



Reconstruction and Transformation of Living Space: Focused on Tsunami Affected Coastal Housing Settlements in Sri Lanka

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Doctoral Dissertation

**Reconstruction and Transformation of Living Space
: Focused on Tsunami Affected Coastal Housing Settlements in Sri Lanka**

地域生活空間の再建と変容に関する研究
スリ・ランカの津波災害で被災した沿岸市街地に着目して

January 2009

**Graduate School of Science and Technology
Kobe University**

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ABSTRACT

Two thirds of the entire Sri Lankan coastal population and two percent of entire housing were affected by the Sumatra earthquake and tsunami in 2004 which made the necessity of a quick reconstruction processes in the housing sector of Sri Lanka.

In general coastal housing in Sri Lanka faces a variety of problems related to living environment, including quality and quantity habitability issues and administrative problems in the form of vague government regulations regarding housing construction on the nation's coastline. These problems vary according to the urban or rural areas of the country. Most low income communities were residing in structurally unsound squatter camps located along the coastline which had not taken account to the government housing stock. Such housing also totally destroyed by the disaster and made the problem worst.

It could be found many shortcomings in most of the post-disaster reconstruction programs which were implemented by the Sri Lankan government or other organizations with many financial supports of donors to obtain a full recovery.

This research had been conducted in the opinion of reconstruction can make not only the rebuild the damaged housing but also a substantial contribution to long-term development in the coastal zone in the country as a whole and correct reconstruction methods and strategies provides the opportunity to rectify many of the mistakes that were made and mitigate the affect of future natural disasters.

The study clarifies the pre-disaster and post-disaster local living environment organizations and domestic spatial arrangements and availability. Implications of resettlement and relocation on changes to domestic spatial arrangements and availability as well as community adaptations to the changing living environment were also investigated through the study. The study introduces different post-disaster housing reconstruction approaches of urban and suburban areas and analyzes and discusses about the advantages and short comings of those. Finally propose some proposals which could be helpful to develop an appropriate post disaster housing reconstruction strategy for the Sri Lankan coast line.

A chronological study method has been used for this research to clearly observe and clarify the existed conditions, transformation and development progresses of each stage of selected coastal living environments. In this descriptive and explorative field work study, to select the case studies several observations had been conducted in western and southern coastline which occurred a marked damaged from tsunami. Those belong to the highest populated provinces of the country and focused on the partially damaged and totally destroyed housing that necessitated relocation or rebuilding. Two of the six fieldwork surveys conducted in the selected fields in Colombo (urban), Galle (urban and suburban) districts were used for detailed study and to produce layout maps of each stage; a.) Pre-tsunami b.) Post-tsunami-shortly after the disaster c.) Post-tsunami-2.5 years after the disaster, which could be helpful to investigate real situation of the affected areas.

Findings reveals that; 1.) Through the post disaster housing reconstruction programs inhabitants of shanty areas would receive guidance for building permanent housing; possibly the first such experience for many and it will help to mitigate the future damages and alleviate problems associated with shanty/squatter settlements along the coastline. 2.) Most of the permanent housing reconstruction projects have been unable to identify the former balance of the original communities, importance of usual living patterns and livelihood, and satisfy the beneficiaries in the new settlements. 3.) The decrease in floor area and household occupancy of post disaster housing could result in future housing quality problems. 4.) Reduction of buffer zone regulation clearly affects the progress of reconstruction programs and deferring coastal housing and living environment related problems into the future. 5.) There is a wide gap between the quality and quantity of permanent housing and the progress of restoration efforts in urban areas compared to suburban areas.

Could be proposed; 1.) The process of housing reconstruction must be driven by the goal of upgrading existing living standard, promotion of better livelihood and ensuring the future security. 2.) The concept of post disaster reconstruction methods should be deal with community based disaster prevention and the main facts to be considered are original community and living environment organization, neighborhood groups and livelihood 3.) Reconstruction programs should be response not only to future tsunami disasters as well as other possible natural disasters through the entire processes 4.) Re-establishment or strengthen of coastal zone management, development laws and related authorities will be a backup for reconstruction process. 5.) Reconstruction programs should be considered the difference of housing measures and resettlement arrangements in between urban and suburban areas or redevelopment plans should consider the differences between areas and community needs.

Key words: reconstruction, permanent housing settlements, squatter camps, living environment and domestic spatial transformation, livelihoods, tsunami disaster

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CHAPTER 1-Introduction

The physical environment of resettlement settings crucial and relates to the recovery of disaster victims. This study is documenting how the affected people, existed built environment and living environment move with the post disaster recovery processes.

Coastal housing in Sri Lanka currently faces a variety of problems related to living environment, including quality and quantity habitability issues and administrative problems in the form of vague government regulations regarding housing construction on the nation's coastline. These problems vary according to the urban or rural areas of the country. Most low income communities are located along the urban coastline due to the livelihood opportunities associated with such areas and the relative ease with which they can sustain themselves using the available resources such as fisheries, tourism and opportunities related to the provision of service labor, etc. About 70% of all such coastal housing is structurally unsound and susceptible to collapse during disasters. We prospect that those problems become worst in the disaster situations. Even though government authorities have historically ignored these factors during housing planning, proper consideration is essential for developing reliable housing designs and proper living environments.

In such a situation two thirds of the entire Sri Lankan coastal population was affected by the Sumatra earthquake and tsunami in 2004¹. Tsunami waves generated by earthquakes, volcanic eruptions, or underwater landslides can reach 50 feet or more in height and devastate coastal communities. In recorded history; tsunamis worldwide have killed hundreds of thousands of people. On 26th of December 2004, South and Southeast Asian countries were hit by a tsunami, caused by an earthquake off the coast of the Indonesian

island of Sumatra (Fig.1.1). The Tsunami has killed over 150,000 people in the region and over 35,000 in Sri Lanka alone. The tsunami is the worst natural disaster to affect Sri Lanka in living memory. The word of 'tsunami' was unheard by most Sri Lankans until Sumatra earth quake and tsunami occurred. It has given rise to a massive humanitarian crisis and is causing untold suffering to millions of people. And also the Sumatra tsunami disaster destroyed and damaged nearly 100,000 housing units in 12 coastal districts of Sri Lanka, affecting nearly 2 percent of the total national housing and non-count shanty house/squatter camps stock.

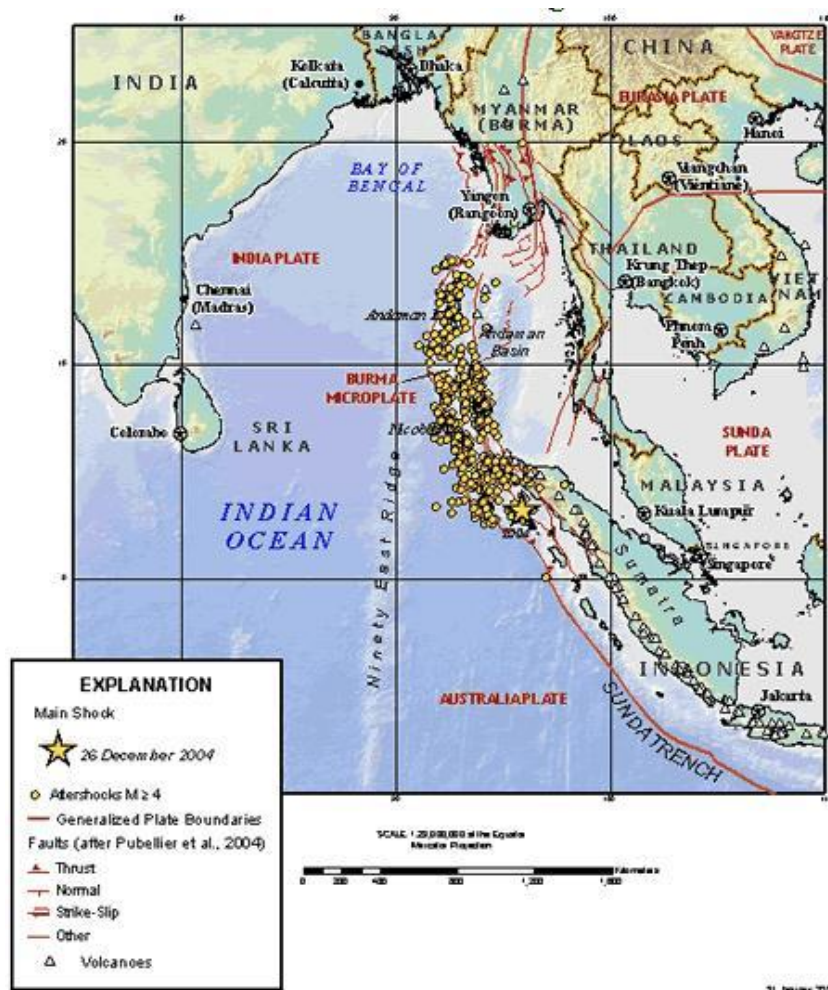


Fig.1.1: Northeast Indian Ocean Region Tectonic Setting and Location of Sri Lanka and Sumatra Islands

Although it can be said the necessity of reconstruction prompted by a worst possible circumstance like tsunami, it is clear that the reconstruction process has a high potential for significant improvements in the social, economic and environmental upgrade of Sri Lanka's coastal population. At the same time rebuilding can make a substantial contribution to long-term development in the coastal zone and in the country as a whole. Correct reconstruction methods and strategies provides the opportunity to rectify many of the mistakes that were made and were in some cases allowed or even encouraged to happen in the past and mitigate the affect of future natural disasters.

