	294
Total	1990	1660	33	208	23	17	30	12	4	3	3	330

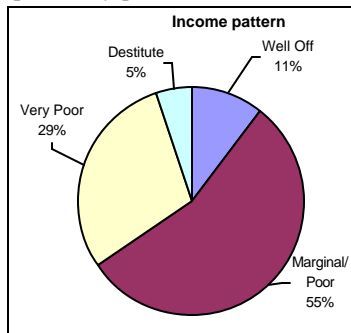
Source: Primary survey through PRA exercise

The foremost source of income of the villagers is pisciculture and 83% of the population is allied with it. There are hardly any agricultural activities being practiced in these villages. About 10% of the population depends on overseas employment, which has raised substantially the economic standards of these families and brought about strong economic disparities within these villages.



3.2.2.2 Income profile

Depending on their income and assets, all the households have been grouped into the well-off, marginal poor, very poor and destitute.



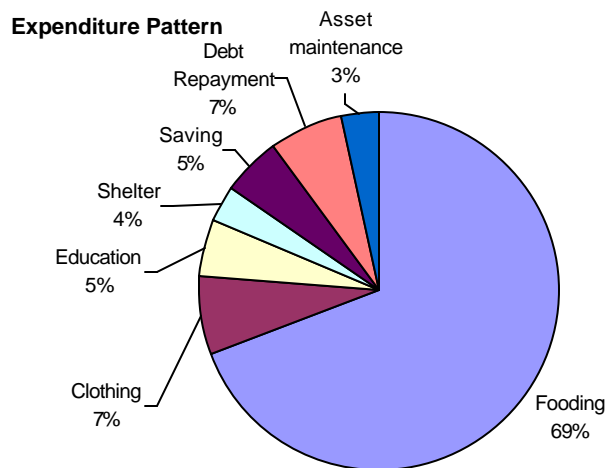
FISHER GROUP	Chinakotaimedu		Medavamedu		Overall
	No. of HHs	%age	No. of HHs	%age	
Well Off	2	3%	66	18%	11%
Marginal/ Poor	47	78%	115	31%	55%
Very Poor	8	13%	167	46%	29%
Destitute	3	5%	18	5%	5%
TOTAL	60	100%	366	100%	100%

There are about 11% well-off families, 55% marginal poor families, 29% very poor families and 5% destitute families.

3.2.2.3 Expenditure Pattern

The graph alongside highlights the approximate average expenditure of a household in these villages incurs.

On an average, people spend about 69% of their income on food, 7% on clothing and 6.75% on debt repayment.



3.2.3 Land characteristics

3.2.3.1 Legality of land issues

The people of Medavamedu and Chinakotaimedu villages have patta for their residential land while those in Pazhaiyar village have no patta, since these lands are primarily forestlands belonging to the fisheries department.

3.2.3.2 Soil Characteristics

The major soil types in the coastal region of Tamil Nadu include:

- Sandy soil
- Fine loamy
- Coarse loamy

3.2.4 Housing characteristics

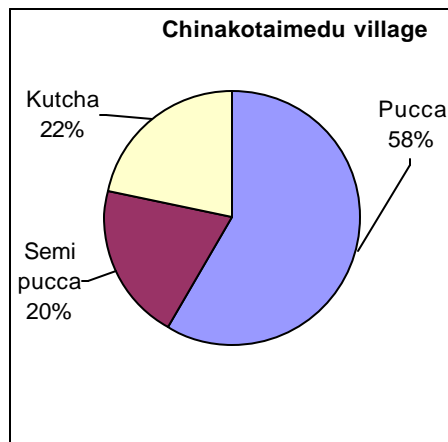
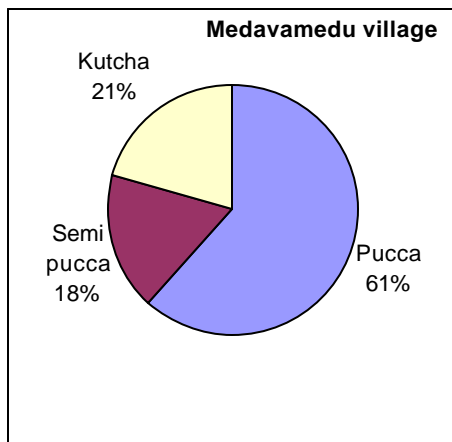
3.2.4.1 Housing Typologies

Structurally, the houses in these three villages can be classified into three categories i.e. pucca, semi-pucca and kutcha. The criteria adopted for such classification are as follow s:

	Foundation	Wall	Roof
Pucca	Brick masonry, Reinforced cement concrete	Brick wall	RCC slab
Semi pucca	Brick foundation, RCC	Brick wall	Bamboo / wood truss with plant leaf, Tile or AC sheets
Kutcha	Mud foundation	Mud wall with wooden post	Thatch roof

Name of the Village	Pucca	Semi-pucca	Kutcha	Total
Medavamedu	224	64	75	363
Chinakotaimedu	35	12	13	60
Total	259	76	88	423

In Medavamedu out of 363 households, 61% houses were pucca, 18% houses were semi-pucca and 21% houses were kutcha. In Chinakotaimedu out of 60 families, 58% houses were pucca, 20% houses were semi-pucca and 22% houses were kutcha.



