HABITAT MAPPING OF CHINANGUDI

A Study of Chinnangudi Village in connection with Tsunami Reconstruction Project

Benny Kuriakose

South Indian Federation of Fishermen Societies (SIFFS)

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By

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Most bureaucrats and politicians perceive a programme of public housing as nothing more than the construction of a series of 'boxes', one per family. A million families are bundled into these ill fitting cells without being able to say a word about the design, and however much science is applied to the grading of families and the matching of them to their dwellings, the majority are bound to be discontented. They do not realize that providing housing involves much more than just building houses.

— Hassan Fathy, 'Architecture for the Poor'

FOREWORD

The December 2004 tsunami caught us completely unawares. Surprisingly, for a twenty five year old coastal organisation, SIFFS had no previous disaster experience. Functioning for most of its life on the lower south west coast of India (Kerala and Kanyakumari), SIFFS was quite sheltered from natural disasters including cyclones that regularly thrash the east coast of India. Our lack of disaster expertise was soon compensated by the arrival of a number of volunteers from all over India with previous disaster experience. SIFFS became a platform that attracted committed and talented people from different parts of India, many of whom had worked together in the Gujarat earthquake. As a fishermen's organisation anxious to ensure proper rehabilitation, we decided to take on responsibilities that were outside our core competence making use of the external expertise made available to us.

SIFFS as an organisation has extensive expertise in fishing livelihoods and none whatsoever in housing. However, the support of a large number of individuals and organisations with experience in post disaster housing, gave us the confidence to get into both temporary and permanent shelter construction. This appeared to be an excellent opportunity to put into practice all that had been learnt from previous disasters and housing programmes. The very lack of previous experience became our strength. Instead of being limited by in-house expertise, as is the case with most organisations, we had the opportunity to tap the awesome talent that was outside and willing to help. The support of the architect couple Anu and Krishna, who were among our initial volunteers, helped us make a mark in the temporary shelter stage. The support of Sushma Iyengar from Kutch with links to a number of organisations with housing experience also gave us the confidence to stake a claim to building 2000 permanent houses in Nagapattinam district.

However, the huge volunteer force that had come immediately after the tsunami started fading away with every one needing to catch up with their routine work. By March 2005, our housing related plans looked uncertain and we were not sure as to who would provide the leadership to the programme. It was at the stage that Benny Kuriakose arrived on the scene bursting with ideas on disaster resistant housing and his own unique analysis of what had happened to houses and settlements during the tsunami. Interestingly, Benny had started his career in Trivandrum and one of the first buildings he constructed was a SIFFS boat building centre. After spending a few years in the alternative technology centre run by the Kerala People's Science Movement, he had moved on to Chennai and developed an independent practice that included both mainstream and alternative architecture. Whilst building houses for cinema stars, he also found time to build post disaster houses in Latur and Kutch. However, his fame today rests on the "Dakshinachitra", a unique project on the East Coast Road showcasing the traditional architectural styles of South India.

The SIFFS team under Benny has been thinking big and initiating a number of path breaking initiatives with respect to settlement planning, housing design, construction methodology and people's participation. The "total station" survey of the topography of Chinnankudi was probably the first such exercise ever undertaken in Nagapattinam district and it is increasing recognised as an important tool for planning in a district prone to waterlogging. This settlement study was another pioneering work in the district and perhaps for any fishing village in India. With the help of a large group of motivated architecture students who came to learn, Benny organised this settlement study based on inspiration from similar work done in other parts of the world.

SIFFS is happy to bring out this document that was essentially meant as an input for our new settlement plan and house design exercise. Benny has prepared this document in a way that it is likely to be of interest to lay persons as well as professionals and agencies interested in post disaster housing, social housing and housing for the fisher folk. This is just the first of a series of documents we intend to bring out sharing our experiences in tsunami reconstruction. Future documentation would include the socio-economic study we conducted, the plan that we developed and the participatory processes we undertook in both Chinnankudi and Tarangambadi villages.

V.Vivekanandan
Chief Executive, SIFFS

PREFACE

This report is based on a habitat mapping study of the Chinnankudi village in Nagapattinam District, Tamil Nadu, South India. It was carried out by a team of architects, students, engineers and planners. The field visits, which included a series of interactions with the villagers, were carried out from 2nd June, 2005 to 12th July, 2005.

While working on this project, SIFFS gained valuable experience in the various facets covered. This knowledge has so far not been made available to a wider public and it should not remain only in the memories of the individuals who worked on the project. To prevent the loss of this vast experience–both positive and negative – and to share the knowledge gained by SIFFS, the production of a series of publications covering the various sectors of the project is being planned. The first of these publications is the one presented herewith on the habitat mapping of Chinnankudi village.

It is hoped that with this publication on the habitat mapping of Chinnankudi (and with the others to come), the SIFFS' experience, its working methods and its efforts to improve and improvise itself in accordance with the micro-level situations, including the socio-cultural, technical and economic dimensions, will be useful to a range of architects, planners, engineers, sociologists and the interested public.

Despite the range and depth of this study, and the care taken to ensure quality at every stage of the exercise, there are some limitations. The attempt is to embrace the whole problem as comprehensively as possible. The following are the limitations of the report.

- The measurements of the plot and the houses have been plotted to a scale of 1:400 only.
- Some of the houses could not be measured due to lack of access.
- Locations of external structures (outside the main structure), such as kitchen, bathroom, temporary structures etc. may not be accurate.
- The positions of trees and other vegetation are approximate.
- In the case of fully demolished houses, the data might not be accurate.

I would like to thank Mr. V. Vivekanandan, Chief Executive of SIFFS and the whole team of professionals (many of them who contributed voluntarily), my friends in SIFFS and above all, the villagers for giving all help, which made this study possible.

Any comments, criticisms or suggestions on the study will be appreciated.

Benny Kuriakose,
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CHAPTER ONE

Introduction

Over the years, the failure of numerous public housing projects has forced the design community to take a second look at how housing projects are conceived, developed and implemented. The analyses of the causes of failure and the inferences gathered from studies on failed public housing projects has led to a major shift in the "approach" to the designing of housing projects.

It is very clear that a majority of public housing projects fail because they do not factor in critical issues such as the lifestyle of people, the socio-cultural norms and the architectural idiosyncrasies of that region. Designs are made based on presumptions and notions rather than on a clear understanding of the needs and aspirations of the people, and are imposed on the beneficiaries. Therefore it is not very hard to understand why such projects often fail.

Chinnangudi is one of the two villages in Nagapattinam district of Tamil Nadu in which SIFFS has taken up the task of housing reconstruction for the tsunami affected families. A total of four hundred houses are to be rebuilt in Chinnangudi. SIFFS is keen on promoting the option of *village re-planning*: neither *in situ* nor relocation. This means that the existing roads will be widened, the people having less than three cents of land will be given three cents of land and there will be a general improvement of all amenities. Since the Government of Tamil Nadu promised to provide three cents of land for all those who agree to relocate beyond 500m, SIFFS felt that the same facility

should be provided to all those who remain within 500m. This has two motives. One is to ensure that people living in safe locations (sufficiently elevated) within 500m do not relocate unnecessarily, taking the risk of being farther away from the sea — their main source of livelihood. The other is to ensure that the original settlement does not remain congested and a source of the poor quality of life that a fishing community normally suffers from.

It is necessary to understand the way the community was structured physically in space before one can plan for reconstruction. This is because a higher proportion of the members of the community have a common profession – fishing. This also calls for specific spatial design criteria in terms of location of the houses with respect to the sea, requirement of open spaces for beaching craft, drying nets and fish and so on. Hence it was deemed necessary to do a detailed habitat mapping before coming up with recommendations on various options for houses and spaces.

1.1 Habitat Mapping

Habitat mapping is an exercise done to bring out the characteristics of a locale not only in quantity but also in quality, both at the micro level and at the macro level. It includes the study of not only the distribution of houses and the usage of space within the houses, but also the common spaces and the village as a whole.

In general, most rural planning studies are done at the macro level and general guidelines are laid out. But in this case, the study goes into the details of each house.

1.2 Objectives of the Study

The objectives of the present study of the settlement in Chinnangudi village are the following:

- To document the local knowledge about the topography and drainage, and the history of floods, cyclones and other natural disasters,
- To understand the peculiarities of the settlement in terms of land use, circulation, hierarchy of spaces, use of spaces etc.,
- To emphasize the need for understanding socio-cultural aspects of people in order to be able to design houses that satisfy them,

- To introduce a new dimension to local level, resource based planning of the settlement in a more scientific way, and
- To collect data at the extreme micro level of the individual plots.

The study proposes to show the importance of integrating the local knowledge of the community with the scientific and technical data; as well as the need for architects, engineers, sociologists and planners to work closely with people in the community in conducting research and compiling information on the local settlement. In addition, it hopes to show how the data collected by the community as well as by professionals can formally augment and supplement one another. This will eventually improve the access to scientific and technical data by the community, as well as the quality of data available in the community. This will lead to the empowerment of the citizens and enhanced participation in decision making processes.

Communities must understand that the mapping, while time and resource intensive, is not the end point in itself. The power of habitat mapping lies in what happens after the resources have been identified. The results of the mapping are used to inform community members on how best to accomplish their goals with the existing resources and where to focus their efforts on siting and development of the settlement. The information gained by habitat mapping should be used to create new partnerships for community building.

1.3 Procedure of Mapping

A total station survey of the village was carried out containing the following details:

- The streets in relation with the beach and the river.
- The electric posts, telephone posts, wells, water taps, hand pumps etc.
- The contours of the land at an interval of 0.25 metres
- The location of the public buildings and vegetation in the common areas.

The total map of the village was divided into grids. Each grid map covered a group of houses or public buildings surrounded on all four sides by streets or any definite landmark. A checklist of all the data which was to be collected was also given to the individual teams.

The data collected had to be accurate enough for a map to be generated in 1:400 scale required for the micro-level study envisaged. Such data was fed into the computer and the review of each day's work was done in the evening. Any discrepancies found in the work had to be set right after cross-checking the relevant information the very next day.

1.4 Methodology

The following methodology was adopted in the study;

- Manual survey for gathering architectural data such as street width, plot size, plinth area, building materials for flooring, walling and roofing, vegetation, extent of damage to the house, usage of enclosed spaces.
- Interaction with the villagers for gathering information on their needs, preferences and aspirations, and on life before and after the tsunami.
- Visual documentation of key features of architectural interest in the form of drawings, photographs and sketches.

The study was carried out by architects, planners, sociologists, engineers and students of architecture from different parts of the country with the help of village volunteers. Discussions were held with senior members of SIFFS and the villagers at regular intervals to ensure quality and consensus at every stage.

A detailed socio-economic survey regarding the specific requirements and preferences of the villagers was also done and provided valuable inputs to the study.

CHAPTER TWO

Chinnangudi

Chinnangudi is a small fishing village located off the Coromandel Coast, under Pillaiperumal Nallur *panchayat* in Nagapattinam District. It is located 35 kilometres north of Karaikal (a part of the Union Territory of Pondicherry).

Map 2.1 shows the location of Chinnangudi with respect to the nearby villages.

According to the Praxis report on Chinnangudi (Praxis 2005), there are 563 households in Chinnangudi village. The demographic profile of Chinnangudi is given in Table 2.1.

Table 2.1
Demographic Profile of Chinnangudi (Praxis 2005)

Demographic Profile - Population (Nos)	No.of People
Total population	2,475
Men	1,273
Women	1,202
Young men (below 25) with 10 years of schooling	161
Young women (below 25) with 10 years of schooling	172
Children up to 1 years of age	85
Children up to 5 years of age	228
Children above 5 years (up to 14 years) of age	596
Widows	64
Widowers	9
Elderly people over 60 years of age	112
Disabled people	33

Setting out to sea

Men at Work

The Old Ruined Temple

Tarred Road

2.1 Topography of the Land

Traditionally, along the Nagapattinam coast, many of the fishermen settlements have come up on naturally elevated sand dunes. When the settlements grew, the people had to settle in the low lying land around the old villages. In the case of Chinnangudi, the central part of the village is elevated and has gradual slopes on all four sides so that rain water runs off quickly into the sea.

2.2 History

Chinnangudi was nothing more than a scrub forest about two hundred years ago. It started off as a neighbourhood of about 10 fishermen families and has since grown to a village of more than five hundred families. The first settlers of Chinnangudi were from surrounding villages like Tarangambadi (Tranquebar). This is evident from the family names of the villagers - each family line has its native village name attached to it (for example, if Mr. Veerasamy's ancestors were from the village of Tarangambadi, then his name would be Mr. Veerasamy Taragambadiyar). A majority of families have such names which indicate a very mixed populace and extensive immigration, though they hail from the same caste.

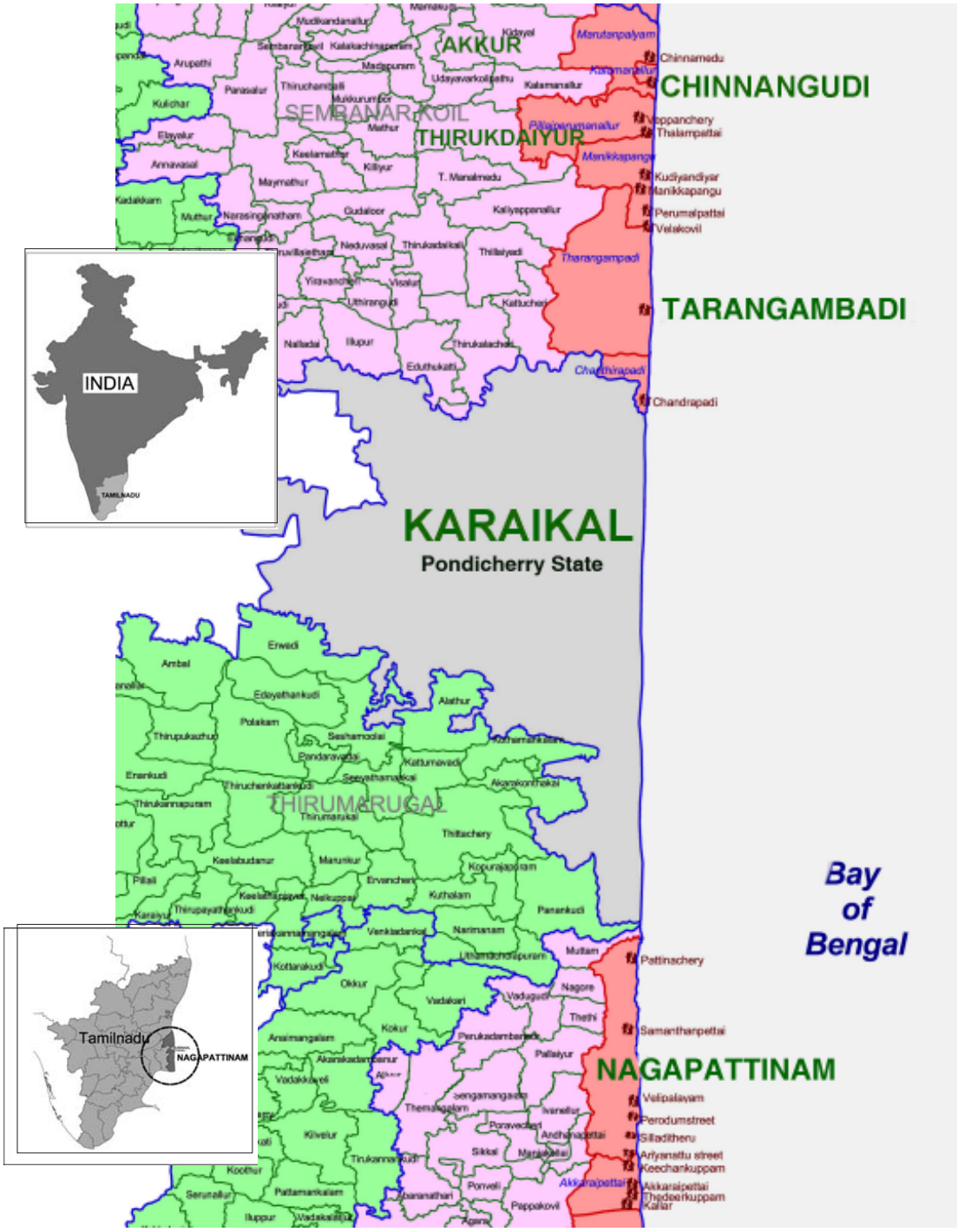
The original neighbourhood was located around the old dilapidated temple located on the beach front. As the population of the village increased, the village started expanding westwards.