After the tsunami disaster several reconstruction programs were implemented by the Sri Lankan government with many financial supports² to obtain a full recovery. Simultaneously, buffer-zone (set-back zone)³ which describe in detail on coming chapters, directs two programs for permanent housing known as home-owner driven housing reconstruction program⁴ and donor-driven housing resettlement program⁵ to repair or rebuild damaged houses were also introduced. For people living outside the buffer-zone, under the home-owner driven housing reconstruction program financial support is being provided to about 67,000 families.

For people previously living within the buffer-zone, the donor-built housing resettlement program is underway and about 32,000 victims will be benefited under this program. The total cost of the required relief, rehabilitation and reconstruction effort has been estimated at approximately US\$ 2.2 billion. The government has projected, even with a grate effort it would take 3-5 years to rebuild destroyed structures and achieve a full recovery.

The concept of reconstruction method of this kind of natural disaster is that, importance should also put on community based disaster prevention and on the principal of

community-unit basis other than shifting the whole affected communities to the permanent housing settlements in the remote areas.

Through the observations it is evident that the prior necessity is setting of a long-term efficient reconstruction plans which consider the order and needs of the original communities, differences between areas of the country and possibilities/opportunities for future developments.

1.1. Research Background

1.1.1. General Introduction of Sri Lankan Coastal Zone

The land area of the coastal zone, which is approximately 24 percent of the total land area, is occupied by 34 percent of the country's population, of which 45 percent lives in urban areas. Sixty-five percent of the country's urbanized areas are located in this zone. Therefore, a highly developed road and rail transport infrastructure can be found in this area, together with commercial ports, fishery harbors and anchorages. The coastal area thus provides access to transportation and shipping lanes which lead to distant markets and link neighboring communities through navigable lagoons, rivers and canals. Some of the richest biodiversity areas in the country occur in the coastal zone, including coral reefs, extensive sea grass beds, mangrove forests, salt marshes, beaches, sand dunes, coastal wetlands, highly productive estuaries and lagoons and sanctuaries, which cover an area of 160 000 hectares.

The coastal zone also serves as a focal point for economic development. Forty percent of the Gross Domestic Production (GDP) comes from the coastal zone with 70 percent of

the total industrial output. The contribution to economic development by way of tourism-related industries is high, as more than 80 percent of the tourism-related infrastructure is located within this zone (most in the western and southwestern coastal belts). There are nearly 100 sites of special historical, archaeological, cultural and religious significance and 100 more of special scenic and recreational importance scattered within the coastal zone. Fishing is the predominant coastal economic activity along the eastern and northeastern coasts during the southwest monsoon and along the southern and western coasts during the northeast monsoon. Marine fisheries are of considerable socio-economic importance along the entire Sri Lankan coastline. In 2003, the fisheries sector contributed nearly 3 percent to the GDP and employed over 300 000 persons directly and in related activities. The livelihoods of about one million people depend directly and indirectly on the fisheries sector. (R.A.D.B Samaranayaka)

1.1.2. The Damage of the Sri Lankan Coastal Community by the Sumatra Earthquake and Tsunami

The tsunami struck left widespread destruction along coastal belt which covered the northern, eastern, southern and western parts of Sri Lanka. Out of 25 districts 14 have been affected by the tsunami and of the 19.3 million population 11 million (57.4%) lived in those affected districts (Department of Census and Statistics, 2004). In total it has been estimated that up to one million people have been affected by the tsunami. This represents 5.1% of Sri Lanka's entire population. The coastal communities of western and southern parts were severely affected by being the highest populated coastal areas of the country (Fig.1.2).

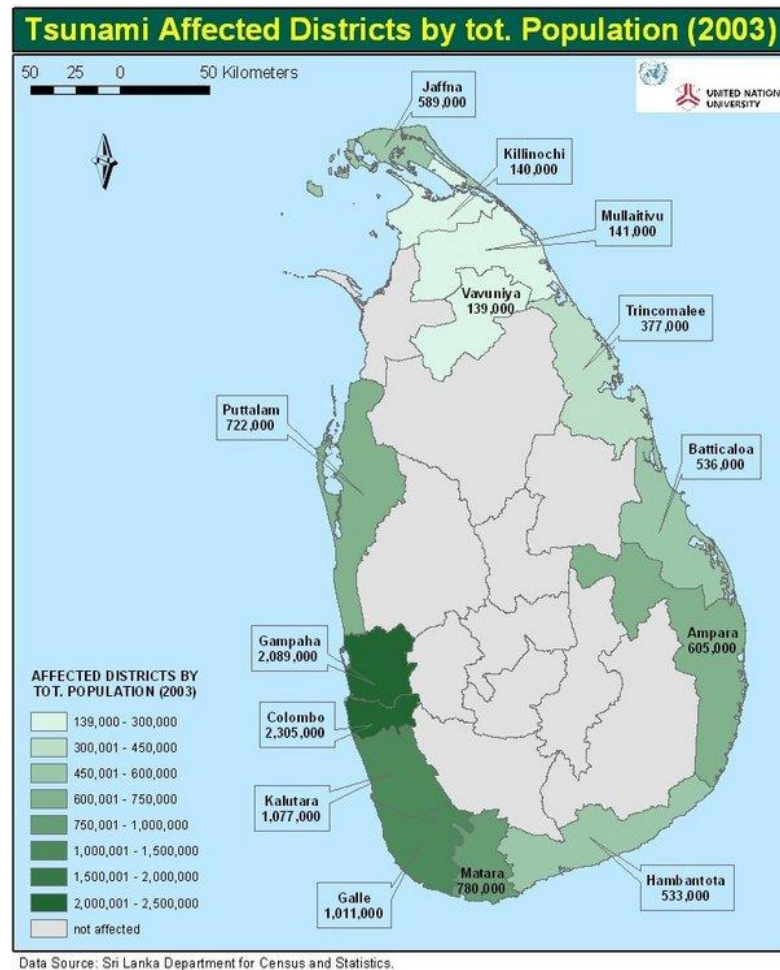


Fig.1.2: Tsunami Affected Districts by Total Population

The tsunami destroyed or damaged nearly 100,000 housing units (Fig.1.3 and Table.1.1), 75% of fishing fleet, 72 hospitals, 182 schools, 53 tourist hotels and lost 150,000 livelihoods. About 50,000 water connections were damaged and drinking water wells contaminated. And about 415km of national roads, 1500km of provincial and local government roads, 23 road bridges, coastal rail track and rolling stock were damaged. Social networks were disrupted. Electricity supplies and communication were severely affected. As a result hundreds of thousands of people found themselves without food and health care because of the breakdown in whole infrastructure.

The number of people affected in a district not proportional to the number of deaths in that district and the physical damage shows another picture of destruction. The underlying reasons for the varying damage patterns could be due to land use patterns, activity patterns, etc. And the number of people affected and damaged housing units are not obvious in district level. Almost a million people from 200,000 families had been displaced, according to figures of the Centre for National Operations. In response, almost 800 camps and 250 school buildings were being used as temporary residence for the displaced persons.

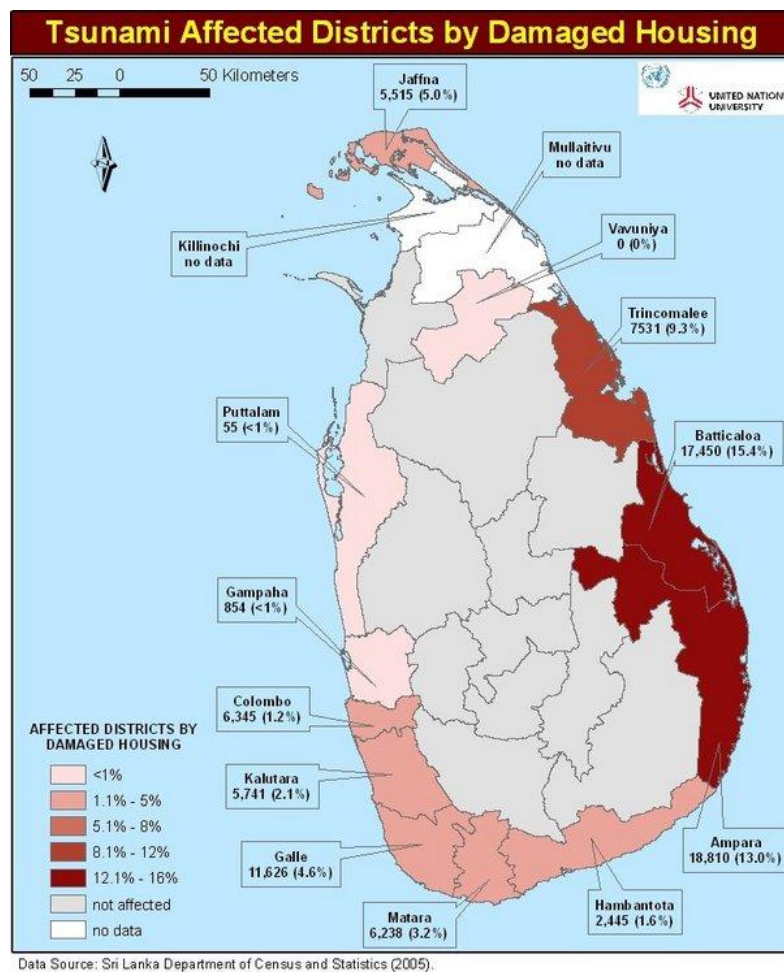


Fig.1.3: Tsunami Affected Districts by Damaged Housing Units

(Source: Sri Lanka Department of Census and Statistics)

There was an urgent need to rebuild Sri Lanka's shattered infrastructure. The most urgent priority was to reestablish the people who had had their homes destroyed completely. They had lost all of their possessions and much of their means of livelihood. For many, a home represents an investment of a lifetime. Under such circumstances, building a new home could be little more than a dream to them.