A kutcha dwelling unit



A pucca dwelling unit

3.2.4.2 Housing Need, Stock and Shortage

Before the tsunami

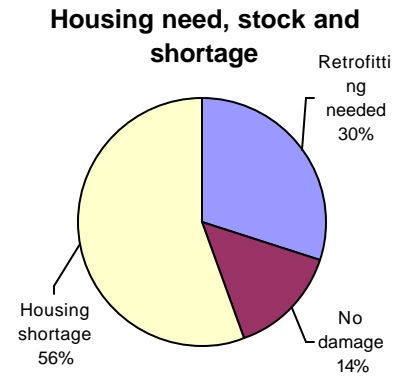
Name of village	Housing Need = No. of households		Housing Stock = No. of pucca + semi-pucca houses		Housing Shortage = Housing Need – Housing Stock (unserviceable kutcha units + badly damaged pucca)	
	Nos.	%age	Nos.	%age	Nos.	%age
Medavamedu	363	100	288	79	75	21
Chinakotaimedu	60	100	47	78	13	22
TOTAL	423	100	335	79	88	21

After the tsunami

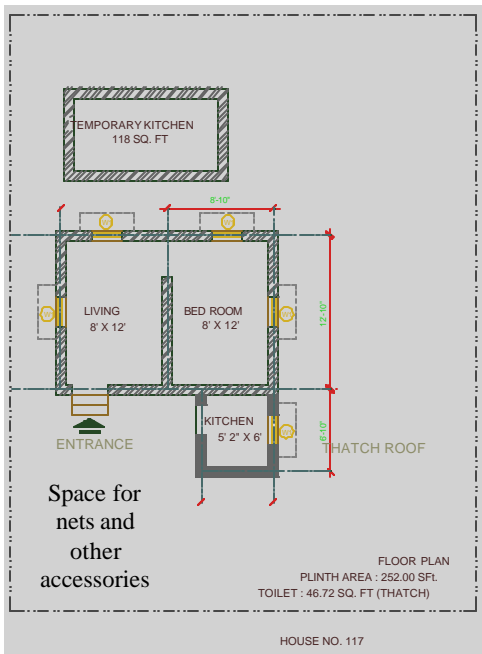
Name of village	Housing Need = No. of households		Housing Stock						Housing Shortage = Housing Need – Housing Stock	
			Not Damaged		Partially damaged houses = Retrofitting Need		TOTAL			
	Nos.	%age	Nos.	%age	Nos.	%age	Nos.	%age	Nos.	%age
Medavamedu	363	100	61	17	121	33	182	50	181	50
Chinakotaimedu	60	100	0	0	7	12	7	12	53	88
TOTAL	423	100	61	14	128	30	189	45	204	56



A fully collapsed pucca dwelling unit



3.2.4.3 Housing Pattern



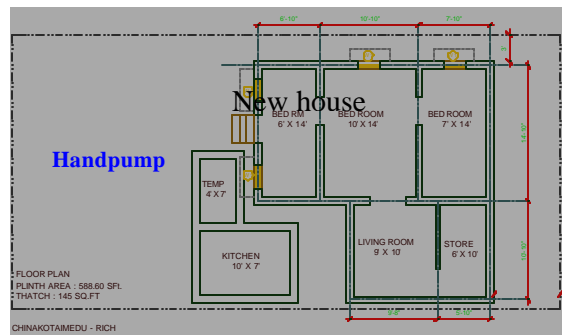
The adjoining design is the plan of residence of Mr. Panku Kutti, a fisherman of Chinakotaimedu village. His is a six-member family. The plan shows the different spaces that the family makes use of at different times of the day.

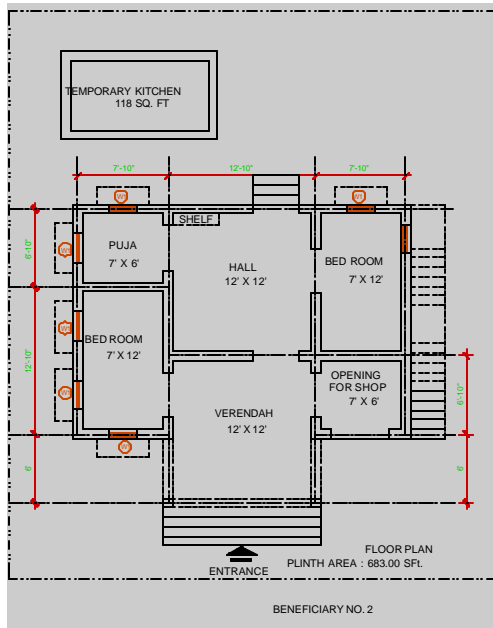
Space use:

- ? Kitchen attached to the front but not integrated with the house was a kutcha structure and was washed away. A temporary kitchen has been set up at the rear of the house.
- ? The living room is used for storing of clothes, household utensils etc.
- ? Washing is done in the homestead and not inside the house.
- ? They keep their nets and other fishing accessories near their house i.e. within the premises of the plot.
- ? They spend their maximum time outside the house with their plot for cleaning, repairing the nets, etc.

Space use:

- ? As almost always observed, the main kitchen is not integrated with the house and is used during rainy season, while in the dry season cooking takes place inside the temporary kitchen.
- ? Some portion of the kitchen is used for storing of fuel wood.
- ? The front portion of the house is under construction and is used for storing of nets and other fishery accessories.
- ? The existing building (mud wall and wooden truss with leaf roof) was not damaged fully.
- ? The shallow tube well within the plot is enclosed by trees all around and is used for bathing and cleaning purposes.
- ? To the family, the outside spaces within the plot have a strong meaning in terms of carrying out activities.