It is interesting to note that the primary core of the village is situated on high ground. This must have been dictated by the topography and vegetation existing there at the time of the first settlers (the surrounding areas could have been a swamp). The process of development of the village in terms of physical infrastructure was hastened in the last 35 years with the construction of the tarred road to the village. The public transport network also improved subsequently.

2.2.1 South Buckingham Canal

The South Buckingham Canal which passed through the village between the beach and the old dilapidated temple has since been filled up with silt and sand, and all that remains today of the Canal is a slightly depressed land formation which still acts as the drain for rain water to flow from the village into the sea. The Amman River or *Manjal Aaru* (literally "yellow river") that

Map 2.1
Political Map of Chinnangudi



Source: UNICEF - United Nations Children's Fund
R&D, GIS Cell, TWAD Board, Chennai-5

Government Colony House

Low Mud Wall and Palm Thatch Roof

Mangalore Tiled Roof

Low Brick Wall

flows on the southern side of the village used to be deeper and was navigable.

There is a ruined brick structure near the mouth of the river. One of the village elders said that it was a resting place for colonial British while they travelled along the South Buckingham Canal.

2.2.2 Government Housing Scheme

The Tamil Nadu Government carried out a colony housing scheme in the village in the early nineteen eighties. More than two hundred houses were built using brick and cement for the walls and reinforced concrete (RCC) for the roof.

Because of the poor quality of construction, many of the houses deteriorated very rapidly. In many cases, the villagers changed the RCC roof into thatch or tile according to their financial capacity. A few houses have been abandoned by their owners. Now there are only fifty three houses which have not been modified in some way or the other. All these are in a very bad shape today, but people continue to live in them as they have no alternative.

In interactions with the villagers, it became obvious that the villagers are aware of the poor quality of construction of these houses. They did not want the same mistakes to be committed in the case of the reconstruction project for the tsunami victims.

2.3 Architectural Aspects

The vernacular architecture[1] of Chinnangudi is modest. The most prominent feature of traditional buildings is the sloping roof. When one looks at a building, it is the sloping roof that is first visible. The low roof protects the walls from sun and rain and keeps the interior cool. The rainwater is not allowed to fall on the walls, which may be made of thatch, brick or mud.

The roof is also an important factor in determining comfort. Both the tiled and thatched roofs are light. Moreover they allow free

[1] Vernacular Architecture is characterized by the

i. Use of local materials in a functional style devised to meet the needs of common people in their time and place;
ii. Building by people without the benefit of plans by an architect;
iii. Indigenous, tribal, folk, peasant and traditional architecture

flow of air between them, because of the gap between the tiles or the leaves used as thatch.

The smallest single housing unit has at least two rooms and a veranda. There are no large houses in the village (e.g. with a courtyard). A *pooja*[2] room indoors and an outdoor kitchen are essential parts of a majority of the houses.

In Chinnangudi village, people spend most of their time outdoors during the day. The window openings are very few for the rooms inside the house, mainly to ensure privacy or security, according to feedback from the villagers.

In a warm humid climate the use and control of wind is very important for comfort. The more the wind movement, the greater is the comfort. The design should be so as to maximize wind flow through the house.

2.4 Building Materials and Techniques

For the load bearing masonry, the foundations are usually built with burnt bricks. For the superstructure, brick in mud mortar as well as brick in cement or lime mortar is quite common.

In the case of mud walls, the load of the thatched roof is usually taken by the bamboo poles which are hammered deep into the ground. The low mud walls which may be from one and a half feet to three feet high give the privacy required inside the houses. The use of mud walls (without ramming, or using sun dried bricks) is common among the poor. Mud mortar is also used in many buildings constructed with burnt bricks.

Stone is rarely used in the buildings because of its non-availability in the area.

The most common type of flooring is cement based. In the less affluent houses, the flooring is of beaten earth, polished with cow dung at regular intervals of time. In many traditional buildings, the original beaten earth-cow dung flooring had been changed to cement flooring.

Timber is the predominant roofing material. Bamboo and palm timber are used in abundance. Coconut thatch lasts only for a year, while palm thatch lasts for about four years. Tiled roof

Traditional Alignment of Doors

Bamboo Roof

Palm Thatched Roof

Coconut Thatch as Walling and Roofing Material

[2] Prayer room or niche

Outdoor Verandah

Verandah as a Raised Flatform

Verandah Enclosed into a Room

Bamboo Gate

buildings with semi circular tiles as well as Mangalore tiles are also common in the village.

Bamboo is also used in the less affluent houses for the columns as well as for the roof.

Only the affluent people in the village, mainly those who have gone abroad for employment, are able to construct RCC roofed buildings. Most of these houses were constructed without the involvement of any engineers or architects and they are poor imitations of the RCC constructions in the city.

It is often the traditional masons who become the labour contractors and take charge of the residential construction in the village. The entire workforce including the masons, carpenters and others comes from the nearby villages or from Akkur Junction on the Chennai-Nagapattinam highway, about seven km away.

2.5 Usage of Various Indoor Spaces

2.5.1 Veranda

Many houses have either a veranda or a *thinnai* (raised platform) in the front, enclosed into a room in some cases. The veranda is mainly used for repairing nets, for drying fish and for socializing while the rooms in the front part of the house are used for storage of nets, outboard engines and other materials. The veranda acts a transition space, easing the movement from the bright and sunny street into cool and dark interiors. The entrance doors of almost all the houses face either north or south.

2.5.2 Rooms

Almost all houses have two rooms — a multipurpose room and a bedroom — and a *pooja*-cum-storage area. Larger houses have an extra storage room and a kitchen. Most of the houses have the kitchen as an extension of the house with a lean-to roof, or as a separate thatched shed. The interiors of the houses are dark and lack air movement due to poor ventilation. The only ventilation available is through the open doors and small *jalis*[3] or ventilators. The eastern and western walls have tiny ventilator type *jaIis* or windows which make adequate ventilation impossible. The

[3] Jalis are openings which are given in stone, terracotta, timber, concrete etc.

Local Materials such as Bamboo, Coconut Thatch and Mud are used for Construction

Outdoor Kitchen

Firewood Stove

Pooja Space

Traditional Decoration in Wall

ventilators or windows of the internal rooms are provided in the eastern or western wall.

2.5.3 Kitchen

All houses have an outdoor kitchen irrespective of whether they have an indoor kitchen or not. The kitchen is usually located at the back of the house in the south-eastern corner. The majority of households in the village use firewood for cooking in traditional earthen stoves built by the women. The stoves generally have two cooking units which are made using terracotta pots. A pair of new terracotta pots is placed on their sides with their openings facing the cook. The pots are then covered with clay till only a portion of the curved bulge is visible from the outside, at the top. The exposed portion is chipped away to make two equal sized holes on which the cooking vessels can be placed. Finally three mounds are built outside the perimeter of each hole to hold the vessels in position. The whole structure is smoothened with clay and cow dung to give it a smooth and pleasant finish.

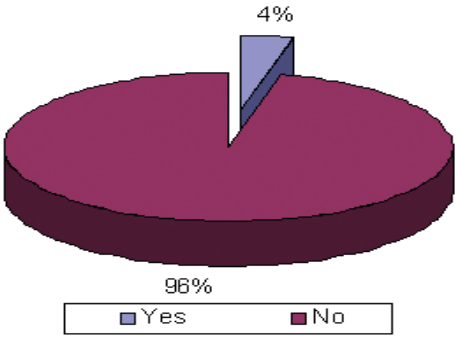
2.5.4 Pooja

Almost all houses have a *pooja* room which always faces the east. No one sleeps in this room even if the house is quite small. If the room is large enough, they use it for storing water, grains and other belongings. Women bring twenty-one terracotta pots as part of their dowry. Even the '*Adukku Paanai*' (stack of terracotta pots) is stored in the *pooja* room in many houses.

2.5.5 Bathroom and Toilet

Few houses have bathrooms and toilets. People bathe in a ramshackle arrangement of old thatch or plastic sheets serving as the four walls; or in the open. (Chart 2.1)

Chart 2.1
Houses and Toilets



The women bathe early in the morning or late at night for lack of privacy at other times. The beach and areas with thick vegetation nearby are used for defecating. The chief reason for not having toilets in their premises was attributed to the lack of good and dependable water supply and drainage.

After the tsunami, many bushes have been cleared and hence women find it very difficult to use the open areas for defecating. There is a great demand from them for the provision of toilets in the houses.

Adukku Paanai

2.5.6 Storage

Storage is a major issue in all households of Chinnangudi. There seems to be a shortage of storage space in every house. Planks are put across the roof truss members and this loft space and built-in shelves are used for storage.

In Chinnangudi very few people buy firewood. Women collect it from bushes and trees in the nearby scrub land, It is generally stored (usually on bamboo stilts) under the eaves at the side or the back of the house. Better provision for storing it during the rains has to be provided.

Storage of Nets

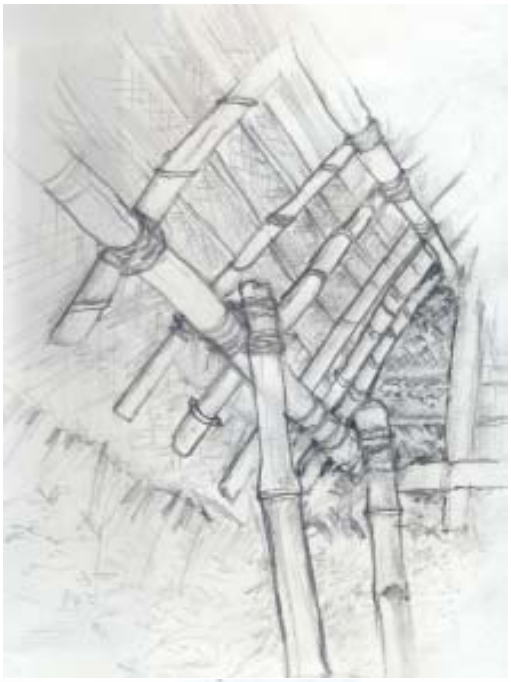
The storage of water (for meeting the needs of three or four days) is necessitated by the erratic water supply and hence sufficient storage space has to be allocated for this. The terracotta pots (that a bride brings as part of the dowry) which are used to store rice, also take up a lot of space. Considerable space is also required for storing nets and other fishing gear. Most houses have a steel cupboard in which all valuables and clothes are stored. This works very well for small families but in households with large families the problem of storage becomes a big issue.

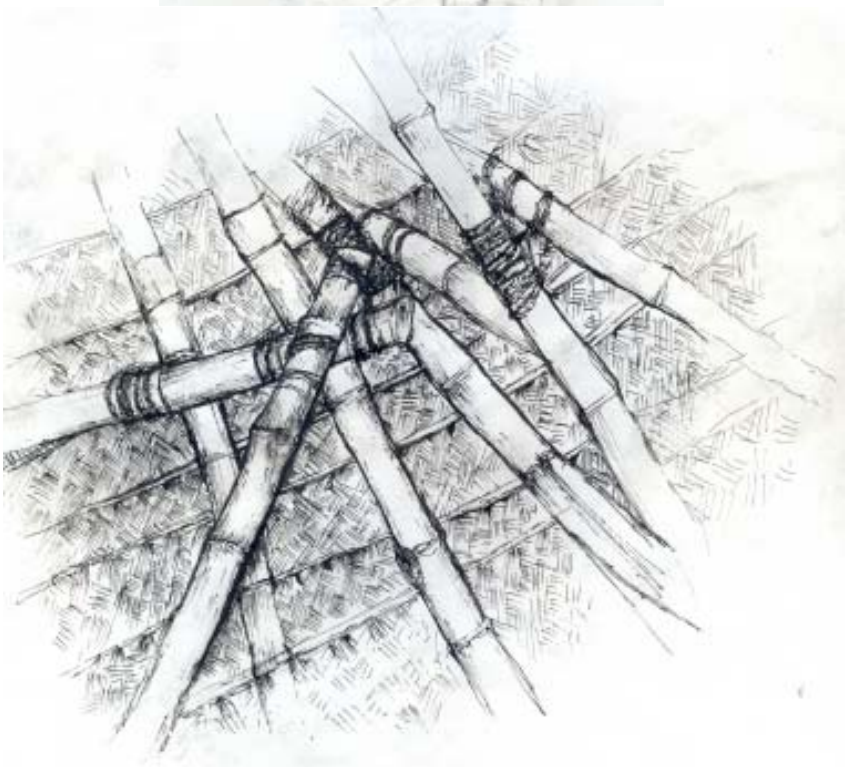
Storage of Nets

2.6 Usage of Various Outdoor Spaces

The village has a small fish market complex which is never used except during rainy days. After the tsunami, the Government built a permanent structure with concrete roof for storing and repairing nets within two hundred metres from the shoreline with no input from the villagers who feel that the building is too small for them to repair nets. At present villagers repair nets on the beach or in their houses according to the availability of space.

Storage of Water





Construction Techniques of Thatched Roof

On the west side near the main road is the village temple built in the traditional style and forming the focal point for all meetings in the village. The traditional *panchayat* meetings are held in the temple. The temple has a public address system and a television set for public viewing. Attached to the temple are some shops which are accessed from the street.

Auction Centre

Two primary schools take care of the educational needs of the community. Older children go to Akkur for high school education. The village also has a primary health care centre with a nurse on duty, and a civil supplies outlet. All the facilities mentioned above are located on one side of the open space in front of the temple. A cyclone relief shelter lies neglected and in disuse at the entrance to the village.

Women at Work in Auction Centre

The burial ground, shared with the people of the next village Chinnamedu, is located outside the village near the beach on the north-eastern side. It was at an elevation, but after the tsunami, the ground level has been lowered.

2.6.1 Auction Centre

A typical day for the women begins with an auction on the beach when the men folk return from the sea with the day's catch. The auctioning process takes place on a large concrete platform on the beach, now in poor condition. During night the auction is shifted to the main road under a street light. The women buy fish in the auction and travel to Akkur Junction and neighbouring villages for retail sales.

Beach

2.6.2 Beach

Apart from the auctioning process, the beach also plays host to other fishing related activities like cleaning and repairing nets, drying fish and making catamarans.

Bringing in the Catch

2.6.3 Vegetation

There are a large number of trees in most of the plots. Neem (*Azadirachta indica*) and Poovarasu (*Thespesia populnea*) are the two most commonly found trees in the village. Neem is used for making doors. *Poovarasu* is used to make furniture, doors and windows. Trees are cut before they become too big.

2.6.4 Streets

The streets in Chinnangudi are perpendicular to the beach in the east-west direction. The tarred arterial road connects the village

Narrow Street

Well Defined Street

with the nearby towns. The village has expanded on both sides of the road. (Map 2.2 – Network of roads…)

Two other streets which run in the east-west direction are also quite wide. The other streets are quite narrow. The pathways and streets together play a very important role in the social life of the village.

People sit on the verandas fronting the streets and discuss everything from fishing to politics. Children have no other place to play but the streets of their village which are free from vehicular traffic and therefore safe. A child playing in the street is a common sight.

Women use the streets and pathways to meet others in the village.

2.7 Infrastructure

Water supply and sanitation rank high in importance in the value added component in a coastal fishing habitation project. Many villagers might not have had toilets and bathing facilities in their old houses. In the new layout, the water closet and the bath and wash areas can be added outside the core house or as part of it depending on specific requirements. Provision for storage of water is another important aspect.

A general understanding about the kind of internal roads that are going to be provided is also necessary.

2.7.1 Water

Drinking water is provided through piped connections (Praxis 2005) spread throughout the village, from two overhead tanks. The villagers also get water from hand pumps found throughout the village. However, most of these have gone dry or only provide brackish water. The piped water supply in the village is very erratic, even on the scheduled alternate days, forcing the people to store water for a few days.

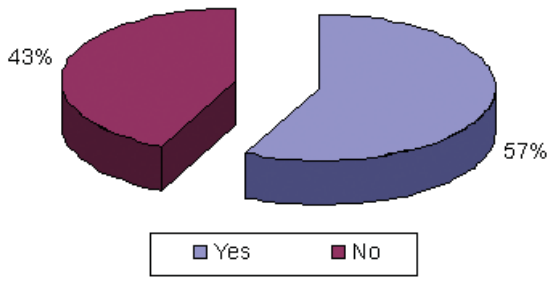
2.7.2 Sanitation

Chinnangudi lacks a proper sewerage system. 96% of the houses do not have toilets. The lack of toilets coupled with the practice of defecating in the open is a potential health hazard. Waste water is allowed to run into the street or to the plants in the garden, due to lack of a drainage system. There is no solid waste management at all. The wastes generated are dumped in the outskirts of the village.

2.7.3 Electricity

About 57% of the houses have electricity (Chart 2.2). A fishing village, unlike an agricultural village, needs electricity only for meeting household requirements. Therefore, the demand for electricity is not very high.