Many organizations were facing a unique opportunity to rebuild damaged housing and other social infrastructure, and to make a positive step in improving the welfare of Sri Lanka's coastal population. However, the government needed to have a firm plan in place for this reconstruction, especially with regard to relocation, resettling and zoning in coastal areas. It is senseless to initiate massive housing schemes without a definitive plan and such plan had to be initiated before reconstructions begin.

Table 1.1: Percentage Distribution of Housing Units Surveyed and Total Housing Units Listed by Type of Damage in Selected Affected Districts.

(Source: Department of Census and Statistics)

Affected District	Percentage of Housing Units Surveyed			Total Number of Damaged Housing Units Listed
	Completely Damaged	Partially Damaged (Unusable)	Partially Damaged (Usable)	
Colombo	47.4	9.2	43.4	6998
Galle	36.8	8.8	52.6	12645
Matara	27.5	10.8	61.7	16554
Hambantota	47.9	12.0	40.1	2541

1.1.3. Government Policy for Coast line Construction and Problem of Squatter Camps

There was a comprehensive legal, policy and institutional framework relating to coastal zone management and development of Sri Lanka before the Sumatra earthquake and tsunami. Due to the interference of changing political parties' the misuse of discretionary powers lead to inactive authorities and abandoned coastal line regulations and laws. Such authorities contributed greatly to the establishment of unsafe, illegal houses or squatter camps along the coastline which highly destroyed by tsunami 2004.

Sri Lanka remains a densely populated country, and land pressure is particularly intense in the Coastal Zone. Rebuilding should be based on the principle of minimum land use. While unused land is at a premium in the Coastal Zone, rebuilding is a priority. This should take place outside the Coastal Zone in suitable locations while giving priority original community orders and livelihoods. Proper land use planning means integrating environmental concerns into housing construction.

There is currently a dangerous belief among some decision-makers that the emergency situation warrants suspending or negating existing laws. In no way should this be allowed to happen. The shoreline and immediate coastal zone are inappropriate and dangerous areas for human settlement. The location of housing must be carefully planned in accordance with internationally accepted safe norms, in line with the provisions of the Coast Conservation Act No. 57 of 1981. Rather, it is essential that existing laws relating to Coastal Zone development be strictly and fairly enforced. These include the Coast Conservation Act, No. 57 of 1981 as amended, the National Environmental Act, No. 47 of 1980 as amended. (Environmental Foundation Ltd.)

At the present the low income community groups in mainly in urban coastal areas than suburban are struggling with their future settlements and livelihood while living in unsafe semi-permanent/shanty squatter camps. High percentage of victims of other housing categories have been able to settle in some where except inside the buffer-zone, though they are struggling with another kind of living environment related problems will be described in coming chapters. Therefore reestablishment of coastal line regulations and laws and strengthening the authorities will be a backup to the whole reconstruction process.

1.1.4. Post-disaster Reconstruction after Natural Disasters in Worldwide Sphere

-Lessons from the “Hyogo-ken Nanbu”/ “Great Hanshin-Awaji” Earthquake

The damage by the “Hyogo-ken Nanbu”/ “Great Hanshin-Awaji” Earthquake which occurred at 05:46 on 17 January, 1995 as below (Fig.1.5);

Scale : Magnitude 7.3

Seismic intensity : 7 on Japanese scale

Epicenter : South Hyogo (North Awaji Island)

Dead : 6,433 people

Completely/ Half destroyed : 249,180 buildings

Financial damage : \$ 87 billion (2.5% of GDP)

Evacuees : 316,678 people at peak

Evacuation centers : 1,153 locations

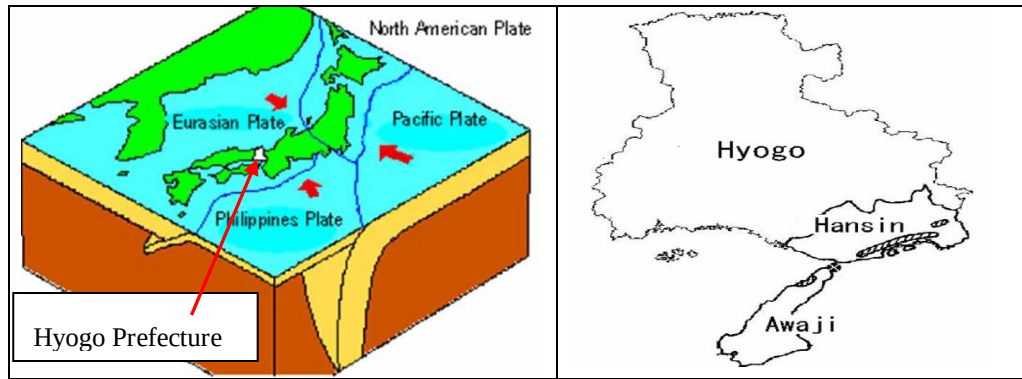


Fig.1.4: Location of Hyogo Prefecture and Earthquake Occurred Area of Japan
(Source: Hyogo Prefecture Phoenix Plan)



Damage for Infrastructure



Damage for Residential Buildings

Fig.1.5: Damage by “Hyogo-ken Nanbu”/ “Great Hanshin-Awaji” Earthquake on 2005
Japan (Source: Hyogo Prefecture Phoenix Plan)

Hyogo Prefecture Phoenix Plan:

Basic concepts of reconstruction

-Reconstruction suitable for a mature society

To not only return what was lost during the disaster, but also to realize creative reconstruction suitable for a mature society in the 21st Century

-Creative Reconstruction-Better than pre-quake

Harmonious Coexistence between People & Nature/Society

Five pillars

- Creation of a welfare society tailored for the 21st century
- Creation of a culturally rich society open to the world
- Creation of a society where existing industries grow and new industries flourish
- Creation of a disaster-resistant metropolis where people can live with confidence
- Urban development with multi-centered network-type metropolitan area

Lesson 1-Delay of first response

Lesson 2-Absence of coordination among relevant organizations

Lesson 3-Lack of preparedness

- 80 % were killed by collapsed buildings
- Most damaged buildings did not comply with the building code “Building Standard Law” revised in 1981 (most of them were old buildings built before this revision)
- Fire broke out and spread at old wooden houses densely built up area

Countermeasures for lesson 3-

- Seismic Building Retrofitting Act (1995); To promote seismic retrofitting of existing vulnerable buildings

Lesson 4-Importance of community and volunteer

Lesson 5- Need for assistance in livelihood restoration

Lesson 6- Importance of urban planning

Countermeasures for lesson 6-

- Live in harmony with nature: understand the nature
- Water and greenery: part of infrastructure
- Decentralization of urban functions
- Balanced transportation system: alternate routes
- Urban infrastructure (ensure public space: roads, parks, public squares, etc.)
- Fire & earthquake resistant buildings
- Life lines: fail-safe approach

Lesson 7-Transfer of lessons

1.1.5. Building for a Disaster Affected Community

Shelter, as an integral part of the built environment, impacts dramatically on disaster recovery and adjustment. There is a complex and consequential mutual interaction between people and their built environment. (Rapoport 1977). Built environment have the potential of being stress-inducing or stress-reducing (Saegart 1976). The built environment can play a very supportive role and therapeutic role in helping people adjust to dramatic change, catastrophe and personal and family loss. This depends in part on the familiarity, meaningfulness, and responsiveness of the setting itself to individual, community and cultural need. (Raser 1979, Sommer 1974). The extent to which the built environment can be determining with respect to behavior and psychological well-being depends on the experiential state of occupants; the more stressed individuals are, the more determining and consequential the impact of the physical setting (Reser 1989).

The real human tragedy that occurs when one loses a home due to a natural disaster is arguably not so much the loss of physical property one's residence, but the loss of that place from which one derives self identity and meaning (Read 1996, Bunbury 1994).

Recovery, adjustment and the sustainability of communities after natural disasters are all founded on a very deep sense of place attachment and meaning (Altman & Low 1990, Altman & Warner 1985, Marcus 1997). Construction materials for disaster relief housing, as well as the nature, design and siting of such housing, can an important role in creating this supportive environment. (Rodaway 1994)

1.1.6. The Problems and Significance of the Study

People who have different life styles cluster together in different degrees. Life style reflects the culture, economy, social background and behavior and values of the people. The strong bond between above important aspects is essential for the existence of a community. But by a sudden disaster such spatial and community organization and social identities could be disordered in a moment.