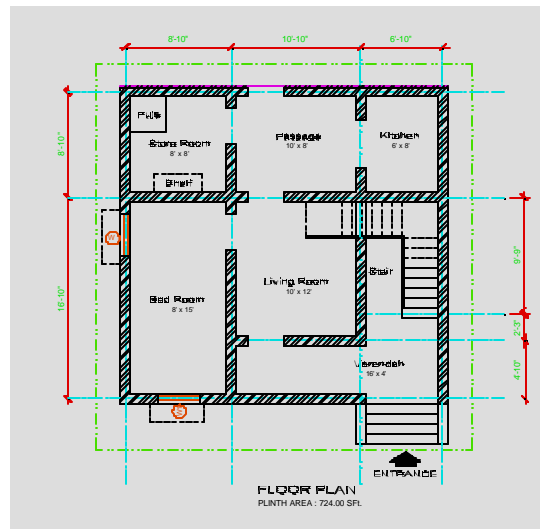


The plan alongside is that of a private building owned by a well off in the fisher community. Some salient features about the house are as follows:

- ? There is adherence to the principles of vastu – puja room located in the east side of the building
- ? Verandah and living room are actively being used for work.
- ? 3ft height of plinth protection has been provided for the house.
- ? Invariably a storeroom is located in the back-side of the house for easy access from the field area.
- ? Staircase present allows cleaning and drying of nets and fishing accessories on the roofs.

This is a newly constructed private building owned by a relatively rich fisherman. Some salient features about the house are as follows:

- ? Veranda /portico portion has been designed most attractively and is used by the entire family as sit-out.
- ? Provision has been kept for opening of a shop at the entry.
- ? Kitchen is outside in the form of a kutchu unit.
- ? For drinking and bathing purposes they also depend on the shallow tube well within the bound ary wall.
- ? Nets and catamarans, fishing equipments for cleaning and drying are kept within the plot.



3.3 Study of existing building construction practices

3.3.1 Building materials used

The following table shows the building materials being locally used:

Building materials used						
Types	Foundation	Wall	Roof	Opening	Door & window	Floor Finishing
Residence	Mud, Brick, Metal, Chips, cement, Steel and sand	Brick, mud, bamboo stick, Cement, Steel and sand	Sand, cement, steel, chips, Bamboo/Wood trusses with tiles or coconut leaves	Brick, sand, cement, wood, steel, chips	Steel, Wood, iron grill	Metal, chips, cement, sand, brick bat, marble, floor tiles, stone patching
Community hall	Mud, Brick, Metal, Chips, Steel, cement and sand	Brick, mud, bamboo stick, cement, Steel and sand	Sand, cement, steel, chips, Bamboo/Wood trusses with tiles or coconut leaves	Brick, sand, cement, wood, steel, chips	Steel, Wood, iron grill	Metal, chips, cement, sand, brick bat, marble, floor tiles, stone patching
Temple	Stone, Brick, Metal, Chips, cement and sand	Brick, stone, lime, cement, Steel and sand	Corbelled brick /stone work, cement, sand, chips, steel	Brick / stone arch, sand, steel, cement, chips	Wood and iron work, Brick / stone Jali work	Metal, chips, cement, sand, brick bat, marble, floor tiles, stone patching, mosaic

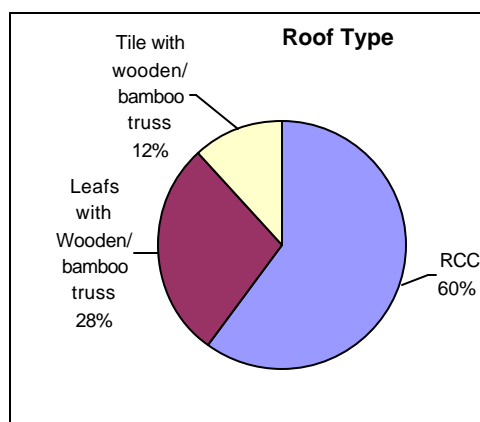
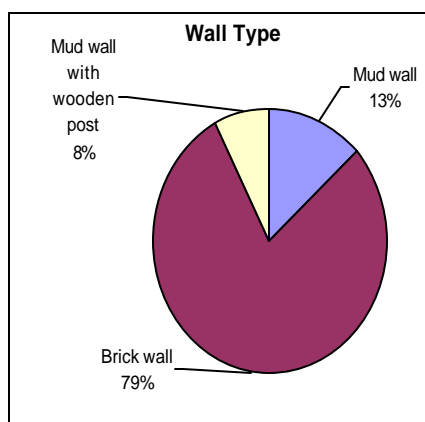
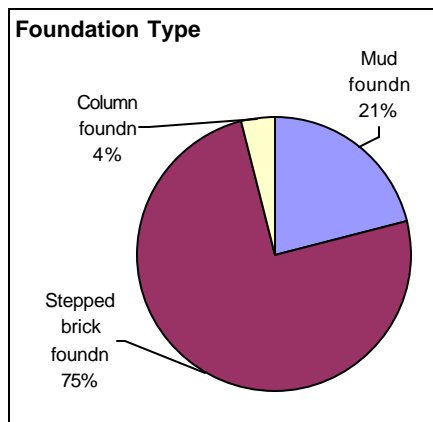
3.3.2 Construction technologies adopted

The following table shows the construction technologies being adopted in the locality:

Building technologies used						
Types	Foundation	Wall	Roof	Opening	Door & window	Floor Finishing
Residence	Mud, isolated column footing, stepped brick foundation	Mud wall, mud wall with wooden/ bamboo posts, Brick wall in English bond with cement and mud mortar	RCC flat/ sloping roof, Wood/ bamboo truss with coconut leaves /tile cover	RCC lintel,	Wood and Mild steel iron	IPS flooring, Brick bat flooring, Marble/ tile/ mosaic flooring, mud flooring
Community hall	Stepped foundation	Brick wall in English bond	RCC slab	RCC lintel	Wood and Mild steel iron	IPS flooring, Brick bat flooring
Temple	Stepped footing in brick/ stone, isolated column footing	Stone masonry with lime/ cement, brick masonry in English bond in cement / lime	Corbelled brick /stone work, RCC	Brick / stone arch, RCC lintel	Wood and iron , Brick / stone Jali	Brick Bat flooring, Stone flooring, IPS flooring, Marble / tile flooring, mosaic flooring