Chart 2.2
Houses and Electricity



Water Tap

Storage of Things

2.7.4 Communications

Telephone connectivity is available in the village in a few houses. The village also has a cable network from which cable connections are provided to subscribers.

2.7.5 Roads

A tarred road that connects Akkur and Chinnangudi is the only way to reach Chinnangudi by motorized transport. The village has a small network of metalled, concrete and mud streets, some of which are quite narrow. Regular bus service is available from Chinnangudi to Akkur every half an hour.

2.8 Social and Cultural Aspects

The fishermen lead simple lives and their homes reflect this aspect of their lifestyle.

2.8.1 Family Structure

The nuclear family system is prevalent. There are few joint families in Chinnangudi. Sons usually move out and find their own accommodation as soon as they get married.

Most of the new houses have been constructed in the periphery of the village in the low lying areas.

2.8.2 Traditions and Beliefs

The people of Chinnangudi follow certain traditions and beliefs in connection with the usage of space. These inherited traditions

Temporary Bus Shelter

Street as a social meeting place for women

are followed zealously. Thus, all *pooja* rooms face east. It is also customary for the cook to face east. The circulation within the house is simple and linear, which means that the front and back doors are along the same line.

2.8.3 Social Relationships

Community bonding in Chinnangudi is remarkably high and the whole village is like one big family living in different homes. The neighbours make sure that a family that is away from home (out of town) gets its fair share of water, their children are taken care of and their property safeguarded.

2.8.4 Leisure Activities

Television is a major source of entertainment for the villagers. The village has a television installed near the temple for the entertainment of people who live in the temporary shelters and those who do not have television at home. The men generally chat while doing some work such as repairing or making nets; and occasionally play cards as well. The women chat in the front yard or in the streets under the shade of trees while cleaning fish or combing their hair.

The children play different games on the streets of the village. Playing with glass marbles seems to be a favourite with the smaller kids while the bigger ones play cricket. The teenagers play cricket and beach volleyball and also have a full fledged village team for both games. It is interesting to note that a new game called 'Tsunami' is played by the kids wherein one person (who is called Tsunami) is supposed to catch the other kids who try to run away from him/her.

2.9 Gender and Occupation

Women play a crucial role in the overall economic life of the village. The auction centre on the beach is one place where it becomes very clear, even to the casual observer, about the extent of responsibility and workload womenfolk share with men. The proceedings at the auction centre (which start at about six in the morning when the fishing boats return) are dominated throughout by the women who buy the fish, sort it and take it for selling outside the village. The men go out into the sea in the early hours of the morning and start returning at daybreak. They spend the rest of the day repairing nets, servicing boats, doing other household related work and chatting. The women

generate the much needed extra income for the family by selling the fish in the neighbouring villages. A few houses have shops attached which are mostly taken care of by women.

Auction Centre

Repairing the Nets

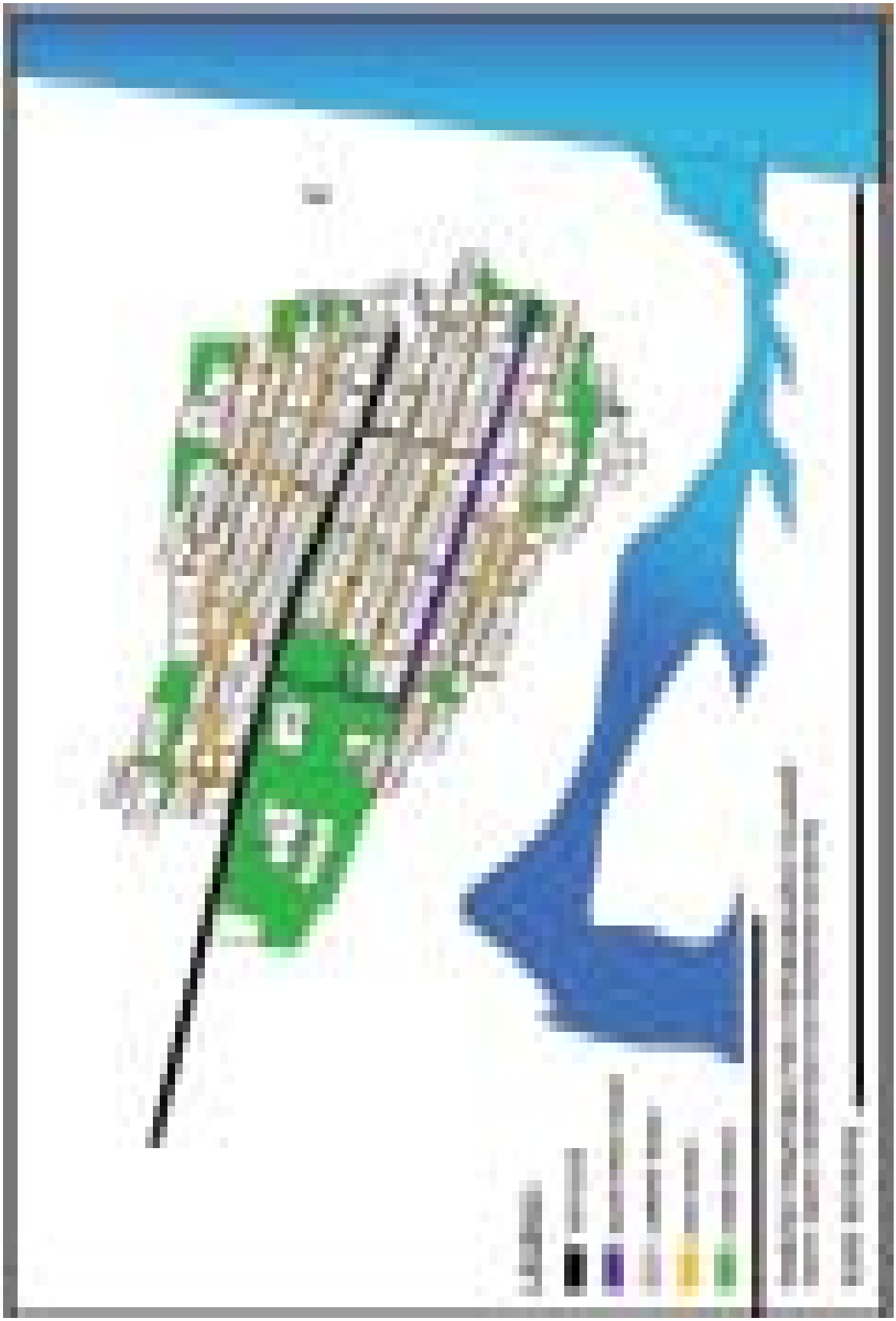
Table 2.2
Details - Based on Occupation (Praxis 2005)

Details - Based on Occupation	Numbers
Total number of fish vendors	361
Widows selling fish	46
Fish vendors over 50 years of age	90
Fish vendors between 40-50 years of age	78
Fish vendors between 30-40 years of age	113
Fish vendors between 18-30 years of age	28
Minor fish vendors below 18 years of age	6
Total number of fishermen	597
Fishermen above 50 years	76
Fishermen between 40-50 years	107
Fishermen between 30-40 years	143
Fishermen between 18-30 years	233
Minor fishermen below 18 years of age	38

2.10 Political Aspects

The traditional village *panchayat* of the fisherfolk (not part of the elected local bodies of the Government) is a committee of six to eight elected representatives. There is no fixed term as such for the traditional *panchayat* and the *panchayat* committee stays in office as long as it enjoys the favour of the villagers. The villagers have the right to recall any member of the committee should they feel that the person in question is not doing his job well. The village *panchayat* enjoys a great deal of power and is a major source of influence over the villagers in all matters that pertain to the village as a whole.

Map 2.2
Network of Roads and Paths



CHAPTER THREE

Tsunami — The Aftermath

A quick visual survey established beyond doubt the destruction caused by the tsunami. The scars are still visible in the form of destroyed houses, shattered boats and uprooted trees. The people of Chinnangudi have since returned to fishing after a break of three months following the tsunami. About 250 families now live in temporary shelters constructed by various NGOs (Non Governmental Organisations). The destructive nature of the tsunami is still fresh in their minds.

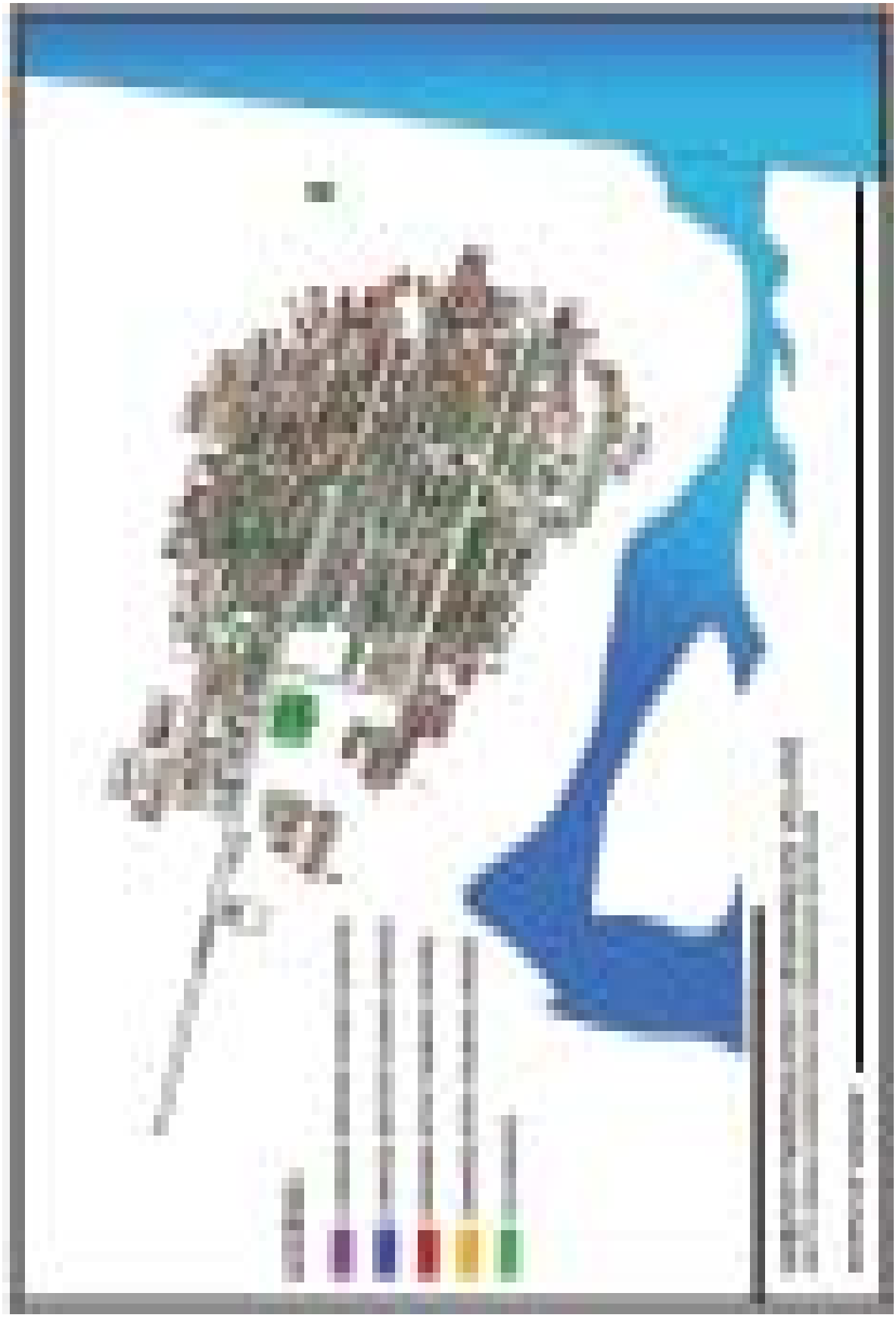
Table 3.1
Demographic Profile - After Tsunami (Praxis 2005)

Demographic Profile - After Tsunami	Numbers
Total Households	563
Women headed households	110
No. of houses partially destroyed	123
No. of houses fully destroyed	134
No. of Total Deaths by Tsunami	47

3.1 Water Flow/Drainage Pattern

The water flow pattern of the tsunami was dictated to a large extent by the topography of the land. The core of the village is on higher ground compared to the peripheral areas of the village, and this caused the wave to rush in faster around the northern and southern peripheries of the village. These waters

Map 3.1
Extent of Damge



came in with great force (unimpeded, due the flat profile of the land and the lack of any obstruction in the form of vegetation or man made structures) and met each other at the far end of the village (close to the temple) causing great damage to life and property (Map 3.1).

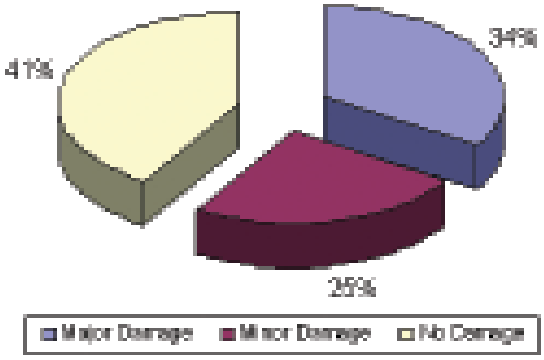
This analysis is validated by the data on death pattern *vis-à-vis* the spread of dead bodies (Map 3.2) which shows that 60% of the dead bodies were found at the seaward end of the village (with which the wave made first contact) and 40% at the western end of the village, close to the temple area. The built environment and open spaces also had a role to play in dictating the inundation pattern.

3.2 Analysis of Building Damage

The houses that were fully damaged and/or have suffered major damage were mostly those close to the beach on the eastern, northern and western sides of the village, where the elevation is low compared to the rest of the village. Houses closer to the beach are at higher risk from wave action.

The houses on the southern side that are close to the river have survived with no damage, since they are elevated above the ground level with a raised plinth compared to other houses. The southern side of the village gets flooded from the Amman River frequently. People living in those areas took extra precautions while building houses by raising the plinth. Even here, those houses which did not have raised plinths were badly damaged by the tsunami.

Chart 3.1
Distribution of Extent of Damage



Damaged Wall and Roof

A House Stood there

Damaged Flooring Material

Damaged Roof Beam

There is very little damage in the centre of the village because of the elevation. The quality of the building is also a factor which determines the extent of damage to buildings.

41% of the houses had suffered major damages, which means that the houses were fully destroyed or the damages were such that they affected the building critically (Chart 3.1).

3.3 Physical Damage

The degree of damage varying from house to house even within a small area seems quite puzzling at first glance. An analysis based on the field work and the study makes many things clear. The thatched houses were supported by strong bamboo poles rooted deep inside the ground. The low mud walls which form the perimeter offered little resistance to the rushing waters and were washed away whereas the brick walls of the RCC roofed houses, being the load bearing members, gave direct resistance and as a result, collapsed, bringing the roof down.

Most of the houses have developed cracks and have plaster flaking off at the base where the water made contact with the walls. The flaking of cement plaster can be attributed to the mechanical forces exerted on the wall due to crystallization of salt (see Section 3.5).

The receding waters also caused a lot of damage to houses by weakening the foundations through scouring action on the soil around the foundation.

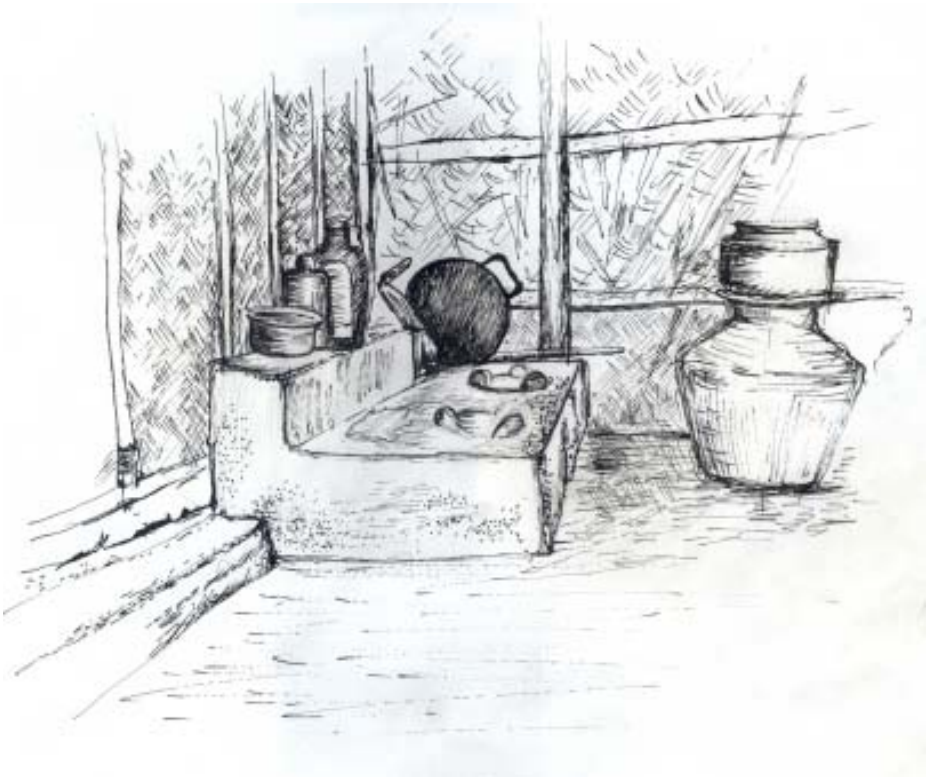
3.4 Height of the wave

One of the reasons it is necessary to know the height of the inundation from the mean sea level is because, when it comes to safety, the elevation of the built structure is of greater importance than the distance from the sea. To determine the height of the inundation from the mean sea level, it was necessary to find out the maximum height of the inundation at various points in the village. Each area of the village is at different levels of risk based on the elevation of the plot, the height of the plinth of the house, distance from the sea etc.