Tsunami disaster is not a common phenomenon in Sri Lanka until Sumatra tsunami tidal waves hit to the Sri Lankan coast line on 2004. It was devastation of life and properties and destroyed the long standing communities on Sri Lankan coast line which made a sudden necessity of a mass housing supply for the country. Although such a mass housing reconstruction program was a big challenge to the Government of Sri Lanka and other development authorities through the continued aids of national and international donor groups quick permanent housing supply for the victims was possible.

Since most of the reconstruction proposals had been missed community care, environmental contexts, and livability produced settlements are being with many problems. Such unplanned prompt reconstruction proposals drag the housing and living environment related problems in to future which makes the current housing problems more severe.

The communities in damaged districts had been lost their lives, houses, neighborhoods and all kind of life-infrastructures. Those coastal communities remained with nothing left and should rebuild prudently, at the beginning from housing levels to communities' levels. But with the beginning of reconstruction programs, members of these communities have been confused by the sudden changes to their living environments, domestic spatial arrangements and availability, living patterns as well as livelihood and neighborhood environments. Furthermore, the reduction of the buffer zone policy⁶ and its accompanying regulations from the Coastal Conservation Department (CCD) has seriously disrupted the reconstruction processes and the reestablishment of new community settlements.

It is hard to find the proper researches and field works done on post disaster reconstructions in Sri Lankan coast line and related problem. This study could be useful for proposing appropriate planning methodology for both future post-disaster living environments and domestic housing planning initiatives, as well as for providing valuable information for other house building programs directed at alleviating the housing shortage along the coastline of the country.

1.2. Objectives of the Study

The objectives of this study are to clarify the pre-disaster and post-disaster local living environment organizations and domestic spatial arrangements and availability. And to investigate the implications of resettlement and relocation on the domestic spatial arrangements and availability. Furthermore community adaptations to the changing living environments also examined.

This study introduces different post-disaster housing reconstruction approaches of urban and suburban areas and analyzes and discusses their advantages and problems.

The study intends to put an effort to study on such housing reconstruction programs, related community problems and to introduce some proposals which could be helpful to develop an appropriate post disaster housing reconstruction strategy for the Sri Lankan coast line.

1.3. Methodology

It could be found many affected living environments along the Sri Lankan coast line. Suffered people and areas were unequal. Reconstruction processes and social systems also were complicated. Because of that observations and surveys had to conduct in different areas to understand the situation.

A chronological study method has been used to clearly observe and clarify the existed conditions, transformation and development progresses of each stage of selected coastal living environments. Furthermore in this study the pre and post disaster coastal living environments and domestic spatial arrangements and their transformations due to the post disaster reconstruction processes have been studied in detail.

This is a descriptive and explorative field work study by using six different case studies in western and southern coast line (Fig.1.6) where marked damages occurred from tsunami by being highest populated provinces of the country. Two of the six fieldwork surveys conducted in the selected fields in Colombo (urban) and Galle (urban and suburban) and districts were used for detailed study and to produce layout maps of each stage a.) Pre-tsunami b.) Post-tsunami-shortly after the disaster c.) Post-tsunami-2.5 years after the disaster, which could be helpful to investigate the real situation of the affected areas. This study focuses on the partially damaged and totally destroyed housing that necessitated relocation or rebuilding along the western and southern coastline of Sri Lanka.

To select the above mentioned case studies, observations had been conducted in three stages, during the periods of 10/07/2006-26/07/2006, 10/02/2007-12/03/2007, 10/07/2007-25/07/2007 and 10/09/2008-20/09/2008 in the western and southern coastal areas. Those selected villages were fully or partially fishers' villages. And those were selected as case studies due to the clear evident community problems. We researched those fields on sites, and interviewed informally with the officers and the concerns, to grasp the physical situation of pre-disaster settlements and post-disaster settlements redeveloped.

Data was gathered through multiple collection methods including literature surveys of local statistics⁷, international statistics⁸, field surveys of onsite observations, questionnaire surveys, municipal drawings and informal interviews as mentioned above.

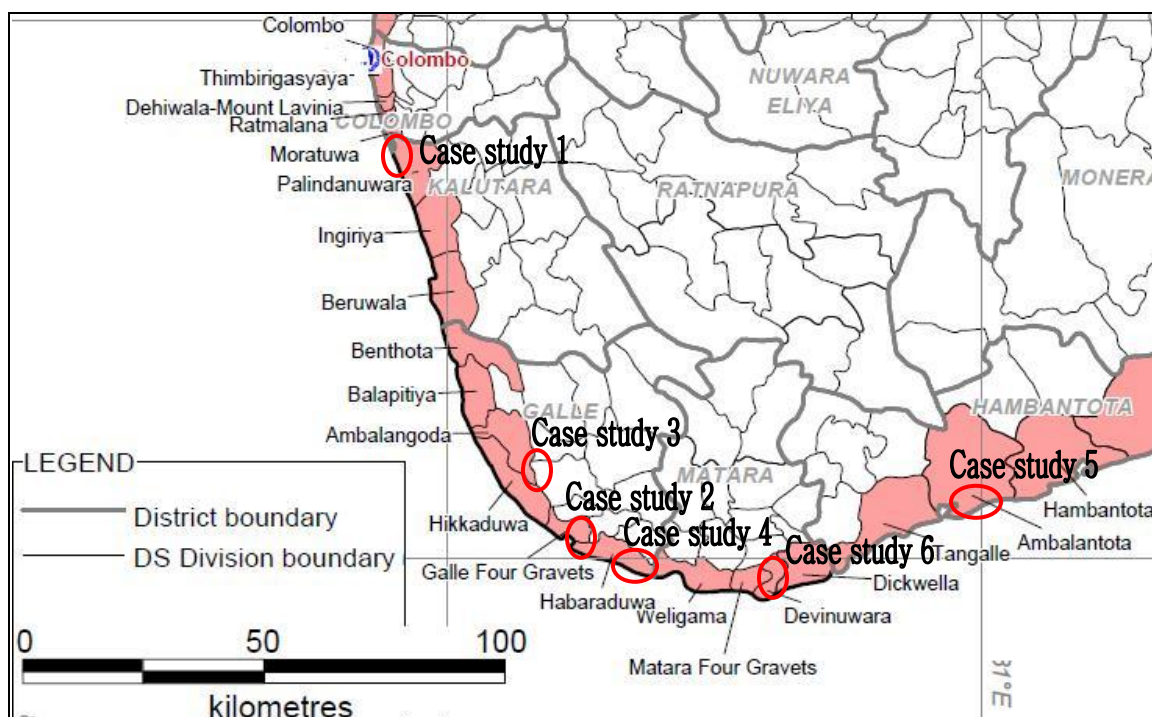


Fig.1.6: Locations of the Case Study Fields in Western and Southern Coast line

Table 2.2: Selected Housing Settlements/Case Studies

Case Study (Housing Settlement)	District	Context	Reconstruction Category		Distance from Shore line	Current Reconstruction Stage	
Case Study 1 Egodaunya	Colombo	urban	owner and donor driven	driven	original location or 5-6km	under construction	
Case Study 2 Walahanduwa	Galle	suburban	donor driven		6-7km	completed on 2006	
Case Study 3 Monrovia	Galle	suburban	donor driven		5-6km	completed on 2006	
Case Study 4 Mirihanawatta	Galle	suburban	donor driven		1km	completed on 2008	
Case Study 5 Minsiripura	Hambantota	rural	donor driven		4km	completed on 2006	
Case Study 6 Totamuna	Matara	suburban	owner driven		original location	under construction	

Case Study 1- “Egodauyana” Housing Settlement- Colombo District

Egodauyana GN Division⁹ of the Moratuwa DS Division¹⁰ of the Colombo District had been undergone high damaged to the living environment and housing. Originally most of the affected housing was semi-permanent or squatter camps. Current situation of housing is under construction or temporary shelters.

**Case Study 2- “Walahanduwa- Salsberg Village” Permanent Housing Settlement
-Galle District**

Walahanduwa- Salsberg Village, is one of the outer urban periphery post disaster permanent housing settlement in Akmeemana DS Division of Galle district mainly for the victims of Dewata, Katugoda, Kaluwella, Magalle, Pettigala, Mahamodara GN Divisions, Etc. Permanent housing construction is completed by 2006.

Case Study 3- “Monrovia Estate” Permanent Housing Settlement - Galle District

Monrovia estate is one of the 5-6 kilometers inward permanent housing settlements from the shoreline in Hikkaduwa DS Division of Galle District mainly for the victims of Telwatta, Hikkaduwa Nagarikaya, Dodanduwa, Ratgama, Boossa, and Pitiwella GN Divisions. Permanent housing construction is completed on 2006.

Case Study 4- “Mirihanawatta” Permanent Housing Settlement- Galle District

Mirihanawatta Permanent Housing Settlement is one of the outer urban periphery post disaster permanent housing settlement in Habaraduwa DS Division of Galle district mainly for the victims of Kataluwa-East and Kataluwa-West GN Divisions, Etc.

Permanent housing construction is completed on 2008.