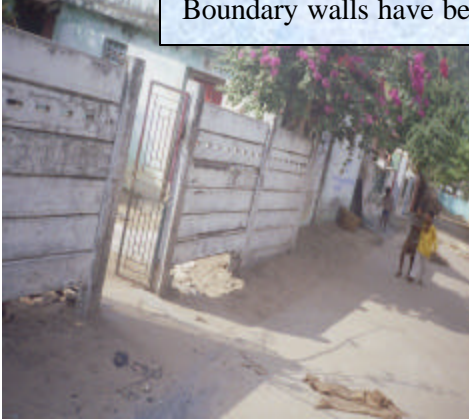
The predominant technologies used for the three major structural components of a house, viz. as foundation, wall and roof are:

Name of Village	Foundation (in nos.)			Walling (in nos.)			Roofing (in nos.)		
	Mud foundation	Stepped brick foundation	Column foundation	Mud wall	Brick wall	Mud wall with wooden post	RCC	Coconut leaves on Wooden/bamboo truss	Tile with wooden/bamboo truss
Medavamedu	75	265	23	49	288	26	224	97	42
Chinakotaimedu	13	46	1	8	47	5	35	18	7
Total	88	311	24	57	335	31	259	115	49



- ? 75% of houses have stepped foundation and 4 % have isolated column footing & 21% have mud foundation.
- ? 79% houses have brick wall with cement /mud mortar, 8% houses have mud wall with wooden/bamboo post inside and 13% houses have purely mud wall.
- ? 60% houses have RCC flat/ sloping slab roof, 28% houses have wooden/ bamboo truss with coconut leaves and 12% houses have wooden / bamboo truss with country tiles.

Boundary walls have been constructed through panels and coconut trees



Kitchen of a kutchcha house



Kitchen – a pucca unit but never integrated with the main house

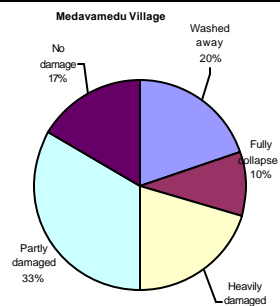
Kitchen always outside as an ancillary unit to the house

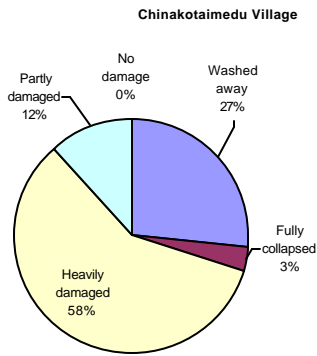
3.4 Damage to housing

Villages	Washed away	Fully collapsed	Heavily damaged	Partly damaged	Not damaged	Total
Medavamedu	73	35	73	121	61	363
Chinakotaimedu	16	2	35	7	0	60
Total	89	37	108	128	61	423
%age of damage	21 %	9 %	26 %	30 %	14 %	100%

Medavamedu village

The total no. of house holds in village Medavamedu is 363. All the houses are primarily used only for residential purposes. Out of the total houses 20% houses have been washed away, 10% houses are fully collapsed, 12% houses are heavily damaged, 41% houses are partly damaged and 17% houses are not damaged. 138 boats, 135 nets and 362 household utensils had been damaged.



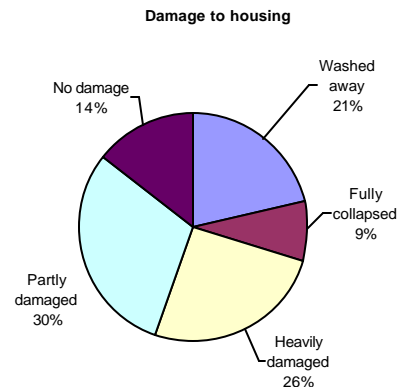


Chinakotaimedu village

Out of the 60 families living in the village Chinakotaimedu 27% houses have been washed away, 3% houses are fully collapsed, 58% houses are heavily damaged and 12% houses are partly damaged.

Overall damages in both the villages

It has been observed that the overall 21% of houses have been washed away, 9% of houses are fully collapsed, 18% houses are heavily damaged, 38% houses are partly damaged and 14% houses are not damaged.



Damages to roof



Damages to foundation



3.5 Analysis of existing situation

3.5.1 Location of the settlement

All the three villages are located very close to sea. Most of the people have *patta*. The ground level of the settlement is not much elevated compared to the mean sea level. The people of Pazhiyar having acquired the govt. land without patta constructed their houses.

3.5.2 Land and soil characteristics

The soil pattern of these two villages is mainly loamy & sandy. As they are cohesion less, scouring during tsunami is easier.

3.5.3 Housing characteristics

- ? Nearly 85% of the houses for the poorest families have been washed away or fully collapsed. These were basically unserviceable dwelling units.
- ? Some of semi pucca houses, which were near to the sea or in a low-lying area, have either fully collapsed or heavily damaged.
- ? The longer side of the walls of houses facing the sea was more affected.
- ? Most of the marginal poor and very poor families have two rooms, of which one was being used as living and the other as bedroom before tsunami.
- ? People use the open spaces within their plot to keep their nets and fuel wood.
- ? Almost all families cook outside within the open space inside their plot using firewood as fuel.
- ? Nearly 10% of the people who are well off are using their own toilet. The remaining 90% families defecate outside.

3.5.4 Building materials and technologies

3.5.4.1 Foundation

Existing building practices

- ? The mud houses have no strong foundation.
- ? Most of the pucca and semi-pucca houses have foundation just one to two feet below the original soil level.
- ? Few of the pucca houses have a strong Isolated & stepped footing.