3.5 Salt Crystallization

Salt crystallization refers to the presence of water soluble salts such as chlorides, sulphates and carbonates in the building

material or in the groundwater rising by capillary action, and their crystallization during the evaporation of water. Mere presence of salts is not going to affect the material unless an agent is there to activate these salts. Water plays the key role of the agent either in the form of rainwater, or ground water rise in the structure. When the ground water is drawn from the soil, it contains a solution of salts present in the soil. When evaporation takes place on the surface, the salts get deposited near the surface and the mechanical forces exerted during crystallization cause the plaster or brick to disintegrate over a period of time. In Chinnangudi, the ground water table is quite high and the water is brackish.



CHAPTER FOUR

Hazard Mapping

Prior to December 26, 2004, the risk caused by tsunami or other natural hazards such as cyclones, floods and earthquakes were not considered significant by the community. Now the perception has changed. The 2004 December tsunami has raised the concern of the villagers, NGOs, Government and professionals about the impact of natural hazards and the importance of safeguarding the houses and the village against such hazards in future.

4.1 Frequency – Recurrence Interval

To determine the probability that a building will be affected by a specific natural hazard, the designer must know not only the recurrence interval of the event, but also the timescale (period) during which the building will be exposed to the hazard. The length of this period is determined by the designer based on certain baseline data relevant to the building, such as the assumed useful life of the building.

For example, assuming that a tsunami is an event that occurs once in a hundred years, the designer can determine the probability of one or more occurrences of that event. From Table 4.1, assuming the lifespan of the building as fifty years and the tsunami as a hundred year event, the probability of a tsunami occurring during the building's lifetime is 39%. If the useful life of the building is only thirty years, the chance of a tsunami occurring during its lifetime is 26%.

Table 4.1
Natural Hazard Probabilities during Periods of Various Lengths* (FEMA 2000)

FREQUENCY- RECURRENCE INTERVAL					
Length of Periods (Years)	10 - Year Event	25 - Year Event	50 - Year Event	100 - Year Event	500 - Year Event
1	10%	4%	2%	1%	0.20%
10	65%	34%	18%	10%	2%
20	88%	56%	33%	18%	5%
25	93%	64%	40%	22%	5%
30	96%	71%	45%	26%	6%
50	99+%	87%	64%	39%	10%
70	99.94+%	94%	76%	50%	13%
100	99.99+%	98%	87%	63%	18%

*The percentages shown represent the probabilities of one or more occurrences of an event of a given magnitude or larger within the specified period.

The formula for determining these probabilities is $Pn = 1-(1-Pa)^n$, where Pa = the annual probability and n= the length of the period.

4.2 Hazard Mapping Exercise

A hazard mapping exercise was carried out at four risk levels to ascertain the areas of the village that would be submerged for different levels of water above the mean sea level. The areas of the village that would be submerged under water (for a given height of water above the mean sea level) were arrived at based on the contour map of Chinnangudi village and the information collected during the study. Based on this, four inundation maps have been made that show the areas of the village that are at high risk, medium risk, low risk and no risk for water levels of 2.80 metres, 2.25m, 1.50m and 1.00m, respectively (Maps 4.1-4.4).

4.3 Use of Inundation Maps

These maps can assist the Government, villagers and professionals in fulfilling their responsibilities for protecting the public from the effects of tsunamis and floods. They also have an educational value to help improve awareness of risks due to tsunami and floods.

- Highest hazard areas (red) have experienced tsunami inundation up to a height of six feet or more. They include beaches and low lying areas.

- Moderate hazard areas (orange) are areas likely to be flooded by a major tsunami up to a height of four feet based on the observations of recent tsunami.

- Low hazard areas (yellow) show evidence of flooding up to a height of two feet from ground level and are likely to provide refuge in all but the most extreme event.

- No hazard areas (green) are sufficiently high in elevation and/or are too far inland to be at risk.

A continuous gradational colour scale with blurred boundaries helps to convey the continuum of possible events and the uncertainty in delineating distinct inundation lines.

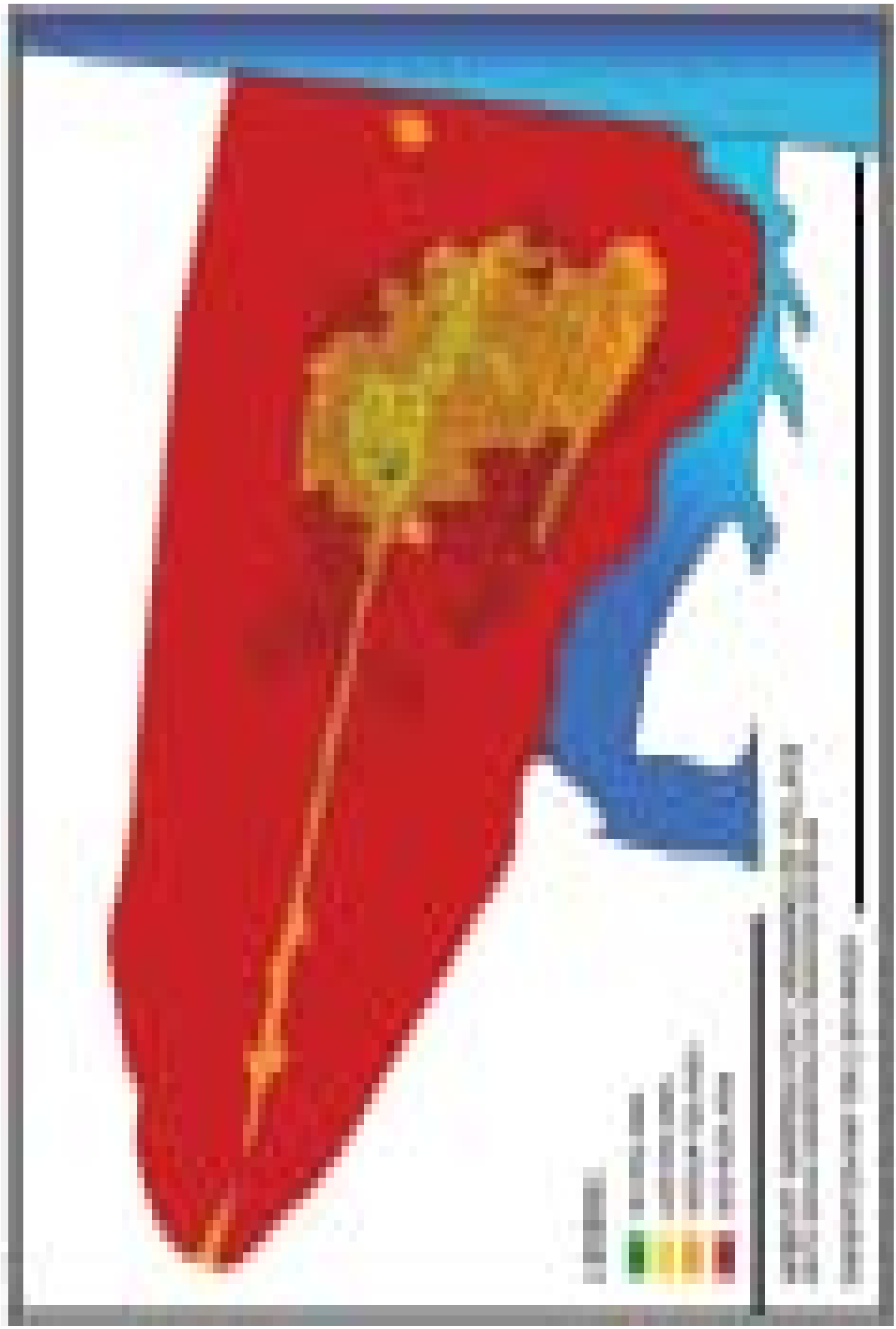
Map 4.1 shows areas of the village that are at different levels of risk when the water level is at 2.80m higher than the mean sea level. It shows that certain old areas in the existing village are safer than the new site identified for construction (at the time of the study) by the village and district administration as far as the risk against natural hazards is concerned. Similarly, Maps 4.2 to 4.4 show inundation at water levels of 2.25m, 1.5m and 1m respectively.

In case houses have to be built in the high and medium risk areas, the ground level will have to be raised to make the buildings safer.

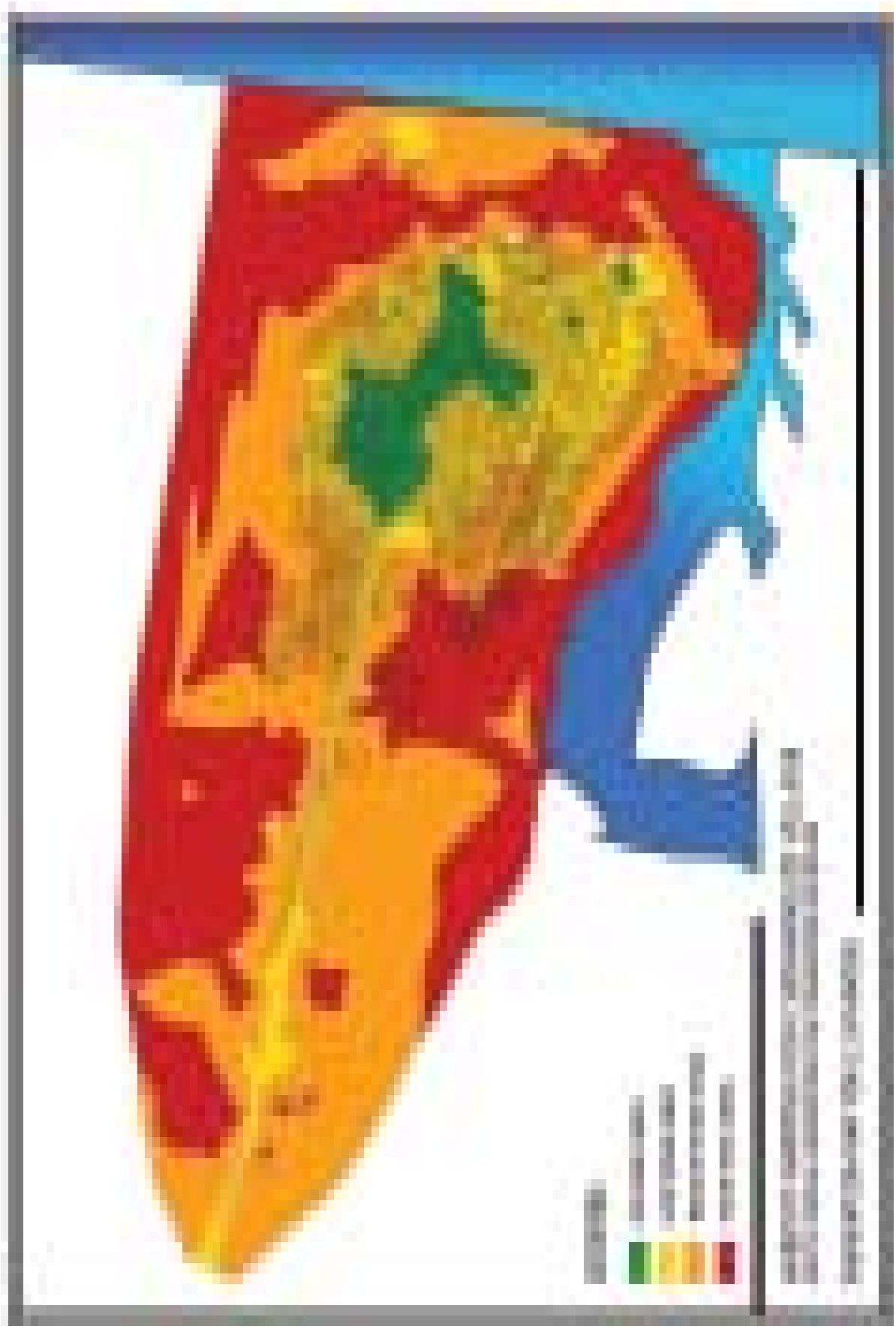
The new areas identified for reconstruction which are being raised by filling are the catchment areas during the rainy season. Once these areas are filled up, the drainage of rainwater becomes very critical. The ecological impacts, the increase in the cost of buildings, and the development of additional infrastructure have to be studied in detail, if building is to bedone in such areas.

The fact that a site lies within the mapped zone of a particular risk does not necessarily indicate that a hazard, requiring mitigation, will occur. Instead, it indicates that the probability of a hazard is great enough to warrant a site-specific investigation.

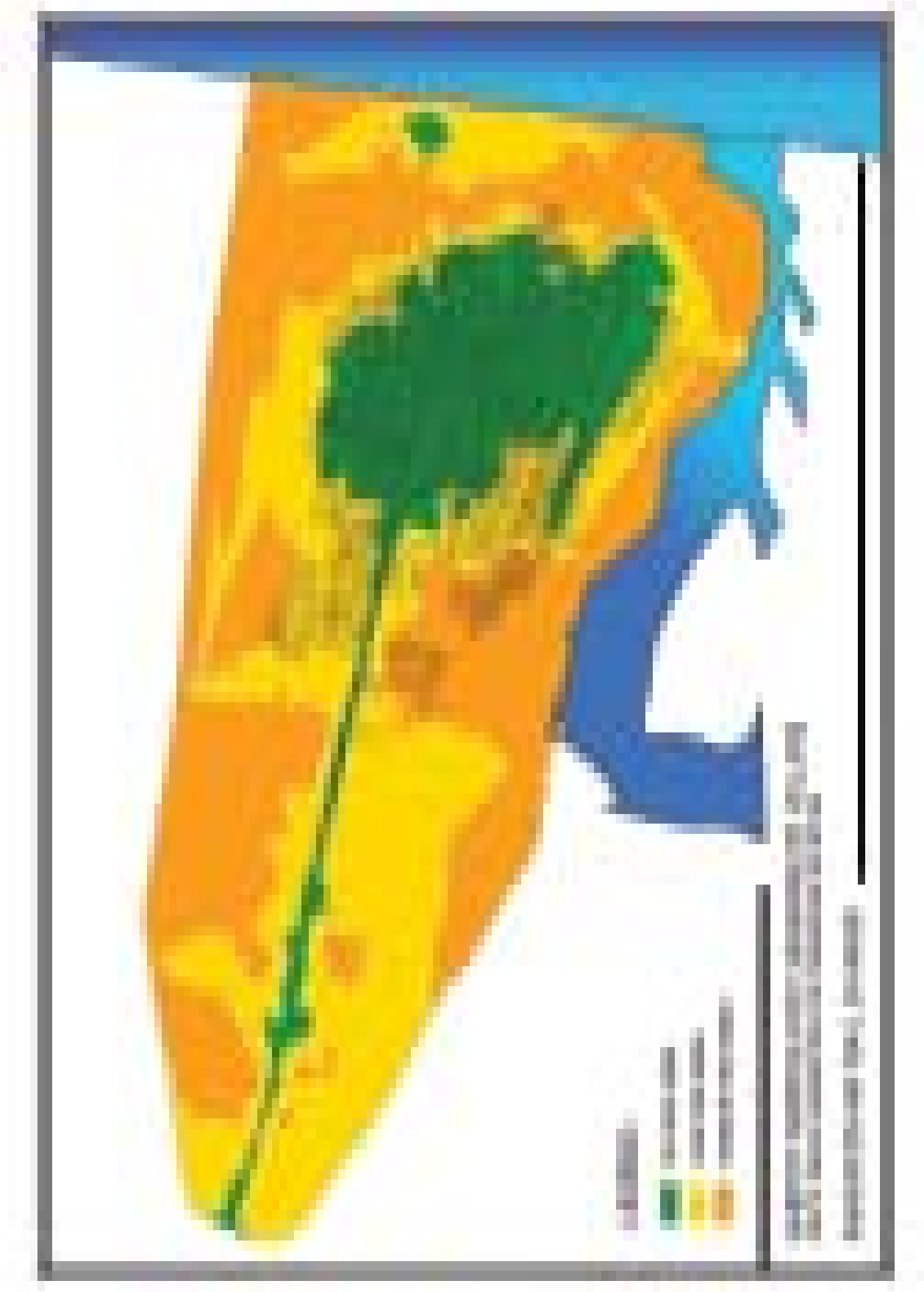
Map 4.1
Inundation Map for 2.8 Metre Water Level