Case Study 5- “Minsiripura” Permanent Housing Settlement- Hambantota District

Minsiripura village in Hatagala GN division of Hambantota district is the permanent housing settlement for the victims of Kalametiya village. The original Kalametiya fisherman village along the coast line had been totally destroyed by tsunami disaster and re-established about 4 kilometers away from its original location. Permanent housing construction is completed by 2006.

Case Study 6- “Totamuna” Permanent Housing Settlement -Matara District

Thotamuna home owner driven permanent housing project in Matara Four Gravets DS Division of Matara district is for the victims of outside the buffer zone in the original land. Most of the houses are under construction stage.

1.4. Scope and Limitation

The northern, eastern, southern and western coastal districts of Sri Lanka affected by the Sumatra earthquake and tsunami on 26th December 2004. This study focuses only on western and southern coastal communities and their housing reconstruction. Only six different case studies in different localities have been selected for this study among many housing reconstruction projects in different affected areas in western and southern provinces which clearly depicts problems and benefits.

1.5. The Structure of Dissertation

This dissertation is arranged to five chapters.

Chapter 1 is introduction of the study. It is describe the back ground, objectives, methodology, scope and limitation and the structure of dissertation. The research background clarifies the damage of the Sri Lankan coastal community by the Sumatra earthquake and tsunami, government policy for coast line construction and problem of squatter camps, lessons from the “Hyogo-ken Nanbu”/ “Great Hanshin-Awaji” earthquake and introduction to building for a disaster affected community.

Chapter 2 presents the wider context and damage occurred by Sumatra earthquake and tsunami of the selected study areas. It provides details about traditional and current coastal housing, community and living environment arrangements. Further more data of urban structure (demography and land use) and administration system will be introduced.

Chapter 3 introduces the six different field works and their completed and ongoing reconstruction programs. Describe the data of pre and post disaster living environments and livelihoods. And provide an evaluation and analyze of adequate level of facilities provided in housing relocation and resettlement and the satisfaction level of beneficiaries.

Chapter 4 describes the transformation of the original living environmnet and domestic spatial arrangements and availability of selected two case studies in urban and suburban contexts. The implications on living spaces also described in detail.

Chapter 5 provides the conclusion of the study and considerations for future reconstruction programs.

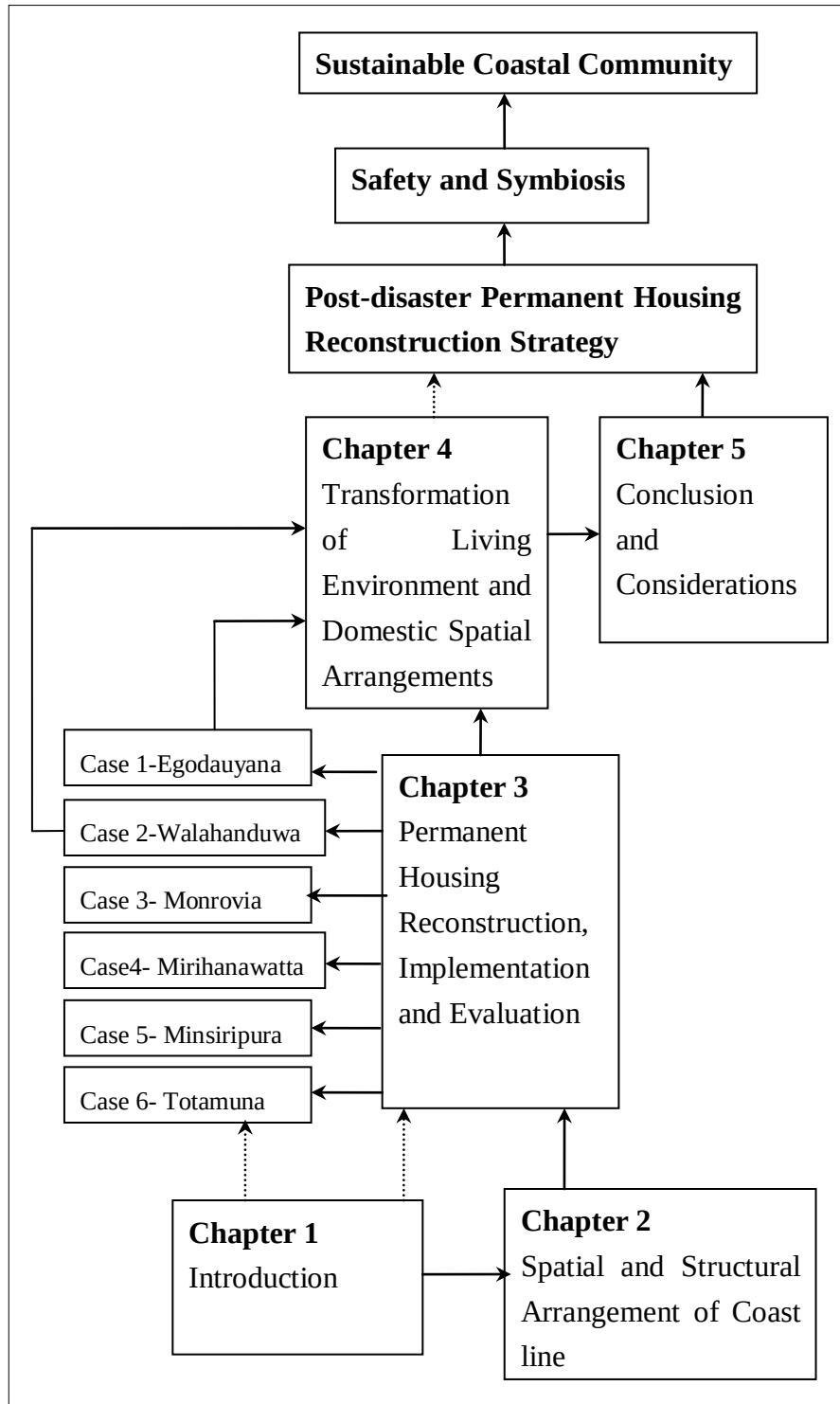


Fig.1.7: The Structure of Dissertation and Research

Notes

¹The Sumatra earthquake, with a magnitude 9.0, occurred at 7.58 AM on December 26th 2004 under the Indian Ocean. As a result of the earthquake and tsunami, more than 220,000 people died, making it one of the greatest natural disasters recorded.

²The Sri Lankan government received the financial support of international organizations, including major international non-governmental organizations (INGOs), multilateral and bilateral donors, and civil society organizations, etc.

³The buffer-zone (or set-back-zone) was divided into two parts due to the country's land value. Zone 1 – 100 m landwards from the mean high waterline in the western, southern and southwestern districts. Zone 2 – 200 m landwards from the mean high water line in the northern and eastern districts of Sri Lanka. The buffer-zone has been a critical issue in the recovery process which has not worked equally effectively in all areas.

⁴The government of Sri Lanka is providing cash grants backed by different development banks and bilateral donors to affected homeowners for the reconstruction of partly or totally destroyed houses outside the buffer zone.

⁵All affected families are entitled to a house built by a donor agency in accordance with the government of Sri Lanka standards. The donor will provide each new settlement with a common internal infrastructure while the Sri Lankan government provides services up to the relocation site. The beneficiary remains the legal owner of his/her property within the buffer zone and receives full title to the property in the relocation site.

⁶The original buffer zone (set-back-zone) was 100 m or 200 m landwards from the mean high waterline of the coastline. This was reduced by the Coastal Conservation Department (CCD) after the disaster and varies between 25m-80m according to the area.

⁷Data collected from RADA - Reconstruction And Development Agency, UDA -Urban Development Authority and other Sri Lankan authorities, Department of census and Statistics, etc.

⁸ Data collected from international websites

⁹*Grama Niladari* (Village Officer) Division of Sri Lanka which is a combination of number of villages.

¹⁰District Secretarial Divisions of Sri Lanka which is a combination of number of GN divisions.

CHAPTER 2- Spatial and Structural Arrangements of Coast line and Damage of Tsunami and Reconstruction Approach

2.1. Coastal Community, Housing and Living Environment Arrangements

This chapter provides data about traditional and current coastal housing, community living environment arrangements, urban structure (demography and land use), and administration system.

2.1.1. Transition from Traditional Situation to Present Situation

Simple structures of wattle and daub¹, mud and cabok², cadjan (coconut leaves) and wood were not peculiar things for coastal zone house builders from the past. Due to the comfortable climate, simple life style, tradition, culture and economy such structures were sufficient for their living. Although people could survive in such simple home, with the development of the society and economy various types of structurally sound houses were being appeared and started to get wide spread.