Damages which occurred due to tsunami

- ? The damages occurred to the buildings due to scouring of sand from foundation.
- ? Cracks have developed in most of the buildings due to foundation settlement.

Analysis of the damages which occurred

- ? The depth of foundation is less so scouring has taken place.(<1m)
- ? No binding between PCC, foundation and plinth
- ? Sufficient corner lapping and cover to reinforcement were not properly placed
- ? The plinth height is less so sea water ingress below, so floor gets damaged.

3.5.4.2 Plinth Details

Existing building practices

- ? Nearly 6" plinth height in kutchha houses.
- ? In semi pucca houses nearly 1 feet is the plinth height.
- ? Most of the buildings have nearly 1 to 1.5 feet plinth height.
- ? Private buildings have nearly 2 feet plinth height.

Damages which occurred due to tsunami

- ? Most of the kutchha houses have been washed away.
- ? Plinth as well as plinth band of the semi pucca and pucca houses have been damaged.

Analysis of the damages which occurred

- ? No binding between walling to plinth bands.
- ? Sufficient cover not provided to the reinforcement in lintel and chajjha.
- ? In case of mud houses the wall heights should not be so less.
- ? No reinforcement like bamboo or wooden planks to the mud houses.

3.5.4.3 Wall Details

Existing building practices

- ? The height of wall is very low in Kutchha houses.
- ? In case of semi pucca houses and some RCC sloped roof the wall height is nearly 7' .

- ? Almost all private pucca houses have nearly 10 feet wall height.

Damages which occurred due to tsunami

- ? The walling of mud houses has been washed away.
- ? Walling of some semi pucca houses have been partly damaged & some of them are fully washed away
- ? Most of the walls of private pucca houses have not been damaged.

Analysis of the damages which occurred

- ? For mud walls there is no tie between truss, purlins, posts in the wall, so all behave as separate unit.
- ? There is no connection between roof, wall and foundation so each component behaves as separate unit

3.5.4.4 Roof Details

Existing building practices

- ? The mud houses have rafters made of bamboo & local wood.
- ? Most of the mud & semi pucca houses have coconut & palm thatch roofing cover, which they usually change every 2 to 3 years.
- ? Few of the semi pucca houses have tile roofing.
- ? In pucca houses the roof is sloped on both sides in case of govt. houses & all most all roofs are flat in case of private houses

Damages which occurred due to tsunami

- ? The thatch roofing has been severely damaged.
- ? The tile roofing are partly damaged, few of them are fully damaged which are nearer the sea & in low - lying area.
- ? Few of the pucca houses have collapsed.
- ? Cover concrete portion has already been removed causing rusting of reinforcement.

Analysis of the damages which occurred

- ? The roof has been washed out because of the flow of water.
- ? Opening near sea face should be avoided.
- ? Because of improper covering & poor quality of RCC the bottom portion of concrete has fallen down.

3.6 Scope for Mobilization of local resources

3.6.1 Availability of local Building materials

In the case study area, the predominant building materials used for housing, the source of availability, the distance, mode of transportation and cost of materials at source, etc details are mentioned in the table below. This approximately holds good for the affected coastal settlements of the state.

Local Building Products availability in the village Chinakotaimedu and Medavamedu						
Sl. No.	Name of item	Source of availability	Distance in Km.	Mode of Transport	Unit	Cost incl. transporting in Rs.
1	Brick of good quality	Vallmbadi	15	Lorry, Truck, Tractor, Bullock cart	1000 nos	1850
2	Local Brick	Pudipatnam	4	Truck, Bullock cart	1000 nos	1500
3	Cement	Pudipatnam	4	Truck, Bullock cart	Per bag	300 to 320
4	Good quality Sand	Kolidum Kaveri river	15	Truck, Tractor, Bullock Cart	Per Cum	250
5	Local Sand	Local	5	Truck, Tractor, Bullock Cart	Per Cum	130
6	Coarse Aggregate (20mm)	Elaversanar kottai	120	Truck, Tractor	Per Cum	750
7	Coarse Aggregate (40mm)	Elaversanar kottai	120	Truck, Tractor	Per Cum	650
8	Steel (12,10,8,6mm)	Sirkali	25	Truck, Tractor, Bullock Cart	Per qtl.	2650
9	Binding Wire	Sirkali	25	Own arrangement	Per Kg	35
10	Tiles for roof	Sirkali	25	Truck, Tractor, Bullock Cart	Per piece	5.50 to 6.00
11	Sky light (1.5' + 1.5')	Pudipatnam	4	Own arrangement	Per piece	45
12	Iron Grill	Sirkali	25	Tractor, Bullock Cart	Per Kg	45
13	Cost of wood door (3.5'+7')	Locally		Own arrangement	Per No.	2000
14	Cost of wood window (3'+4')	Locally		Own arrangement	Per No.	1000
15	Shuttering	Locally		Own arrangement	Per Sq.mt.	70
16	Bamboo	Locally		Own arrangement	Per piece	70
17	Bamboo stick (10 pieces) 2' thick & 15' long	Locally		Own arrangement	Per bundle	100
18	Well ring (3' dia & 1' depth)	Pudipatnam	4	Bullock cart	Per No.	120
19	For boundary wall construction Slab of 6' x 1'	Pudipatnam	4	Bullock cart	Per No.	120
20	Slab Post (7.5' high)	Pudipatnam	4	Bullock cart	Per No.	210
21	Lime	Serkali	25	Own arrangement		10

Source: The house owner of the village and the owner of mini buildings center at Pudipatnam

A local mini building centre

There is a small building centre, which is more of a sanitary mart located 4 km away from the village Chinakotaimedu named as Maruti construction owned by a private person, which has been running for 15 years. The major building materials produced include:

Sl. No	Name of building materials	Unit	Cost at source
1	Well ring of size 3' dia & 1' depth	Per piece	120.00
2	Sky light per piece (size 1.5' x 1.5')	Per piece	45.00
3	RCC planks for boundary wall of length 6' and width 1'	Per piece	120.00
4	RCC posts to hold the slab in boundary wall of height 7.5'	Per piece	210.00

Source: - Maruti construction, Pudhipatnam

Note: The owner is not aware of the techniques involved in production of building materials like fly ash bricks, concrete blocks & hollow concrete block. Such local building center may be forced and used for massive reconstruction work.