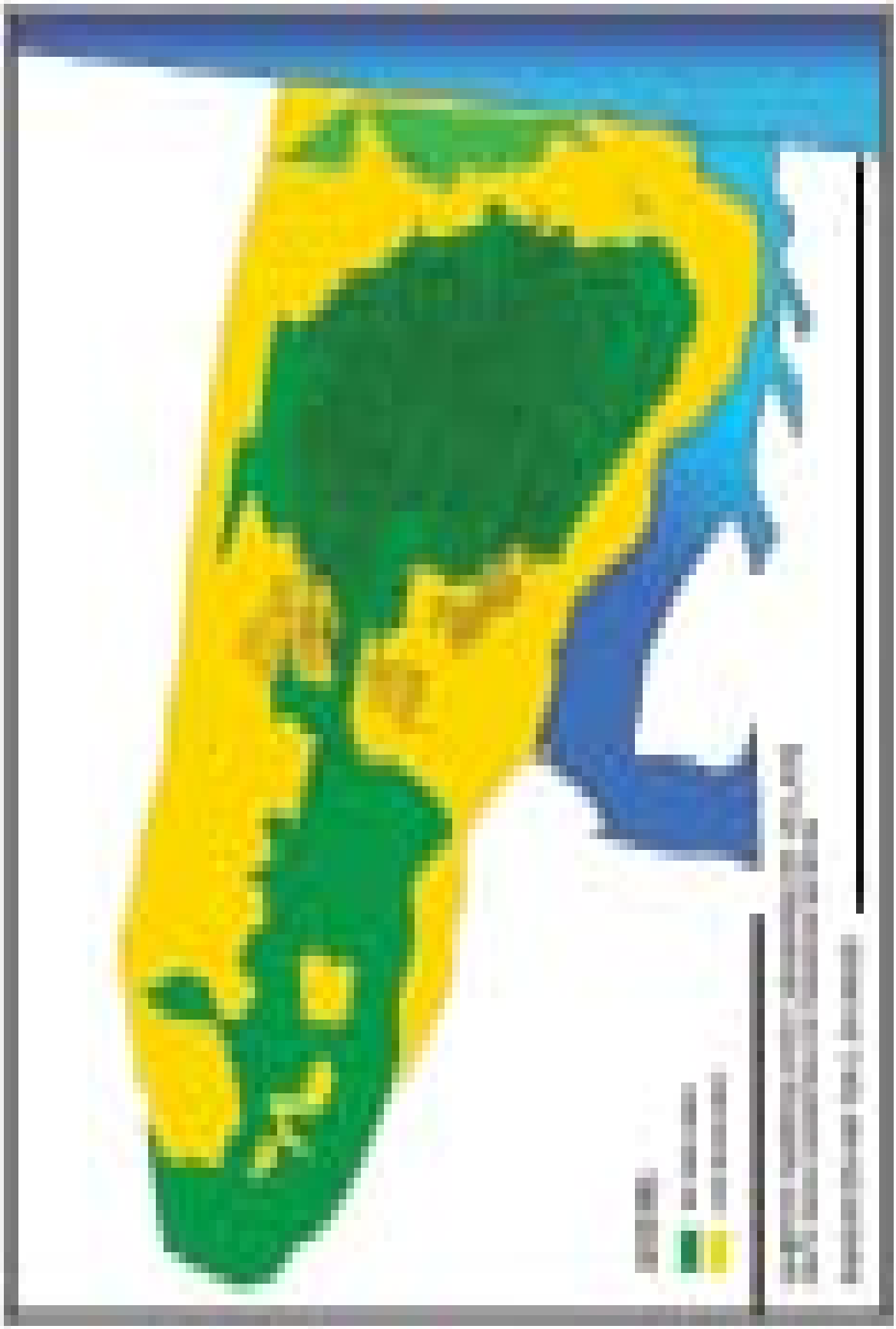
Map 4.2
Inundation Map for 2.1 Metre Water Level

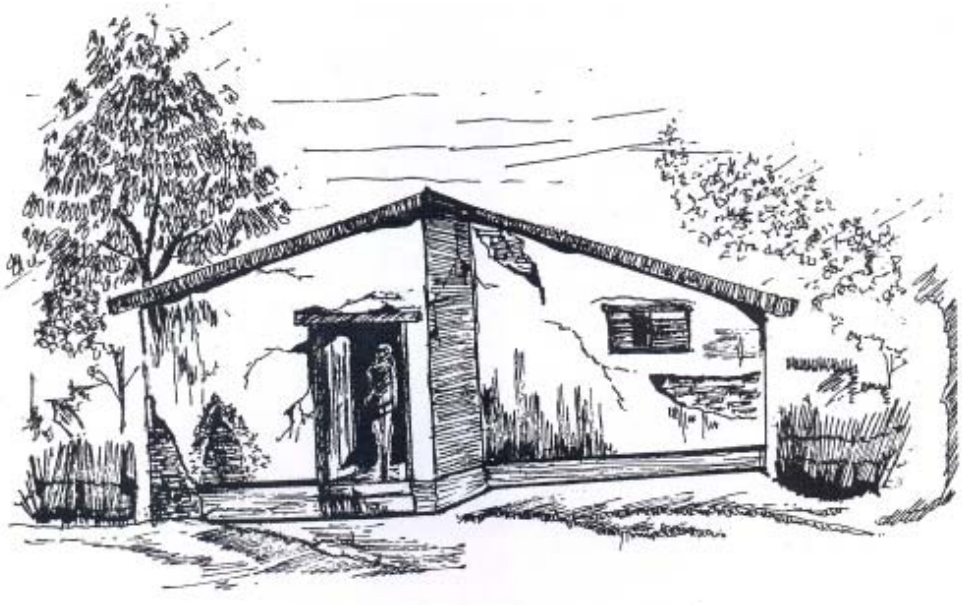


Map 4.3
Inundation Map for 1.5 Metre Water Level



Map 4.4
Inundation Map for 1.0 Metre Water Level





CHAPTER FIVE

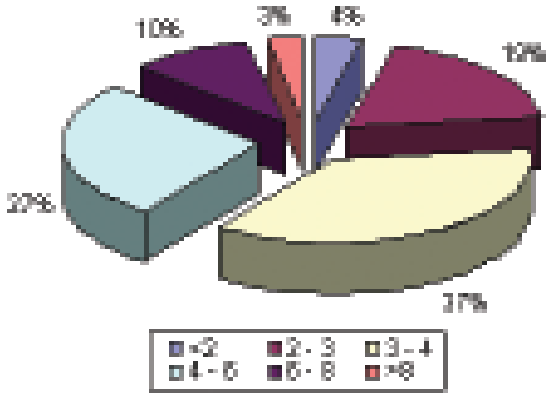
Analysis of Data Collected

This chapter deals with the analysis of the collected data and the observations made in order to be able to understand the ground situation before the tsunami and the changes that took place as a result of the tsunami.

5.1 Distribution of Plot Areas

Map 5.1 shows the distribution of plot areas above and below three cents. Chart 5.1 shows that 77% of the households have a land holding of more than the three cents (120 square metres) that is going to be provided by the Government as part of the

Chart 5.1
Distribution of Plot Area in Cents



House type - Kutcha

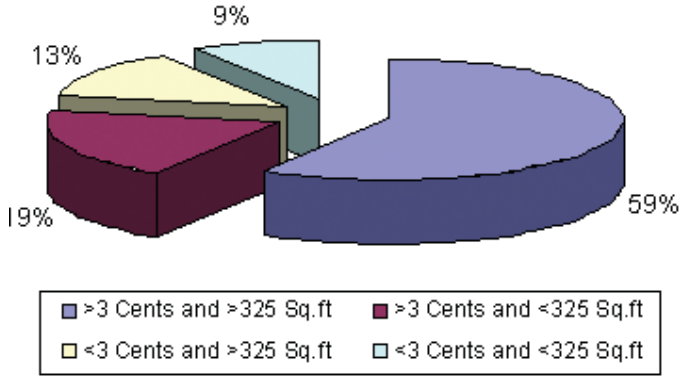
House type - Pucca

House type - Semi Pucca

tsunami reconstruction schemes. The reluctance of many villagers to move out from their existing properties becomes clear when seen in the light of these figures. It does not make sense for a villager who owns four or five cents of land to move to the new village where he will be given only three cents of land and will not be compensated financially or otherwise for the remaining two cents of land that he owned in the old village.

Chart 5.2 shows that 59% of the houses have a plot area more than three cents with plinth area greater than 325 sq ft. Only 9% of the houses have plinth area less than 325 sq ft and less than three cents in plot area. Map 5.2 compares the plinth area (less than or greater than 325 sq ft). Map 5.3 compares the plinth area with the plot area. Map 5.4 shows the usage of various buildings in Chinnangudi.

Chart 5.2
Distribution of Plinth area in Square Feet



5.2 Distribution of House Types

Map 5.5 shows the distribution of house types in the village. According to Chart 5.3, 41% of the houses are *pucca* and 28% are *kutcha* houses. *Pucca* houses have both the walls and the roof of permanent building material – brick walls and tiled or RCC roof. In *Kutcha* houses, both the walls and the roof are of impermanent building material such as thatch and bamboo (Chart 5.3).

As shown in Chart 5.4, majority of the houses in Chinnangudi have cement flooring in their houses (also see Map 5.6).

The superstructure of 75% of the houses in Chinnangudi is built with brick (Chart 5.5, Map 5.7).

About 59% of the houses have thatched roofs made from either coconut or palm leaves (Chart 5.6, Map 5.8). 19% of the houses have RCC roof. Fifty three of the houses that were built as part of the Government housing scheme are in disrepair.

Chart 5.3
Type of Houses

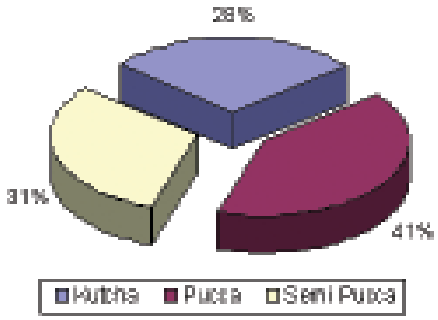


Chart 5.4
Distribution of Flooring Material

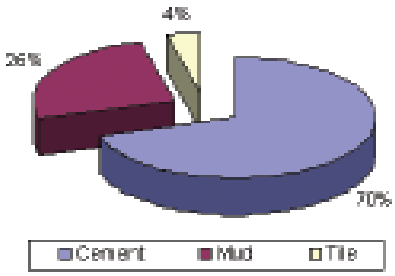


Chart 5.5
Distribution of Walling Material

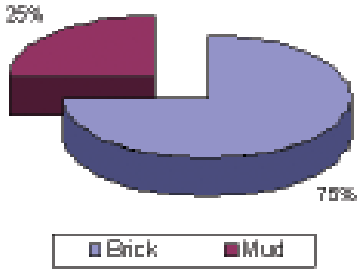
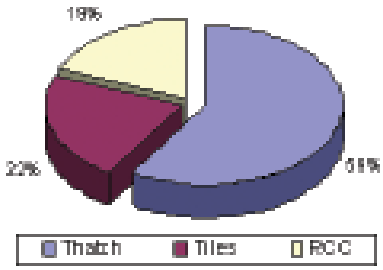
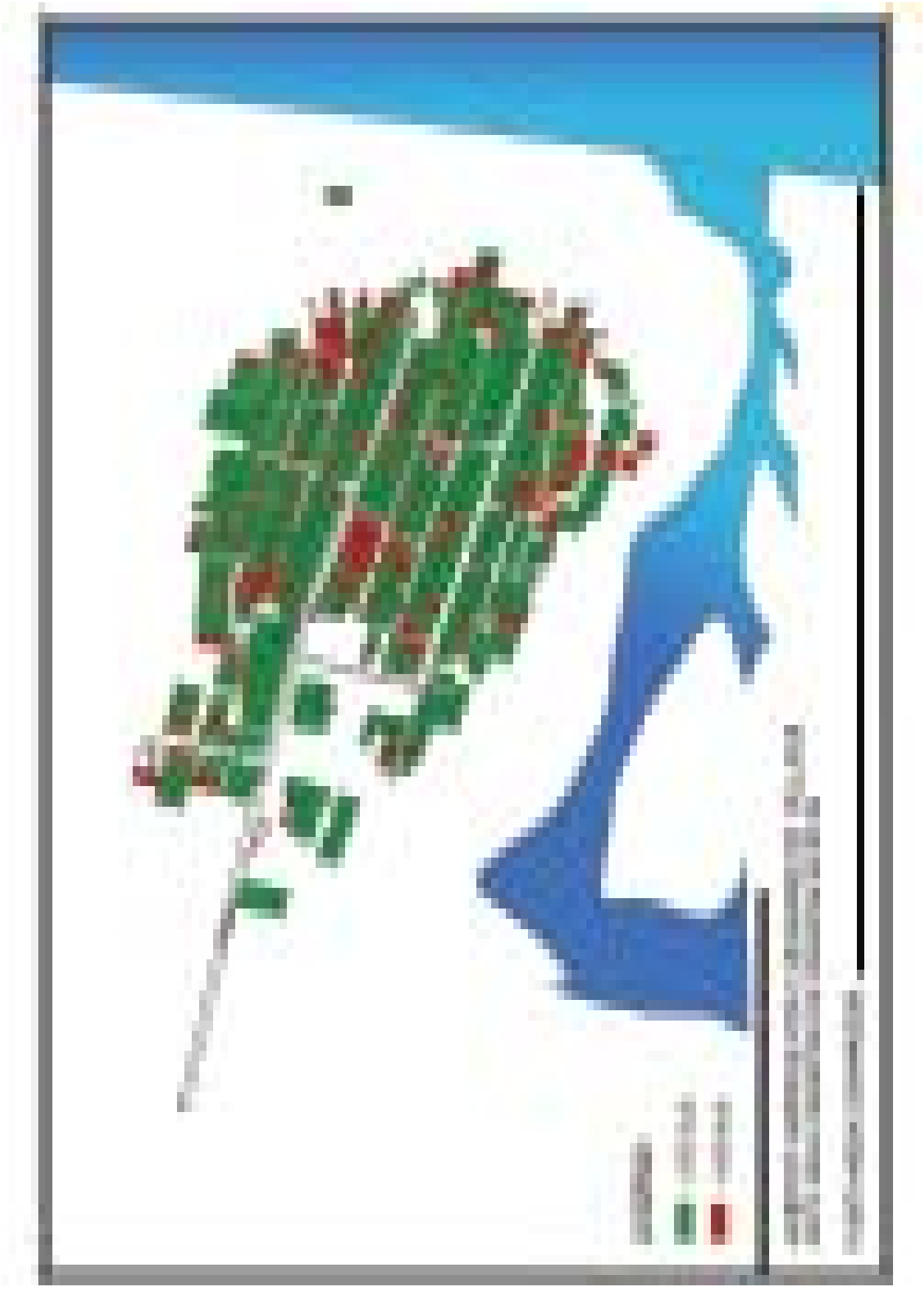