2.1.1.1. Traditional Coastal Housing Types

- i. House on the beach;

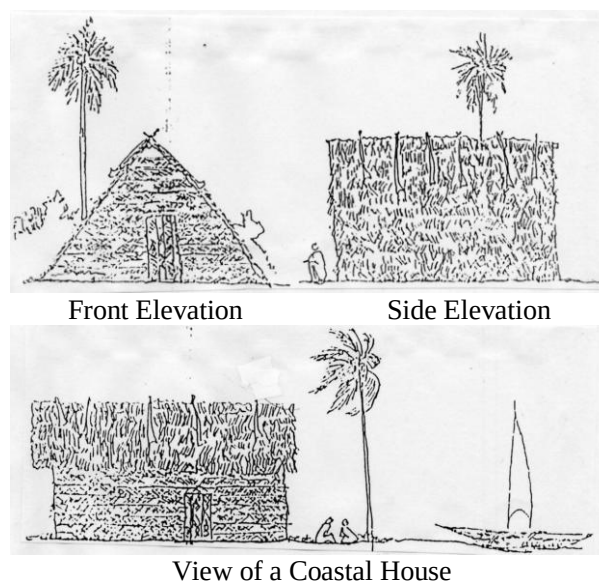


Fig.2.1: A Traditional House- In the Coastal Area
(Source: Sri Lankan Tradition by Prof. N. De Silva)

Typical house was rectangular in shape with one room and without any plinth or verandahs. The roof was gable with cadjan covering and the walls were also constructed out of cadjan. In some areas the roof has extended up to the round without any wall and the door was also very temporary in nature.

ii. House outside the coast line- '*Ruhuna*' Chena Housing Type;

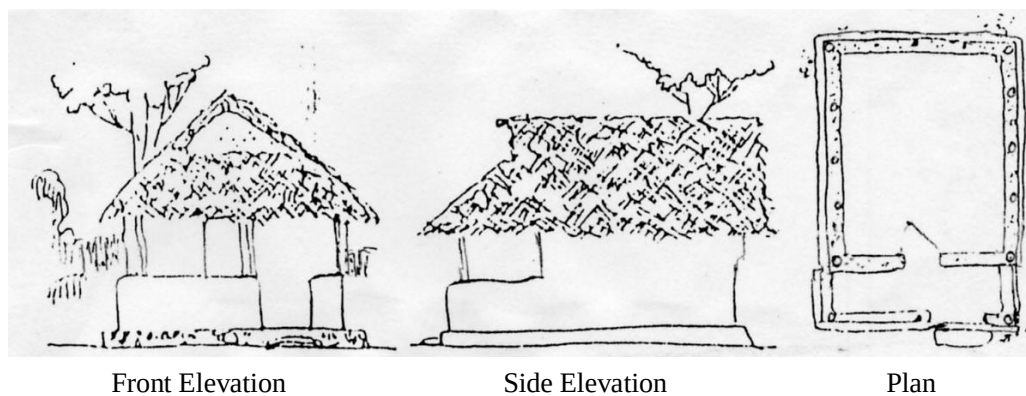


Fig.2.2: A Traditional House of Southern Province- outside the coast line
(Source: Sri Lankan Tradition by Prof. N. De Silva)

This was very simple small rectangular house with one room and the verandah, wattle and daub construction with a rough finish and very temporary in nature. Roof was thatched with "*Mana*" grass, "*Illuk*" grass or cadjan.

2.1.1.2. Present Coastal Housing Types

Category 1-

i. Traditional or Colonial Influenced Permanent Housing

Provincial identities in those traditional housing types were still preserved in many locations due to the functional environmental and the cultural acceptance of those forms and plans to the occupants. The deviations from the basic plan were common due to

different requirements of various families, availability of materials in relation to their economy and the influence on styles.

With the last two hundred years the colonial influence on housing and construction methods were synthesized with the local architecture and evolved many other types of houses that came in parallel with the tradition. These houses were mostly found in the coastal areas from Negambo (western coast line) to Matara (southern coastline). The verandah in these houses became an important architectural feature with decorated timber or masonry columns, doors and windows were much refined and painted in color, the floor finished either with clay tiles or cement. The half round clay tiles became more popular as a roof covering and the walls white washed and plastered even though it was constructed out of mud or cabok. These houses were environmentally well suited; it was functional, durable and culturally acceptable to the socio economic condition of the rural folk. (N.De Silva)



Colonial Influenced



Common Type

Fig.2.3: Permanent Housing Types

ii. Common Permanent Housing

This is the most common housing type existing in coastal zone as well as other areas of the country appeared from several decades ago with the influence of local architecture and others. These houses are constructed by using durable construction materials such as cement, bricks/cement blocks, concrete, wood, tiles, etc. The floor area, finishes and number of stories of this kind of housing basically depends on the income level.

Category 2- Semi-permanent Housing or Squatter Camps

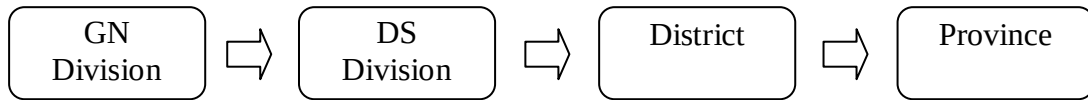
Coastal areas occupied by fisherman and those who related coastal line occupations, which is being considered as a low income group by the society up to date. According to their income level, tradition and irregular government coastline regulations they could build a simple home by using cheap or waste construction materials any vacant land in coastal areas. Later other low income community groups also started to follow them. That was dragged the coastal line shanty house and squatter camps problem up to date.



Fig.2.4: Semi-permanent/Squatter Camps on Egodaunya Coastal Community of Western Coast, Sri Lanka

2.2. Administration System

2.2.1. Area Organization



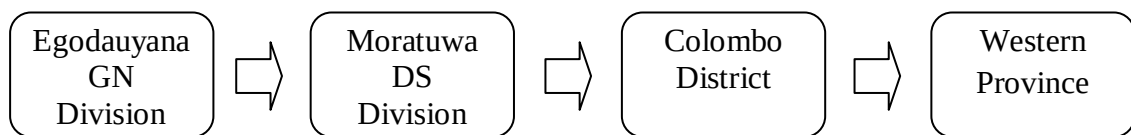
GN Division- *Grama Niladari* (village officer) Division (Combination of no.of villages)

DS Division- District Secretarial Division (Combination of no. of GN divisions)

District - Combination of no. of DS divisions (Sri Lanka has 24 Districts)

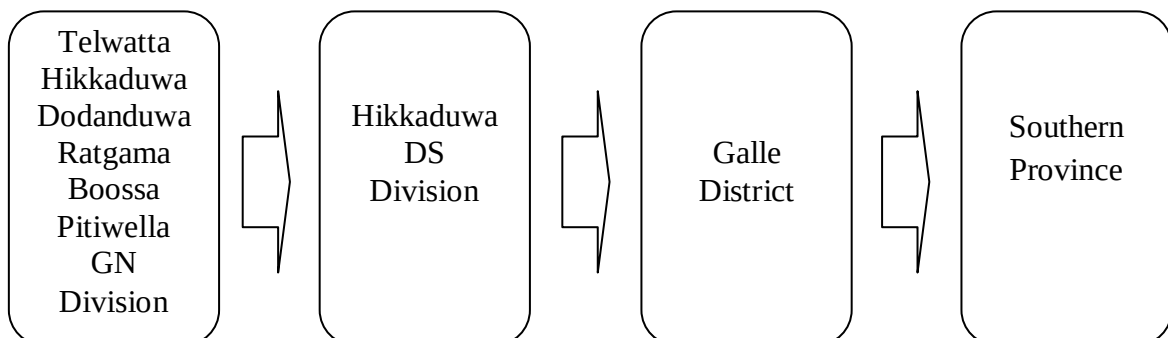
Province - Combination of no. of Districts (Sri Lanka has 9 Provinces)