3.6.2 AVAILABILITY OF MAN POWER

A significant finding has been the existence of a Construction Artisan Federation in this region, with its office at Pudhipattinam for 15 years now. There are about 400 artisans including 150 masons, carpenters, electricians, plumbers, rod binders, etc, in the federation. The members hail from about 5 km radius from Pudhipattinam. They conduct periodic meetings on the first of every month. The artisan members of the federation are as follows:

BUILDING SKILLS A VAILIBTY IN LOCALITY									
Name	Description	Approx. no. in locality	Level of skill	Necessity of skill up gradation	Does the mason feel the need for any training	Are they sufficient	Approx. experience in the field	Shortage to do the construction work (Yes/No)	Market rate in Rupees
Mason	Skilled	150	Moderate to high	Required	Yes	No	5 to 20 years	Yes	130
	Unskilled (Men)	More than 100	Helper/ Some times as assistant	Required	Yes	No	1 to 7 years	Yes	80.00 to 100.00
	Unskilled (women)	More than 100	Helper	Required	Yes	No	5 to 20 years	Yes	50.00 to 60.00
Carpenter	Skilled	More than 50	Head carpenter	Required	Yes	Yes	8 to 25 years		
Electrician	Skilled	More than 20	Moderate to high	Required	Yes	No	8 to 20 years		140
	Unskilled	More than 40	Moderate	Required	Yes	No	1 to 7 years		80.00 to 100.00
Plumber	Skilled	More than 15	Low to Moderate	Required	Yes	Yes	3 to 25 years		80.00 to 140.00
Bar-bender	Skilled	More than 100	Moderate to high	Required		Yes	5 to 25 years		100.00 to 130.00
Painter	Skilled	More than 50	Moderate to high	Required	Yes	No	5 to 20 years		100.00 to 130.00

3.6.2.1 Skill assessment of the local masons

The following skills of masons were assessed through a detail technical study of houses of the well off, the marginal poor & poor families, which they had constructed. It was observed that the quality of construction of well-off families is very good, of the poor families very poor. 11% houses are of good quality. Out of 68% of pucca and semi-pucca houses, the construction quality is not appreciable. As felt and stated, skill upgradation seems to be essential for the artisans. The following table shows the quality of construction works for the houses of the well off, marginal and poor families. The survey does not include the quality assessment for kutchha houses.

Qualitative assessment of construction works						
Name of village	MEDAVAMEDU			CHINAKOTAIMEDU		
	Poor man's House	Middle class person's house	Rich man's house	Poor man's House	Middle class person's house	Rich man's house
Foundation	Very bad	Good	Very good	Very bad	Good	Very good
Plinth height	Very bad	Good	Good	Very bad	Bad	Good
Plinth band	Bad	Good	Good	Bad	Bad	Good
Walling	Good	Good	Very good	Good	Good	Good
Roofing	Bad	Bad	Very good	Bad	Good	Good

Qualitative assessment of construction works						
Name of village	MEDAVAMEDU			CHINAKOTAIMEDU		
Description	Poor man's House	Middle class person's house	Rich man's house	Poor man's House	Middle class person's house	Rich man's house
Plastering	Bad	Bad	Very good	Bad	Good	Good
Flooring	Bad	Good	Good	Bad	Bad	Good
Coloring	Good	Good	Good	Good	Good	Good
Parapet work	Very bad	Bad	Good	Bad	Bad	Good
Door & Window	Bad	Good	Very good	Very bad	Very bad	Good

Source: Primary survey in both the villages

On interviewing masons, electricians, plumbers on different aspects of construction it was found that they need further capacity building to upgrade their skill. There are some artisans in the village of Medavamedu, who were working in Singapore and abroad but are not ready to participate in the reconstruction programme.

3.7 Strategies on Housing Reconstruction

The process has to be collaborative in nature with the active participation of all stakeholders and building up of partnerships.

Suggestive guidelines for the massive reconstruction process

Step 1: Finalising the legal issues for resettlement.

Step 2: Damage assessment of habitats and finalising through community participation one of the three options below:

1. Complete relocation of the entire village and resettlement of the entire community
2. Partial resettlement of the communities whose houses have been washed away or totally collapsed or who are willing to resettle.
3. Redevelopment of the existing settlement and reconstruction/ retrofitting of houses.

OUTPUT: Quantum of need for Reconstruction and retrofitting to be assessed and mapped.

Step 3: Settlement Planning to be completed. Micro-level **LAND IDENTIFICATION** based on vulnerability analysis etc. and **FINALISATION of TECHNOLOGIES** for protection of habitats either organically or artificially have to be accomplished