Chart 5.6
Distribution of Flooring Material



Map 5.1
Plot Area Comparison

Map 5.2
Plinth Area Comparison



Map 5.3
Plinth Area and Plot Area Comparison

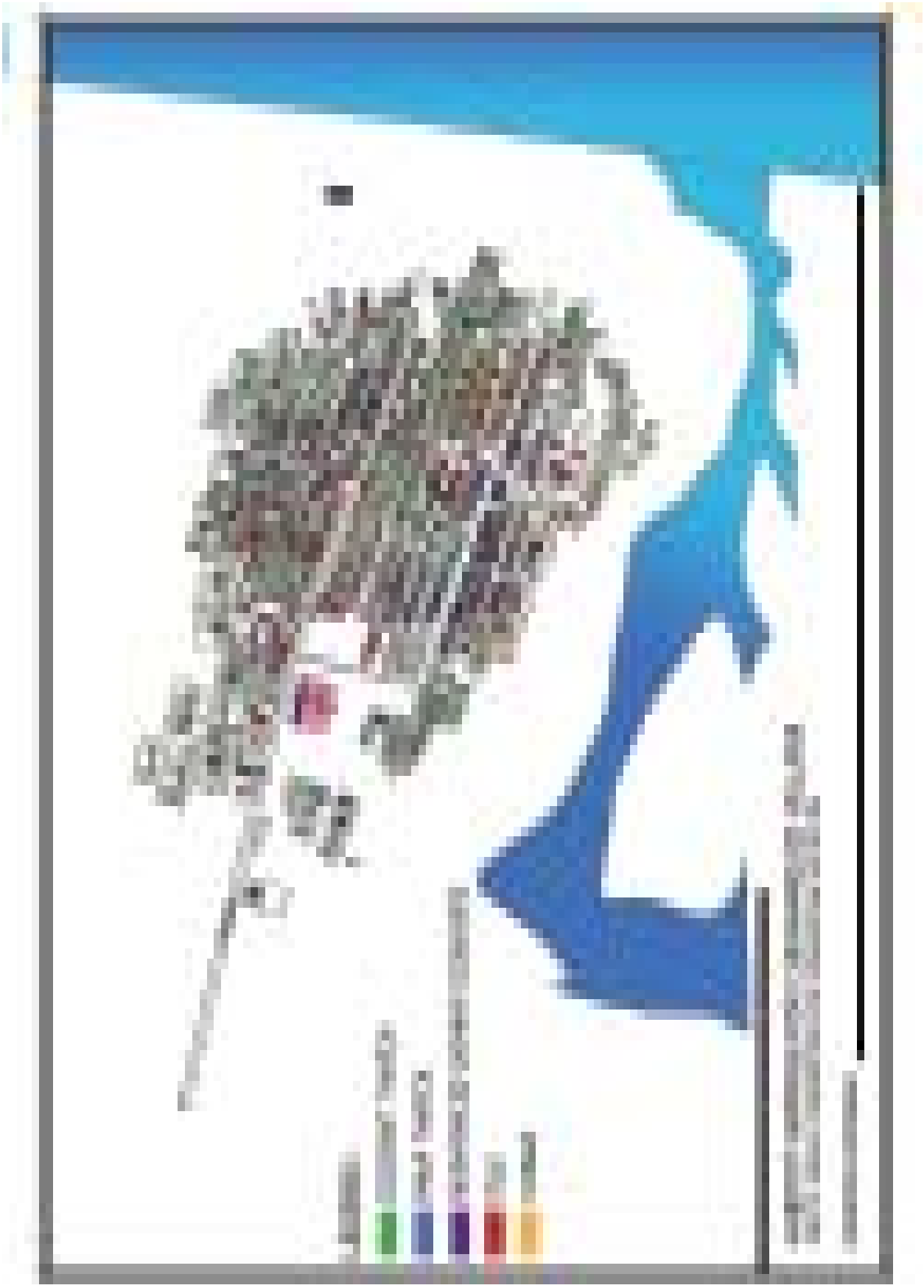
Map 5.4
Building Usage

Map 5.5
House Types

Map 5.6
Flooring Material

Map 5.7
Walling Material

Map 5.8
Roofing Material



CHAPTER SIX

Design Considerations

6.1 Mass Contact Program

The mass contact program (held on 17 June, 2005 at the Chinnangudi temple premises from 11 AM to 6 PM) with the villagers (of one division/ward) was organized with the twin purposes of informing them about the study and to get feedback from the villagers about their needs, requirements and preferences. This feedback was used to draw inferences to make necessary changes in the design or in the approach. Four preliminary designs were presented to the people in the form of models and they were asked to make a choice. About 250 people turned up for the programme to make their choice.

People, in general, were positive about the approach and willing to cooperate and wait patiently for the project to materialize. Most of them were quite excited when they were told that the whole project would be executed based on a participatory model, without the involvement of any contractors.

6.2 Needs and Demands of the Villagers

A section of the people wanted a larger plot of the land, because the plot extent of three cents was insufficient for their needs. They were willing to pay for the extra bit of land. The Government policy is not flexible enough to take this into consideration.

Participatory Discussion

Vewing Models of Houses

At the Exhibition

The poorer section of the villagers did not want to expand the house due to lack of resources. They wanted maximum facilities in the existing core house itself.

The general demand from the villagers regarding the house was that the house should be spacious. Many of them had larger plots and bigger houses before the tsunami disaster. They wanted secure play areas for children.

6.3 Design

Almost everyone wanted a RCC roofed house with access to the terrace through an outside staircase. They also wanted a covered veranda and a separate *pooja* room. Many people insisted on having a compound wall to create an enclosure for their plots. Another important demand that was made was with regard to provision for generous shelf space and lofts for storage.

6.3.1 Storage

Discussions with the villagers brought out the fact that the importance of storage space at the household level cannot be over emphasized. There are different categories of storage needs and the way these needs are met in their traditional houses needs to be understood. Many household things are kept in the loft space created under the sloping roof. Firewood is stored outside the house. Fishing nets which are used only during certain seasons are stored inside the house. Hence it was clear that the issue of storage space should be the focus of considerable attention during the evolution of the designs. Enough provision should be made to allow the villagers to add storage or shelf space in stages, according to their needs and preferences.

Storage of water is a very important issue. The provision of water tanks, for example, would translate into lesser number of vessels for storing water which in turn means savings in terms of space inside the house. A ferro-cement tank outside the house would lead to saving valuable space within the house. Many houses have ground level masonry tanks. They have a number of plastic, brass and terracotta utensils for storing water.

6.3.2 Pooja

The *pooja* (prayer) room is a must for the villagers. In the *pooja* room, the images/pictures of gods always face east. The

According to the US Federal Emergency Management Agency, in coastal areas, a building can be considered a *success* only if it is capable of resisting damage from coastal hazards and coastal processes over a period of decades. This statement does not imply that a coastal residential building must remain undamaged over its intended lifetime. It implies that the impacts of a design level flood, tsunami, cyclone or erosion event (or series of lesser events with combined impacts equivalent to a design event*) will be limited to the following:

- The building foundation should remain intact and functional.
- The envelope (lowest floor, walls, openings and roof) should remain structurally sound and capable of minimizing penetration by wind, rain, and debris.
- The lowest floor elevation must be sufficient to prevent floodwaters from entering the elevated building envelope during the design event.
- The utility connections (e.g., electricity, water, sewer) should remain intact or be restored easily.
- The building should be accessible and usable following a design-level event.
- Any damage to enclosures below the design flood elevation (DFE) should not result in damage to the foundation, the utility connections, or the elevated portion of the building

The above definitions of "building success" can be met through various methods, but they all have one thing in common—careful consideration and use of siting, design, construction, and maintenance practices. Failure to address even one of these four concerns can lead to building damage, destruction, or loss of use." (FEMA 2000)

**Note: The buildings cannot be designed for all the natural hazards of all types. Based on the probability of the various hazards, the buildings are designed to withstand hazards of a particular intensity. The Indian Standards will give the criteria for many of the natural hazards.*

Discussing options

occupants of the house do not sleep in this room. When the villagers were asked whether the space for *pooja* could be a niche or a small room, they were not sure. They wanted the various options of the *pooja* room including the niches to be incorporated in the model buildings.

6.3.3 Kitchen

Houses generally have no chimneys and a lot of smoke escapes between the stove and the cooking vessel (which is supported on three mounds). This traditional firewood stove (*chulha*) consumes a lot of firewood and also generates a lot of smoke. The *chulha* is therefore not very efficient functionally and needs a better replacement because most of the people of Chinnangudi will continue to use firewood stoves for their cooking needs for some time to come (the transition to kerosene stoves, provided by NGOs may not happen very soon). The replacement *chulha* must necessarily be thermally efficient and overcome the drawbacks of the traditional *chulha*.

The main reason why women prefer to cook outside is because of the heat and smoke generated inside the kitchen due to lack of chimneys which creates great discomfort and has an adverse impact on their health. Another related reason why they prefer to cook outside the house is because of the blackening of walls due the deposition of soot (which in turn is due to the lack of chimneys) when cooking is done within the house. When the kitchen is detached from the main house, in case of any fire occurring, it is not likely to spread to the main house.

One of the alternatives suggested was the provision for a smokeless stove, developed by various scientific institutions. One of these models can be installed in the model houses and in some of the existing houses and the acceptability of these stoves can be ascertained.

The firewood stove must be placed along the eastern wall in all the houses. Whenever the layout of the kitchen is planned, it should be done in such a way that the cook can face east.

6.3.4 Toilets

Many villagers wanted the toilets and baths to be outside the houses in one corner of the plot, unattached to the house. The reasoning was that if the toilet/baths are attached to the main

house, pipe lines laid for plumbing and sewerage might become a hindrance if they want to expand the house in future.

Some villagers told the survey team that they wanted a toilet attached to the new house. The elderly and the women find it difficult to go out into the open, since many of the bushes have been destroyed after the tsunami. They have to go either early in the morning or late in the evening. One of the widows in the village has attached toilets in her house because both her daughters are grown up and she did not want them to go out at night.

Surprisingly 10% (fifty-two households) said that they would not be using the toilets in the new house. In reality, when the project is finished, this figure could be even much higher.

There is a need for creating awareness among the villagers regarding the usage of toilets. In many housing projects, toilets have been constructed and people are using it as a store or for bathing.

In the interaction with the villagers regarding the house plans, some of them looked at the plan and said that they would like to convert the toilet into a *pooja* and the bath into a store, and so on.

6.3.5 Position of the Doors

Another question that came up during the interaction with the villagers was regarding the door in the middle of the room in their old houses. Having a door in the middle of the wall appears to be a waste in utility of space because of the blocking of air circulation. But the village *panchayat* members said that this was because of a traditional belief that they have. In some cases, this might still be a feature wanted in the new houses.

6.3.6 Cattle and Poultry

Some of the villagers have goats and poultry. They have a lean-to roof for sheltering the goats. Such provisions for livestock and poultry may be required in the new houses too.

6.4 Streets and Village Festivals

The villagers want three of the streets in the new village to be wider considering the temple festivals and the processions associated with the festival. Other streets could be narrower,

but the villagers wanted vehicles to be able to traverse all the streets.

6.5 Common Facilities

Common facilities that become part of each village also need to be thought about. The Government is already talking about noon meal centres, hospitals and schools.

Common facilities could include

- A community centre, depending on the size of the village.
- A library, where the villagers can access newspapers, magazines and books.
- A small hall to accommodate about three hundred people during some village functions.
- One or two classrooms that could be used by NGOs as a training centre to introduce new concepts and new products to the villagers or for the activities of self help groups.
- A place where a doctor and a nurse can come twice a week.
- Playgrounds for different age groups
- Public buildings such as a *panchayat* office, *anganwadi* etc.
- Shops: A clear idea is needed about commercial activities such as shops, which are going to be part of the new village. Otherwise the house plots near the main road will get converted into shops.
- Training centres and Computer centres: Some villages can have certain common facilities such as centres for improving the skills of the fishermen, and computer centres which women can run. These can be linked up with existing schemes.
- Lighthouses: The possibility of having two lighthouses in the village which will help the fishermen to identify the village from the sea using the triangulation method.

6.5.1 Common Facilities on the Beach

Fishermen wanted some resting places on the beach. These need not mean covered spaces; even shade-giving trees might serve

the same purpose. Built-in-seats could be provided along the beach.

6.5.2 Request for a Boatyard

One of the suggestions that the villagers came up with was the idea of dredging the Amman River that flows by the village, to make it deep enough for motor powered boats to navigate.

Another important suggestion was to have the boat landing facility upstream in the river at a distance of five hundred metres approximately on the southern side of the village. This would make it closer to the new site identified for the village rehabilitation. The distance from the sea may then not be an important criterion anymore, because the boat landing and the fish auction area would shift to the new location. The new village layout may have to be planned taking into consideration the location of the auctioning place.

A problem with this new proposal is that sand is likely to get deposited in the river mouth. According to the villagers, construction of stone walls on either side for a distance of sixty metres would be adequate for this. They say that there is a Government proposal to deepen the river and have the boat landing facility near the new site.

6.5.3 Requirements of the Auction Centre

A roof would be needed to make the auction centre usable during the rainy season. Currently, when boats return to the beach at night, the auctioning place is shifted to where street lighting is available. In future, lighting would also be needed in the auction centre to render it usable at night.

The flooring and the drainage in the auction centre also have to be planned. Smooth flooring may be required for easier maintenance. Provision for expansion may have to be made as the existing space is not enough when the catch is high.

6.6 Choice of Technology and Materials

The villagers have to be convinced about the techniques and materials that are going to be used for the reconstruction.

Whatever new technology is used in the reconstruction, it is very important that the villagers and the local masons get

sufficient training to be able to construct similar buildings in future.

6.7 Quality of Construction and Good Workmanship

Reinforced cement concrete structures need a lot of care in construction and maintenance especially in the highly corrosive coastal environment. If the quality of construction cannot be ensured, poor maintenance of these structures over a period of time can lead to a serious safety issues.

The quantum of construction activities that is going to take place in these areas in the next one year is huge. There will be tremendous shortage of construction workers and migration of the construction labour will take place. Wages will go up. Unskilled workers will become skilled masons overnight.

6.8 High Initial Investment

In general, the decision to build in any area subject to significant natural hazards —especially coastal areas — increases the initial, and long-term costs of building. Initial costs increase because the natural hazards must be identified, the associated risks assessed, and the building designed and constructed to resist damage from natural hazards. Long-term costs are likely to be greater because a building constructed in an area prone to natural hazards will usually require more frequent and extensive maintenance and repairs compared to a building sited elsewhere.

6.9 Village Layout

A bus shelter and space for turning the buses within the new village itself has to be planned. The existing bus shelter is too small and people seem to be sitting and standing everywhere except in the designated place. People end up using the built-in seat provided outside one of the houses.

Trees have to become an important part of the new village landscape. The new site is presently devoid of any vegetation. The importance of trees in the life of the people of Chinnangudi is quite high. For instance an old man has put a cot outside his house under a neem tree as it is cooler under the tree.

CHAPTER SEVEN

Summary and Conclusions

This study was to map the existing settlement at Chinnangudi village in Nagapattinam district of Tamil Nadu where SIFFS has taken up housing reconstruction for those affected by the December 2004 tsunami disaster. The aim was to map the settlement at both macro and micro levels. Information collected included location of the houses and the distribution of various spaces in the village as well as the layout within the houses.

This objective was achieved with creation of a number of maps that give the location of the houses in the village as well as the distribution by area, type and usage of building material. Inundation maps for various water levels were also created that helped in classifying areas by perceived risk.

From discussions with the village members especially the older citizens, it was clear that the original site was at an elevation. Perhaps when the first settlers arrived in the area, they realized that danger from the sea could be mitigated to some extent by locating their homes at a higher elevation. Similarly, houses close to the Amman river have been constructed with raised plinths, pointing clearly to the understanding of the risk due to flooding of the river.

The community is dominated by artisanal/small-scale fishers and the craft used are mostly the catamarans. The men leave

for fishing in the very early hours. Locating their homes or craft and gear at a distance from the sea would not make sense and hence the need for space on the beach for beaching craft and nets and the building of homes close to the beach/ landing area. Apart from space on the beach, spaces in front of their homes (including *thinnai* and verandas) are used for various livelihood related activities such as drying nets and fish. Once the fishing craft land on the beach, the women take over and auctioning of the catch is done on the beach. These activities happen close to daybreak. Sometimes, when the craft return at night, the auctioning area is shifted to under the streetlights. Hence while providing for a new auction centre, these have to be kept in mind.

Within the house, use of space is still dominated by traditional beliefs. Thus, the *pooja* (prayer room) always faces east as do the women while cooking meals. The kitchen is usually separated from the main portion of the house, evidently to avoid the smoke from the wood burning stoves that are still used. Storage space is always at a premium and the request from all has been to provide sufficient space to store household goods as well as livelihood related articles such as fish nets and boat engines. Toilets attached to the house are rare but there appears to be an increasing demand especially from women who would then gain privacy and safety.

Culturally, they are a close knit people and though they would like individualized homes, social life happens on the streets and pathways in the village. While the villagers wanted all streets to be navigable by motorized transport, three streets in the new layout had to be extra wide to accommodate processions associated with the village festivals.