a.) Relevance to Colombo District Case study

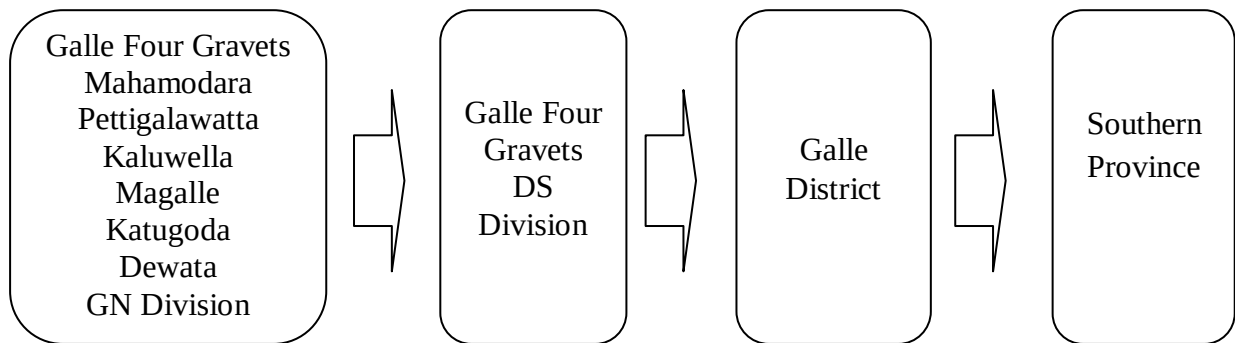


b.) Relevance to Galle District Case studies

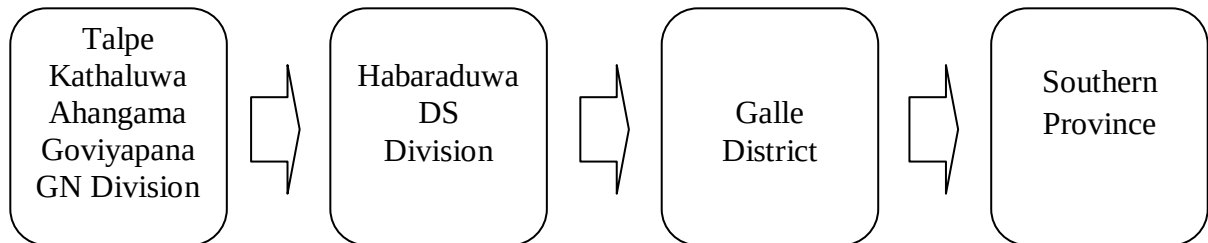
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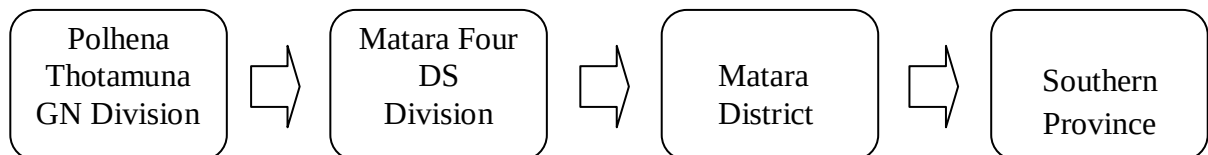
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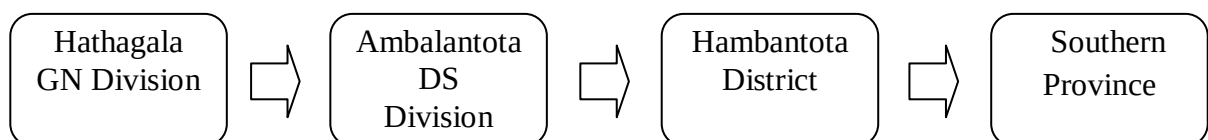
iii.



c.) Relevance to Matara District Case study



d.) Relevance to Hambantota District Case study



2.3. Reduction of Buffer-Zone Regulation

Due to limited or non-availability of land to relocate displaced families under donor-built housing programs and homeowner-driven programs, the Ministry of Urban Development and Water Supply, the other relevant district secretaries and Coast Conservation Department reduced the set-back zone size by following the set-back standards stipulated in the national Coastal Zone Management Plan, 1997. At present the land in the set-back zones is vacant in than pre-tsunami situation in many divisions.

Table 2.1: Buffer-zone Limitation of Selected GN Divisions

(Source: Post tsunami housing program, National Housing Development Authority)

GN Division	Previous Buffer Zone Limitation (m)	New Buffer zone Limitation (m)
Colombo District		
Egodauyana-south	100	45
Galle District		
Telwatta	100	45
Hikkaduwa	100	25
Dodandoowa	100	25
Ratgama	100	25
Boossa	100	30
Pitiwella	100	30
Mahamodara	100	30
Pettigalawatta	100	35
Kaluwella	100	35
Maggalle	100	35
Katugoda	100	35
Dewata	100	35
Talpe	100	30
Kataluwa	100	30
Ahangama	100	30
Goviyapana	100	30
Matara District		
Polhena	100	45
Totamuna	100	45
Hambantota District		
Hatagala	100	35

Buffer Zone or Setback Zone-Phase 1

A buffer zone existed before the tsunami, but was not fully enforced. Following the disaster the government made a decision to introduce a buffer zone of 100m in the south and south west, and 200m in the north and north east as the damage to life and property was higher there than in the south.

Buffer Zone or Setback Zone-Phase 2

Whereas the buffer zone was conceived as a preventive measure, it has become a serious issue because of the scarcity of land. Due to this, the buffer zone has been revised as 25m - 50m in the west, south and south west, and 30m-80m in the north and north east.

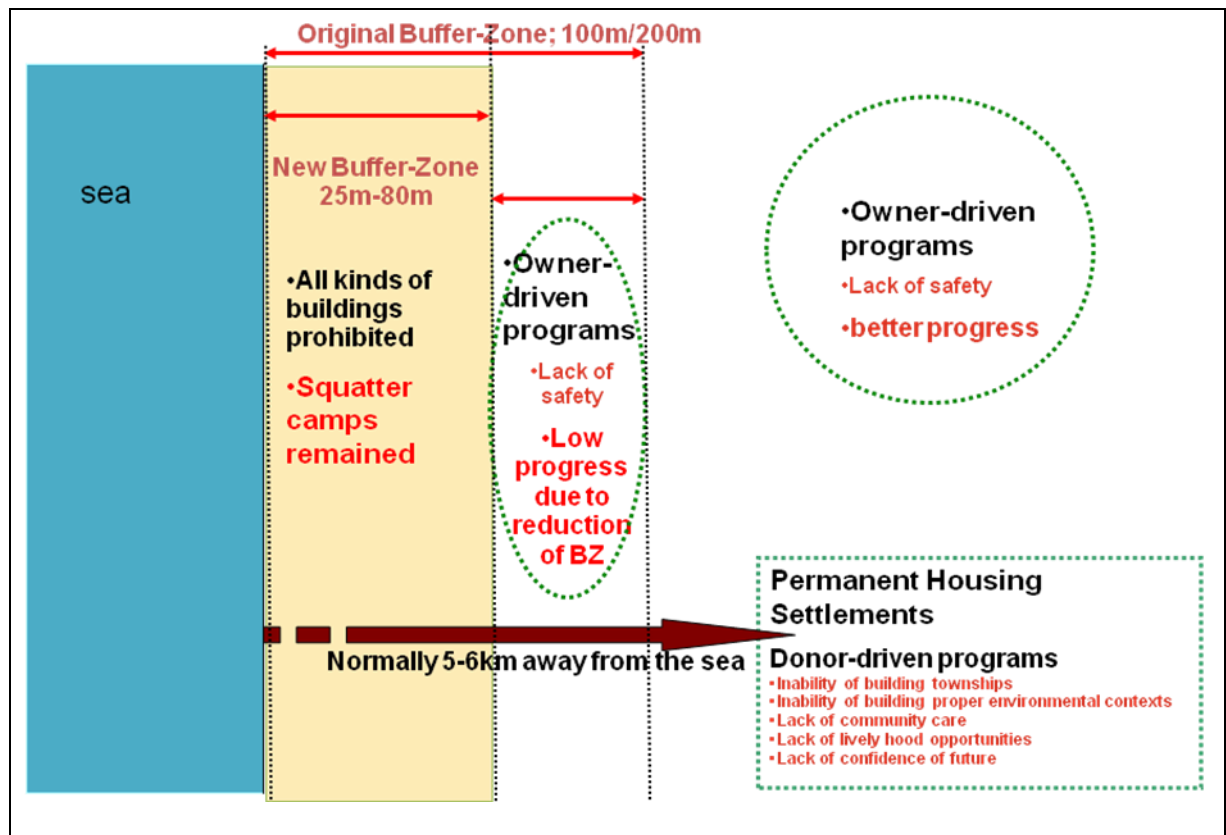


Fig. 2.5: Government Regulations and Enforcements for the Coastline and Housing

Reconstruction (by author)

2.4. Housing Reconstruction and Supply

The tsunami damaged nearly 98,000 housing units in 13 coastal districts of the country affecting nearly two percent of the total national housing stock. Ampara and Batticoloa in the east, Galle in the south and Mullaitivu in the north are the most affected coastal districts. Information shows that around 40,000 houses lie outside the buffer zone and the remain about 58,000 inside the buffer zone. Vulnerable groups, such as low income fishermen communities living close to the shore in semi-permanent houses or squatter camps, have borne the brunt of the disaster.

The government of Sri Lanka provided the overall policy guidelines and the frame work for house reconstruction. Relevant line ministries and departments such as the ministry of urban development and housing, Urban Development Authority (UDA), National Water Supply and Drainage Board (NWSDB), Ministry of Power and Energy, Ceylon Electricity Board, Ministry of High ways, Road Development Authority (RDA) and other relevant government institutions worked together with TAFREN on house building. The government received the support of international organizations, including major international non-government organizations, multilateral and bilateral donors and civil society organizations to construct transitional shelter and permanent housing.

2.4.1. Emergency Accommodation and Transitional Shelters

Displaced families initially found shelter in emergency accommodations such as emergency tents, public buildings, and religious institutions sought refuge with friends and relatives. It was recognized in the early stages that emergency accommodation could be only a temporary solution, since the reconstruction of approximately 98,000

houses would take time. Therefore, transitional shelters were required to bridge the gap between emergency accommodation and permanent housing.



Emergency Tents-2006



Transitional Shelters-2006

Fig.2.6: Emergency Tents and Transitional Shelters in Galle District

Policy;

A transitional shelter must not only provide protection from the environment but should provide secure habitable living space and a platform for re-establishing livelihoods.

Targets and Achievements;

Initial target was to move the people living in the tents and schools to transitional shelters. Total requirement was closer to 60,000 shelters in order to cover the needs of approximately 50% of the displaced people. The rest are assumed to live with friends and relatives or have returned to their original dwelling while repairing it. It is noted that on some sites shelter are at risk of fire and flooding, and later on mitigation and preparedness measures such as construction of proper drainage or placing sand bags on the roofs occurred.