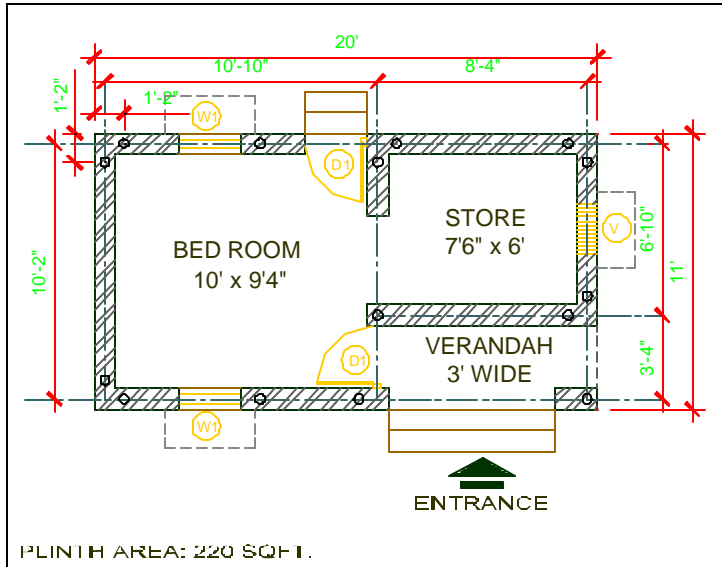
Step 4: Planning for Reconstruction works

1. **Design options and range of costing**
 - ? **An advisory committee may be formed at the state level.**
 - ? **A consultation** may be organized wherein experts would identify a range of architectural designs - creative and culturally sensitive. Also, building materials, technologies, and structural designs can be finalised, which is of primary importance since structural safety at times of calamity is the main issue. Arrive at a set of standard design options, recommendations of the local materials to be used, technologies to be adopted and the costing of it
2. **Assessment of resources that can be mobilised and Mapping of the same**
 - ? Building materials: Quantum of building materials and quality of the same while procurement
 - ? Technologies: Appropriate multi hazard resistant technologies,
 - ? Manpower: Quantum of manpower required for all levels – coordinators, facilitators to the mason at the grassroots level.
 - ? Finance: Quantum mobilised.
 - ? Organizations: Numbers and their strength and operational areas.
3. **GAP ANALYSIS:** For all the above resources, gap analysis to be done based on quantum of need minus resources available and generated - building materials supply, manpower at all levels, finance, need for any policy and strategy revisions, etc
4. Facilitation of interaction between the community and the various facilitating organizations for various kinds of activities so that the community is able to select a model reconstruction process, which may be that through an NGO/ CBO or through themselves.

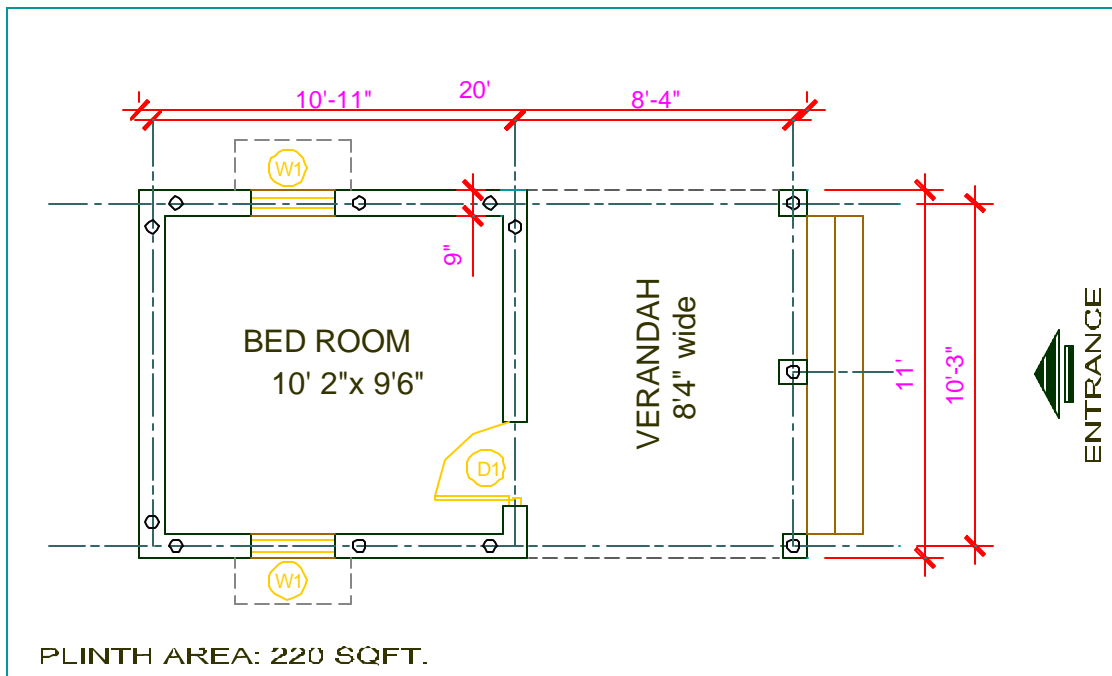
Step 5: IMPLEMENTATION

3.8 Evolving Model designs and suggesting guidelines on use of local building materials and adoption of multi-hazard resistant technologies