Discussions with the beneficiaries indicated that they were happy with the process of interaction and ascertaining their viewpoints. It is clear from the maps that have been created during this project that a number of aspects have to be taken into consideration to ensure that hazard mitigation measures are adopted as are the individual perceptions on utilization of space within and outside the houses so that utilization by beneficiaries is maximized.

APPENDIX I

GENERAL INSTRUCTIONS GIVEN TO THE TEAM FOR CARRYING OUT HABITAT MAPPING

Benny Kuriakose

Ask various people for information on the same topic. If many of them say the same thing, then it can be taken as a general opinion.

Collect maximum information from the old people on the history, lifestyle, usage of spaces etc.

Write everything neatly so that anybody can understand your writing. We might have to refer to your field notes tomorrow after you leave.

Get accurate information. Always cross check the information.

Collect general information about the village:

1. Drainage of the Land
2. Topography of the land
3. Nature of the soil and depth of the soil
4. Variation in Water Table

Collect the details regarding the natural disasters;

1. Tsunami – How the water came, the height of the wave and how it came, the kind of damage it caused.
2. How did the people in the village escape the tsunami? Any relation with respect to architecture?
3. What is the pattern of damage and what could be the possible reasons?
4. Any difference in the ground water quality before and after the tsunami?
5. What is the drainage pattern during the rainy season? Is the Buckingham canal able to hold the rain water load? Any stagnation? If yes, where and how?
6. What was the water level during the tsunami?
7. Previous Cyclones and Floods.

Collect details regarding the history of the village

1. What kind of relief work was done during previous disasters (cyclones/floods)?
2. What were the original road and land levels?
3. What were the sources of water before the present water supply came into being and what is the location of the wells or the bore-wells?

Collect details regarding the construction of the buildings:

1. How are the buildings constructed?
2. Who constructed?
3. How much did it cost?
4. Where were the materials bought?
5. When did the changes in the typology of the buildings occur?
6. Why do their houses have small openings?
7. What could be the reason for the failure of the Government houses?

Collect details from old carpenters and masons on how they used the traditional know how and what were the points they gave importance to.

Collect the details regarding the following resources in the village:

1. Vegetation – What kind of trees will grow under what conditions?
2. Any open tanks – note the details regarding its construction etc.
3. Drinking water – check about the quality including salinity.
4. Where do they collect the water for the various purposes?
5. Toilets.

Collect details regarding the following;

1. *Vaastu* (traditions concerning house design)
2. Use of spaces
3. Storage of things
4. Cooking habits

How do they use spaces for the various activities?

1. How do the people (children, men, women, teenagers, and older people) spend their free time?
2. Are the people willing to shift to a new house? Why do they prefer to stay in their old house, what modifications do they expect?
3. What is the daily routine/schedule of the various members of a family?
4. What are their assets/possessions with respect to furniture/vessels, etc?
5. How firewood is stored during the rainy season?
6. Why is the outdoor kitchen thatched in the concrete houses?
7. What are their storage habits? Details of storage of fish, vessels, firewood, food, and water?
8. What are their needs connected with their occupation (occupational requirements)?
9. What do they do for a living in the lean season (September–November)?
10. What is the fuel used for cooking–whether kerosene or fire-wood or gas?
11. What kind of indoor/outdoor activities take place in the homes?
    i. Selling fish
    ii. Drying fish
    iii. Keeping the boats

iv. Keeping the outboard engines
v. Keeping the nets
vi. Making the nets
vii. Any other activities
viii. Sleeping
ix. Children's play
x. Children's study
xi. Taking rest
xii. Playing
xiii. Bathing
xiv. Eating etc.

Land use details should be collected for the following:

1. Area they use for any vegetable cultivation.
2. Built-up area.
3. Commercial cum residential use
4. Common activities connected with fishing.
5. Recreational uses.
6. Public use or public gathering.
7. Vacant land.
8. Any other use.

Details about the temporary shelters that should be collected

1. Usage of spaces.
2. Storage details.
3. Extra things added.
4. Washing, cooking, bathing etc.
5. Toilets usage.

OBSERVATIONS

Look at the foundations of the old buildings which have been damaged. Note the materials. Note down any points which you find important.

Are there any differences when the family size is bigger or in the case of joint families or where old people are living?

MAPPING

Mark all the public institutions and all common properties or any other resources which have been missed in the electronic survey.

DESIGN IMPLICATIONS

Are there any aspects, which you think as important which we can use in the design of the new village?

OUTPUT

Preparation of the plan of the village to the maximum possible details which will show all the features.

1. Road Networks
    a. Width
    b. Name of the Road/Street
2. Plot Boundary
3. Praxis No. and House No.
4. Owner's Details *(Husband & wife's name)*
5. Building lines *(With setbacks)*
    a. Existing structures b. Dilapidated structures
6. Land use plan with the individual house plots
7. Building Materials – Walls, Floors and Roofs
8. Extent of Damage
9. Vegetation, tanks, ponds, wells, electric posts, telephone posts etc.
10. Plot Area *(in cents)* and Plinth Area *(In sq ft)*
11. Detail Plans (if any)
12. Remarks – About the Zone *(Based on observations)*
13. Sketches - Details
14. Tsunami water level *(in each house)*
15. Tsunami facts and stories *(Case studies)*
16. General Observations about that zone
    a. History
    b. Characteristic features
    c. Landmarks

Documentation of the public buildings in the village

Documentation of the traditional houses according to different types. Every group need not document all types. This documentation should be detailed with plan, section, elevation etc.

Mapping of the buildings which survived – Preparation of the inundation zone map. Also this should give a clear indication of the extent of damage.

Preparing the models for the various options of housing.
Discussing with the villagers on the various options of houses and the layout and getting their feedback.

FINAL RESULTS

Make a detailed site plan with the roads, pathways, individual house plots which will form the base plan for all the future planning activities.

Make a land use plan which will reduce the damage due to floods, tsunamis, cyclones etc.

Make a site plan which will help in the water supply scheme, drainage scheme, sewerage scheme etc.

How to avoid flood damage?

How to see that the drainage is made better?

What are the interventions required to make the site safer? What are the changes in contours required?

What about the vegetation shield which will reduce the risk?

APPENDIX II

ROAD MAP OF THE SIFFS HOUSING PROJECT

X. Joseph

1. Initial dialogue with village leadership to build rapport with the *panchayat*.

2. Contour mapping of old village as well as new location to understand the safety aspects of the locations.

3. Habitat mapping of the old village settlement to understand the use of spaces and people's aspirations needs.

4. Study of individual houses to understand the needs, cultural values and design preferences of individuals.

5. Use of scale models to elicit ideas on house design.

6. Socio-economic survey to collect baseline information and also to get inputs on intervention needs in housing, livelihoods and other aspects.

7. Awareness building of the village communities on the issues to be decided including location of settlement, settlement plans, building technology, construction process etc.

8. Construction of six full scale model houses to demonstrate new technology ideas; feedback from community on models and techniques.

9. Dialogue with community on settlement plan based on 2,3 and 6 to finalise the settlement plan with provision for common facilities.

10. Finalisation of menu of house designs based on 4 and 5.

11. Getting approvals from district administration and other relevant agencies for settlement plan and individual houses to complete the mandatory requirements.

12. Publishing the beneficiaries list to validate the list.

13. Allotment of plots to beneficiaries to ensure their participation.

14. Formation of cluster level committees to supervise the day to day work.

15. Construction of transit shelter on the allotted plot to protect from the monsoon and to monitor the construction.

16. Preparation of strategies/plans for material procurement to ensure proper construction management.

17. Dialogue with village communities to finalise the construction strategy to finalise the respective roles of SIFFS, Village *panchayat*, Cluster committee and individual beneficiaries.

18. Training for individual beneficiaries to make them aware of their responsibilities in the construction process.

19. Training for engineers and workers to ensure the quality and evenness in the construction.

20. Begin construction of houses.

21. Construction of common facilities in stages.

22. Searching for options regarding the development of a bio-shield in partnership with the villages; developing plans and implementing them in stages.

APPENDIX III

AN ALTERNATIVE APPROACH TO HOUSING

Benny Kuriakose

Housing is an important issue in the developed as well as developing countries. Many articles, books and conferences have analysed the problem of housing for the poor in the developing countries.

Defects of the Public Housing Programmes

Most bureaucrats and politicians perceive a programme of public housing as nothing more than the construction of a series of 'match boxes', one per family. The people who are going to live in these houses do not have a say in their design and construction. The families are categorized and one or two types of designs are repeated. The reason given is that it is impossible to design for each individual considering the resources and time available. Hence standardized houses are necessary because it is more efficient and the cost of construction is optimized.

SIFFS' Approach to Housing

A house is a customized product having many cultural, economic, technical and political dimensions. The process of making this customized product is also equally important and complex compared with other consumer products.

We at SIFFS believe that providing shelter means much more than mere provision of the four walls and a roof. One of the aims of this SIFFS project is to construct 2000 houses in 2000 different designs. We know that it is an ambitious task, but given the right approach to layout, planning, design and construction, it is possible to achieve this target.

We have developed our approach based on the following principles;

1. The participation of the people in layout of the village, design of the house and the construction is to be ensured.

2. The social and cultural aspects of the people concerned should be taken into account while planning their houses.

3. The beneficiaries should have an ownership feeling which should be created in the overall housing process.

A model has to be developed considering the micro-level situation in the fishing villages which are affected by the tsunami. This model which has to be followed in the case of architectural design, planning, construction and project management is being discussed at various stages. It is important that these principles are followed strictly so that a human dimension is added to our housing projects.

The same principles being followed here can also be applied to middle income and high income housing regardless of the size and the scale of the project.

Planning the Layout and Designing of the House

In the traditional way of building, a master craftsman and the house owner worked together. Both of them made the decisions regarding the construction of the building. Building was not considered separate from designing.

Every family and every person is unique. They are part of a society, and their interaction with the others in the society has great importance in determining the layout of the village. In most cases, the decisions which control the form of the houses and the village are made at an architectural office too remote from them. The main drawback of this approach is that the fact that different people do not have the same requirements and needs and aspirations is not considered. The product might be efficient but does not have the human touch.

This is a project which cannot be handled from a remote place. The design team has to be in the same locality where the project is taking place. The design which evolves out of a series of interactions is for a specific individual. It will be quite different from the standard ones which are made without understanding the specific needs or occupational requirements of the community.

Construction Phase

The construction in the hands of a big contractor is highly centralized; he is not willing to make any changes, because that involves additional work for him. There is no control at the level of the house owner at which the details have to be decided. The person in charge of construction at the site has no freedom to make any changes because of the terms of agreement in the contract and every detail is frozen even before the project is started.

Cluster Committees

When we think of 2000 houses to be built, the scale is quite big. But when we consider that twenty-five different houses are typically built by one professional in one year, the project becomes feasible. The whole project is being divided into clusters of 25-50 houses and will be managed by a committee of the beneficiaries and the modern master craftsman who embodies the functions of the engineer, builder and the architect. He will be trained to make decisions at the micro-level along with the beneficiaries to control the details of each house. These decisions are made according to certain guidelines developed by the project team based on the macro-level situation.

The house owner should have sufficient knowledge to make the right decisions. A series of training programmes have to be planned so that he/she is informed of the various options and choices available.

The role of the engineer-builder-architect is to guide each one of them to make the right decisions. He/she is constantly interacting with all the house owners and is available at the site during the execution of the project. Changes can be made even during the construction of the house.

The SIFFS approach is to avoid the use of big contractors. The actual construction is to be done by the labour teams who have to be trained so that the quality of construction is ensured. In this case, the beneficiaries will be satisfied and feel that the house is a product of their own effort and also make eventually make extensions to the house at their own initiative and expense. Through our approach, we should be able to create large numbers of houses at reasonable cost.