OPTION - 01

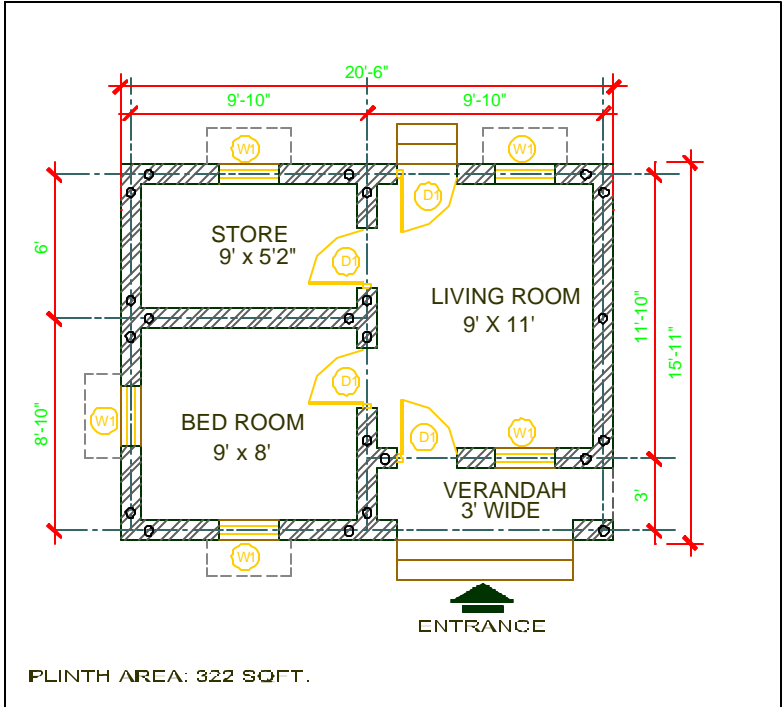


OPTION - 02



OPTION - 03

OPTION - 03



4.0 SHELTER AND HABITAT DEVELOPMENT FOR TSUNAMI AFFECTED VILLAGES IN INDIA

4.1 ISSUES:

The tsunami of December 2004 has affected 927 villages in the country and rendered about 158,000 families in the states of Tamil Nadu, Pondicherry, Kerala and Andhra Pradesh homeless, devastating several habitats and bringing about changes in ecomorphology. The table below is for reference:

	Andhra Pradesh	Kerala	Tamil Nadu	Pondicherry	Total
No. of villages affected	301	187	376	33	897
No. of dwelling units damaged and to be reconstructed	1557	17381	128394	10061	157393

The primary cause for the high damage is related to the location of the settlements on the coastline of India. The Government had formulated and passed the Coastal Regulation Zones (CRZ), 1992, prohibiting permanent settlement within 500 metres of the coast. However this has not been enforced in these areas where the settlements have existed for more than 25-30 years. In the aftermath of this tsunami and devastation to these entire coastal habitats, the Government is now considering relocation that is resettlement of some of these communities along with reconstruction of their habitats.

Substantial resources have become available for reconstruction from variety of sources. Gaps still exist however in technical expertise for designing effective habitats that are culturally sensitive, that respect the pattern of the past settlements evolved over time and at the same time integrate technically sound disaster mitigation measures. There is also need for an effective coordination mechanism linking all stakeholders and all levels of Government concerned habitat reconstruction, which ensures a participatory approach, building from the concerns of the dwellers themselves.

The India United Nations Country Team will be able to draw upon its experience in Orissa after the supercyclone of Oct, 1999 and in Gujarat after the earthquake of Jan, 2001 towards promotion of appropriate disaster-resistant technologies for habitat development and shelter reconstruction using intense community involvement and a participatory approach.

4.2 APPROACH:

- ? Advocating and supporting Government to develop integrated habitat plans in a participatory manner that are culturally sensitive, respect the way of living of fisher communities, enable economic and livelihood opportunities as well as protect the entire habitats against future natural disasters. Habitats designed will also integrate water and sanitation measures, renewable energy technology and construction of multi-hazard resistant multi-purpose shelters. Based on the extent of damage to housing and the willingness of some of the communities to resettle, one of three situations may arise:
 1. Complete relocation of the entire village and resettlement of the entire community, while ensuring continued access to the coastal areas for fishing and fish processing.
 2. Partial resettlement of the communities whose houses have been washed away or totally collapsed or who are willing to resettle, while redevelopment and retrofitting for possible dwelling units in the existing settlement itself.
 3. Complete in-situ redevelopment of the existing settlement and reconstruction/ retrofitting of houses therein.
- ? Reducing the vulnerabilities of the habitat by offering technical guidance not only to the habitat as a whole but also to the built environment i.e., community infrastructure and dwelling units (houses). The above can be brought about by promotion of multi-hazard resistant technologies and evolving the designs of houses with active participation of the community, designs that are culturally appropriate, and enables scope for future expansion.
- ? Ensure that the relocated communities have adequate right to economically productive land. In the case of fishers, that they retain right to the land where they have been living on the shore, as workspace for their boats, fish processing equipment and nets.

The ultimate goal is that all these vulnerable communities are settled in habitats that are designed to be safe and culturally appropriate and where all built infrastructure are multi hazard-resistant.

4.3 ACTIVITIES:

1. Facilitating development of proper habitat plans for all affected villages using a participatory approach involving the community, civil society organizations and local Governments.
2. Evolving design options for houses with participation of the community i.e., the end user and ensuring that the designs while respecting the activity pattern of a typical fisher household incorporate multi-hazard resistant technical features. Finally facilitating the selection of a design option by each household.
3. Support the Government in identification and mapping of available local resources – building materials, technologies practiced, local skills and expertise, etc. Assessing the gaps in the same and adopting effective measures towards bridging the gaps eg. through conducting skill upgradation and capacity building programmes of various stakeholders, strengthening existing construction artisan guilds and formation of new ones, promotion and strengthening of existing building centers and material banks, creation of community groups for management of shelter and habitats, etc.
4. Capacity building of selected women SHGs to take up construction related income-generation activities including skill upgradation of women construction laboureres to masons and setting up of small micro-enterprises.
5. Construction of Technology Demonstration Units (TDUs), mainly community centres integrated with capacity building of local artisans and promotion of appropriate multi-hazard resistant technologies. These demonstration units are to trigger off effective transfer of appropriate multi-hazard resistant technologies in housing.
6. Provide technical and programme management support to the Government at state, district and taluk levels for effective delivery of habitat development and shelter reconstruction package.
7. Supporting the Government in developing an effective monitoring mechanism for the same ensuring that the entire process takes into account community participation and adheres to the standards of cost, time and quality for reducing vulnerabilities and facilitates insurance of housing and common properties against fires and natural perils.
8. Support a legal process for fishers to retain usufructory right of the land on the shore for economic activities as well as temporary shelters.