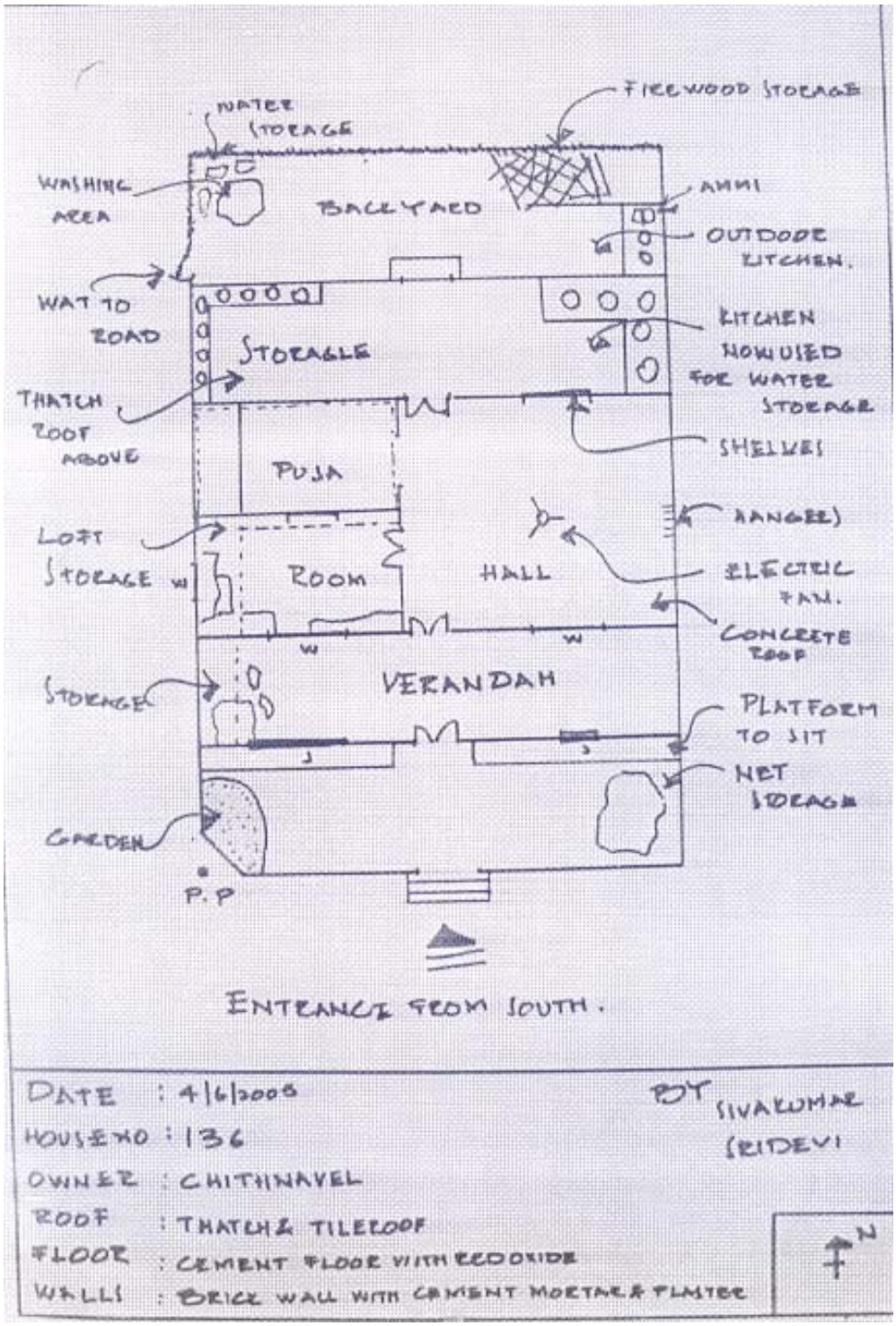
2000 Different Designs

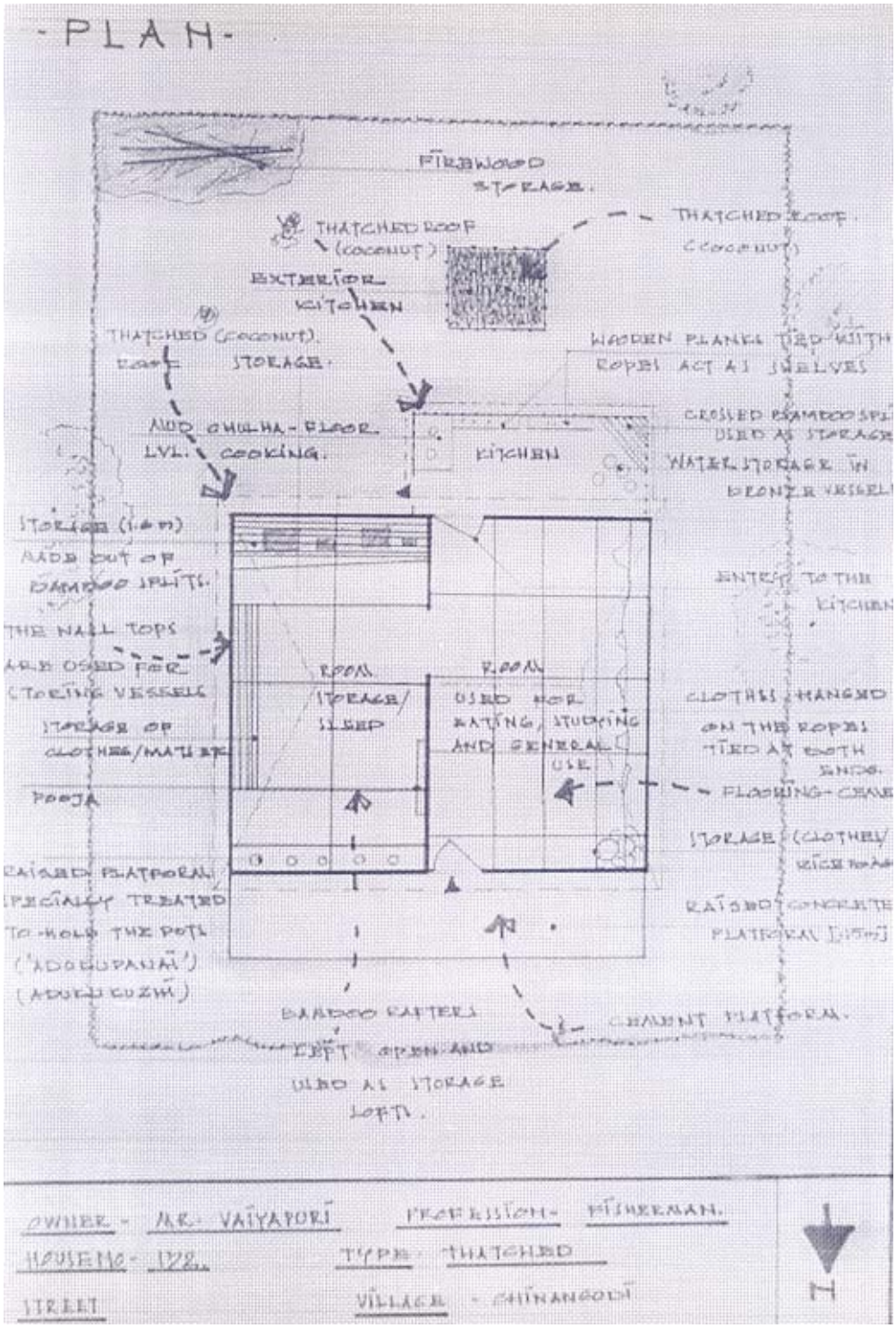
Having a few model houses and allowing the beneficiary to choose one among them may not bring the desired variety in designs. He/she should have the freedom to choose the details, decide on the plan of the house, and have the option for using different materials, to bring in the variety in designs. This is exactly the way in which all these vernacular houses have been constructed. This is a more human approach rather than an architect sitting faraway in an office deciding on what these fishermen want in their houses.

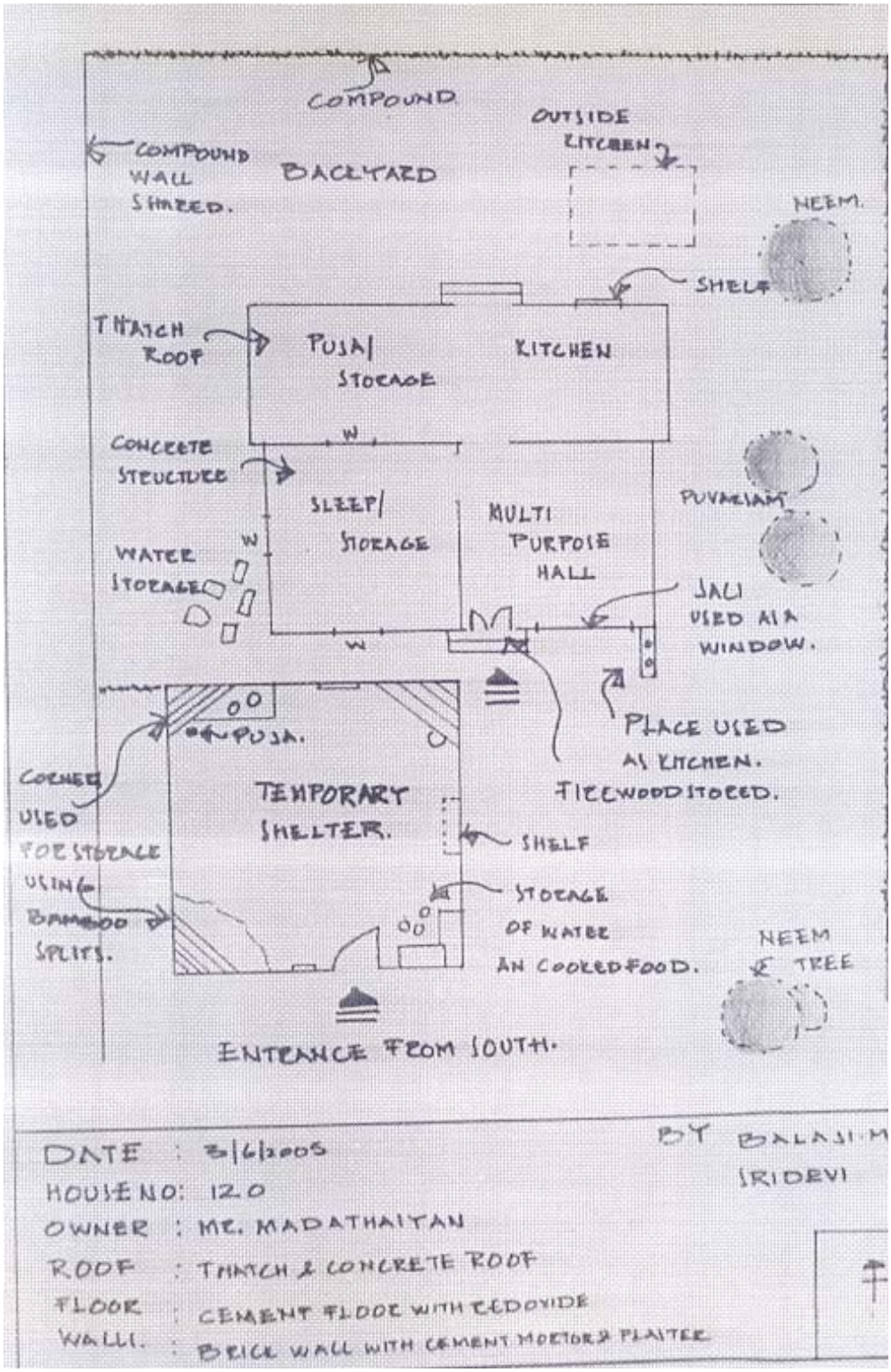
A more flexible cost control system can be adopted to monitor the finances of the project. There will be a fixed cost for the core house depending on the model of the house. The total cost of a single house will be more than the fixed cost of the core house. The beneficiary can choose from the various options available such as a bedroom shelf, veranda at the rear, built-in-seat, water tank etc. so that the overall cost of the project is not exceeded. Thus each house will be different according to the requirements and needs of the individual family.

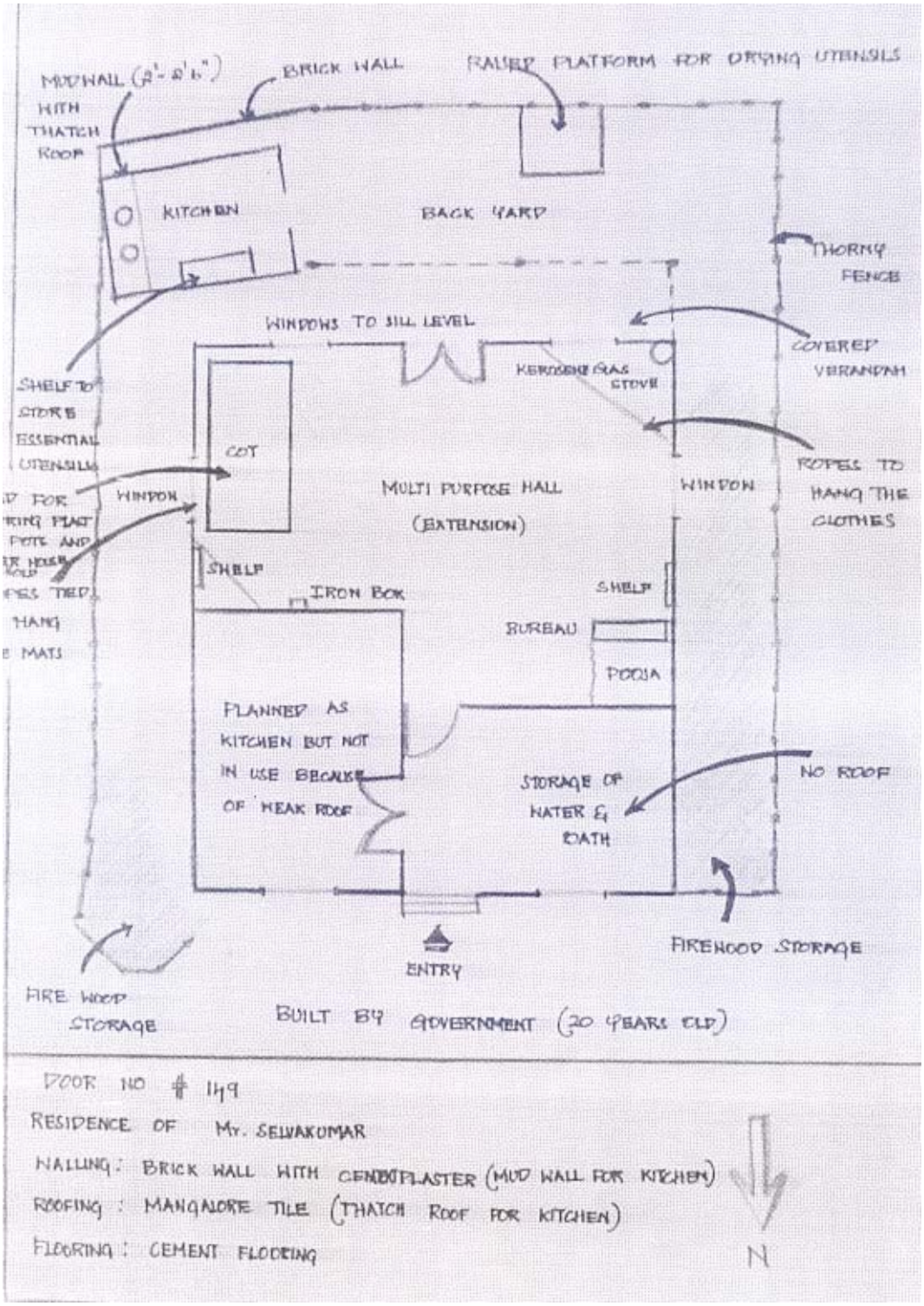
APPENDIX IV

TYPE OF HOUSES AND THE STUDY OF USAGE OF SPACE




-PLAN-
FIREWOOD STORAGE.
THATCHED ROOF (COCONUT)
THATCHED ROOF (COCONUT)
EXTERIOR KITCHEN
THATCHED (COCONUT) ROOF
STORAGE.
WOODEN PLANKS TIED WITH ROPES ACT AS SHELVES
MUD CHULHA - FLOOR LVL. COOKING.
KITCHEN
CROSSED BAMBOO SPLITS USED AS STORAGE
WATER STORAGE IN BRONZE VESSELS
STORAGE (1.6m)
MADE OUT OF BAMBOO SPLITS.
ENTRY TO THE KITCHEN
THE NAIL TOPS ARE USED FOR STORING VESSELS
ROOM STORAGE/ SLEEP
ROOM USED FOR EATING, STUDYING AND GENERAL USE
CLOTHES HANGED ON THE ROPES TIED AT BOTH ENDS.
STORAGE OF CLOTHES/MATERIALS
POOJA
FLOORING - CEMENT
STORAGE (CLOTHES/ RICE BAG)
RAISED PLATFORM SPECIALLY TREATED TO HOLD THE POTS ('ADUPPUPANAI') (ADUPPUCHUZHI)
RAISED CONCRETE PLATFORM
BAMBOO RAFTERS
CEMENT PLATFORM.
LEFT OPEN AND USED AS STORAGE LOFT.
OWNER - MR. VAIYAPURI
PROFESSION - FISHERMAN.
HOUSE NO - 1928.
TYPE - THATCHED
STREET
VILLAGE - CHINNANGUDI
N


COMPOUND
OUTSIDE KITCHEN
COMPOUND WALL STRUCTURED.
BACKYARD
NEEM.
SHELF
THATCH ROOF
PUJA/ STORAGE
KITCHEN
W
CONCRETE STRUCTURE
SLEEP/ STORAGE
MULTI PURPOSE HALL
PUVANAM
WATER STORAGE
JALI USED AS A WINDOW.
PLACE USED AS KITCHEN.
FIREWOOD STORED.
PUJA.
CORNER USED FOR STORAGE USING BAMBOO SPLITS.
TEMPORARY SHELTER.
SHELF
STORAGE OF WATER AN COOKED FOOD.
NEEM TREE
ENTRANCE FROM SOUTH.
DATE : 3/6/2005
HOUSE NO: 120
OWNER : MR. MADATHAITAN
ROOF : THATCH & CONCRETE ROOF
FLOOR : CEMENT FLOOR WITH REDOXIDE
WALLS. : BRICK WALL WITH CEMENT MORTOR & PLASTER
BY BALASI.M
SRIDEVI


MUDWALL (2'-2'6")
WITH THATCH ROOF
BRICK WALL
RAISED PLATFORM FOR DRYING UTENSILS
KITCHEN
BACK YARD
THORNY FENCE
WINDOWS TO SILL LEVEL
COVERED VERANDAH
KEROSENE GAS STOVE
SHELF TO STORE ESSENTIAL UTENSILS
COT
WINDOW
MULTI PURPOSE HALL (EXTENSION)
WINDOW
ROPES TO HANG THE CLOTHES
SHELF
IRON BOX
SHELF
BUREAU
POOJA
PLANNED AS KITCHEN BUT NOT IN USE BECAUSE OF WEAK ROOF
STORAGE OF WATER & BATH
NO ROOF
ENTRY
FIREWOOD STORAGE
FIRE WOOD STORAGE
BUILT BY GOVERNMENT (20 YEARS OLD)
DOOR NO # 149
RESIDENCE OF Mr. SELVAKUMAR
WALLING: BRICK WALL WITH CEMENT PLASTER (MUD WALL FOR KITCHEN)
ROOFING: MANGALORE TILE (THATCH ROOF FOR KITCHEN)
FLOORING: CEMENT FLOORING
N

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About SIFFS

SIFFS is a leading non-governmental organisation in fisheries. It functions as the apex body of over 120 primary fish marketing societies of artisanal fishermen in Tamil Nadu, Kerala, Pondicherry and Andhra Pradesh, which are in turn affiliated to District federations that are the members of SIFFS. The village level primary societies take care of the local fish marketing, credit and saving needs of over 6000 fishing units which benefit 30,000 fishermen. The total fish sale by this network was around Rs.450 million in 2005-06. The district federations provide various support services to the societies including monitoring, input supply, credit services and welfare measures. SIFFS as the overall apex has a wide range of activities, both commercial and developmental. These include running a network of boat yards manufacturing marine plywood/fibreglass boats for artisanal fishing, supply of out board motors, a network of motor service centres, ice plants, a large micro-finance programme, R&D in fishing technology, promotion of fishermen societies in new areas, policy research and advocacy. SIFFS also provides technical, professional and financial support to fisherwomen's organisations. Some of the SIFFS services are available in Karnataka also.

SIFFS has played a major role in relief and rehabilitation after the December 2004 tsunami, especially on the Tamil Nadu coast. In addition to providing immediate relief, it has worked on restoring and further enhancing fisheries livelihoods in many areas. Repairs of boats and motors were followed by supply of new boats and nets. Livelihood restoration support was also provided to fisherwomen and male fish vendors. The opportunity has been seized to strengthen the marketing, credit and technical support activities and expand the fish marketing society network along the east coast. A community based fisheries management programme has also been launched in select locations. Given the scale of the destruction, SIFFS also felt compelled to get involved in activities for which it had no previous experience like housing. SIFFS is committed to constructing 2500 houses with the technical support of a number of institutions and with the participation of the affected communities. The SIFFS tsunami work also involves livelihood support to neighbouring agricultural and labouring communities. Finally, SIFFS has partnered with other organisations including the UNDP to set up coordination mechanisms for tsunami rehabilitation.