2.4.2. Permanent Housing

The introduction of buffer-zone has led to two types of housing programs.

Policy;

a) Home-owner Driven Housing Reconstruction Program

(Damaged houses: fully/partially outside buffer-zone)

The government of Sri Lanka is providing cash grant reimbursed³ by different redevelopment banks and bilateral donors to an affected homeowner for reconstruction of his/her house.

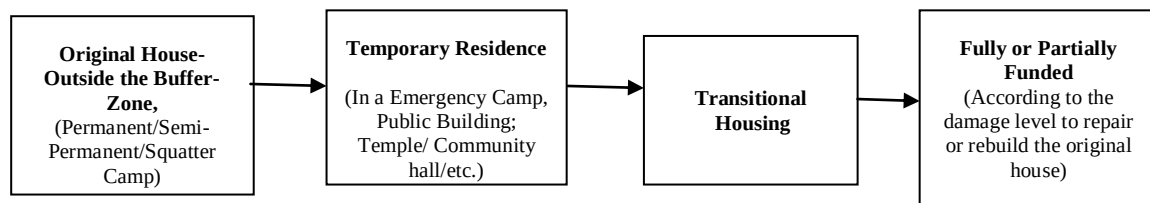


Fig.2.7: Relocation Process: Home-owner Driven Program

b) Donor-driven Housing Reconstruction Program

(Relocation of affected families from the buffer-zone)

All affected families are entitled to a house built by a donor agency in accordance with Government of Sri Lanka standards. The donor will provide each new settlement with an internal common infrastructure while Government of Sri Lanka provides the services up to the relocation site. The beneficiary remains the legal owner of his/her property within the buffer zone and receives a full title to the property in the resettlement site.

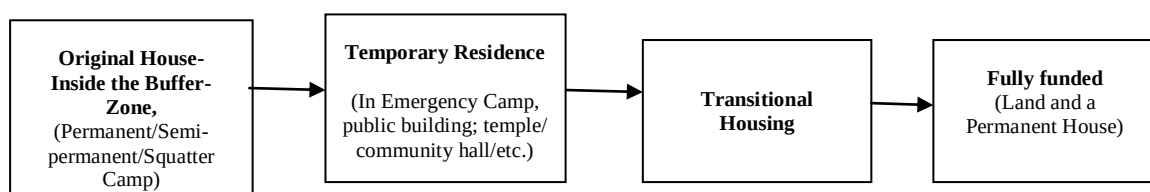


Fig.2.8: Resettlement Process: Donor Driven Program

Table 2.2: Permanent Housing Data

(Source: Reconstruction And Development Agency-RADA)

a). Requirement Original Count as at 31.12.2005	98,525
b). Revised New Requirement (Expected caseload due to extended families and grievances)	123,287
c). Total Number of Houses Completed as at 31.12.2005	15,377
d). Total Number of Houses Completed During 2006	55,687
e). Total Number of Houses Completed as at 31.01.2007	74,446
f). Total Number of Houses in Progress as at 31.01.2007	37,759
g). Total No. of Houses Planned for 2007 and onwards b-(e+f)	11,082

Table 2.3: Activities Completed up to 2007 Jan.

(Source: Reconstruction And Development Agency-RADA)

	Donor Driven Housing Program	Owner Driven Housing Program	Other Programs	Transitional Shelters
Completed	14512	57993	2240	-
Under Construction	11664	25333	3076	-
Yet to Start	10971	5692	800	-
Care, Maintenance & Decommissioning	-	-	-	13974

2.5. Livelihood Sector

After the tsunami disaster most of the affected communities were struggling with livelihood problems. It could be found a tendency for a dependent community after the disaster due to all kind of grants and funds which were provided for a quick recovery in affected coastal areas. As a solution an Income Recovery Program (IRP) has been proposed by Reconstruction And Development Agency (RADA) to upgrade the livelihoods of the whole tsunami affected communities. Through observations it could be found that still many communities are in less than half of the way of the IRP goal three years after the tsunami disaster.

IRP Goal:

To rebuild sustainable jobs and livelihoods by reviving Tsunami-affected local economies in order to move people out of poverty and dependency in an expeditious manner.

IRP Objectives:

- To facilitate immediate protection to vulnerable individuals and families, and for those for whom there is no work
- To provide longer term alternatives to income generation, and rebuilding livelihoods where needed
- To provide temporary employment for those who need

IRP Strategy:

- Social protection (temporary cash and food benefits for those affected by tsunami and without work / Longer term social assistance for disabled in the disaster, widowers and elderly persons) e.g. cash transfers, “*Samurdhi*” assistance⁴
- Community Infrastructure Recovery (temporary employment- work on community and public infrastructure development and associated training)
- Rebuilding local economic activities (facilitating access to finance and other services such as capital, loans, income generating assets, grants, capacity and skills training and sector growth)

IRP Main Instruments:

1. Social Protection: Ensure vulnerable groups will be included into social protection schemes
2. Community Infrastructure Recovery: Coordinate targeting of infrastructure works, improve capacity, standards and quality of investments
3. Local Economic Development: Lead a joint comprehensive approach of local economic development to ensure sustainable livelihoods
4. Information Management System: Cross-Cutting Component

IRP Major Sectors:

Fisheries

Agriculture / Livestock

Tourism

Small & Medium Scale Enterprises

Table 2.4: Percentage Distribution of Housing Units Damaged in Selected Affected Districts by Economic Activity Carried out Prior to Tsunami

(Source: Department of Census and Statistics)

Affected Districts	Economic activity carried out prior to Tsunami								Total
	Fisheries	Coir Industry	Trade	Tourism	Restaurants	Services	Other	NS	
Colombo	10.7	-	22.3	1.2	8.6	15.9	41.3	-	100
Galle	0.6	0.9	43.1	5.1	11.3	23.5	14.4	1.1	100
Matara	2.6	0.3	40.8	4.0	10.0	28.3	12.6	1.4	100
Hambantota	15.6	0.5	34.4	3.8	10.3	25.0	9.7	0.7	100

Table 2.5: Percentage Distribution of the Damaged Housing Units in the Selected Affected Districts which Operated an Economic Activity (only selected activities) within the Unit According to Functionality of the Activity after Tsunami

(Source: Department of Census and Statistics)

Type of the economic activity	Functionality of Economic Activities %											
	Colombo			Galle			Matara			Hambantota		
	F	NF	NS	F	NF	NS	F	NF	NS	F	NF	NS
Agriculture/Farming	71.4	28.6	-	24.0	74.1	1.9	23.4	76.6	-	23.7	76.3	-
Fishery(for sale)	43.7	55.6	0.7	26.0	73.2	0.8	22.1	76.9	1.0	7.9	92.1	-
Other Fishery related	35.0	60.0	5.0	36.2	60.6	3.2	22.6	75.9	1.5	-	100	-
Coir industry	-	-	-	11.1	88.1	0.8	7.7	91.4	0.9	13.3	84.4	2.3
Lime stone industry	-	-	-	23.2	76.8	-	41.7	58.3	-	-	100	-
Other manufacturing industries	34.1	65.9	-	22.1	77.1	0.8	13.2	86.3	0.5	6.3	93.8	-
Trade	45.7	53.8	0.5	29.4	70.2	0.4	19.9	79.0	1.1	13.6	86.4	-
Tourism related industry	33.3	66.7	-	28.6	71.4	-	42.9	57.1	-	33.3	66.7	-
Other related services	41.2	58.8	-	31.5	68.0	0.5	32.3	67.1	0.6	24.2	75.8	-
Other	33.3	66.7	-	10.9	89.1	-	35.7	64.3	-	-	100	-

F-Functioning

NF-Not Functioning

NS-Not Stated

Table 2.6: Percentage Distribution of Number of Employees Worked in the Damaged Housing Units of Selected Affected DS Divisions where an Economic Activity Operated within the Housing Unit

(Source: Department of Census and Statistics)

Type of the economic activity	Number of workers %			
	Colombo	Galle	Matara	Hambantota
Agriculture/livestock	1.5	2.3	1.7	10.8
Fishery(for sale)	35.1	30.0	37	49.4
Other Fishery related industries	1.6	4.0	8	-
Coir industry	-	13.7	5.6	4.5
Lime industry	-	3.3	2.2	-
Other manufacturing industries	38.2	15.8	22.2	3.4
Trade	18.1	15.2	8	19.3
Hotel/ Restaurants	0.7	4.4	1.2	2.3
Tourist hotels	-	0.7	1.3	2.3
Restaurants / Guest houses/ Kabanass	-	0.5	0.9	-
Government service	-	0.1	0.6	-
Education service	-	0.4	0.4	-
Health service	-	0.4	0.9	-
Other service	3.8	7.7	8	8.0
Other	0.7	0.6	0.9	-
NS	0.3	0.9	1.1	-
Total percentage	100	100	100	100

2.6. Pre-disaster and Post-disaster Situation of Western Coast line

2.6.1. Background- Moratuwa DS Division

Moratuwa DS Division situated about 19 kilometers southward from Colombo capital and 96 kilometers from Galle, the provincial capital of the southern province and it is a historically significant residential town⁵.

Economically Moratuwa town is famous in furniture and fishing industries. Most of the furniture industries found in inland areas while fishing industry is found in very closer to the shore line.

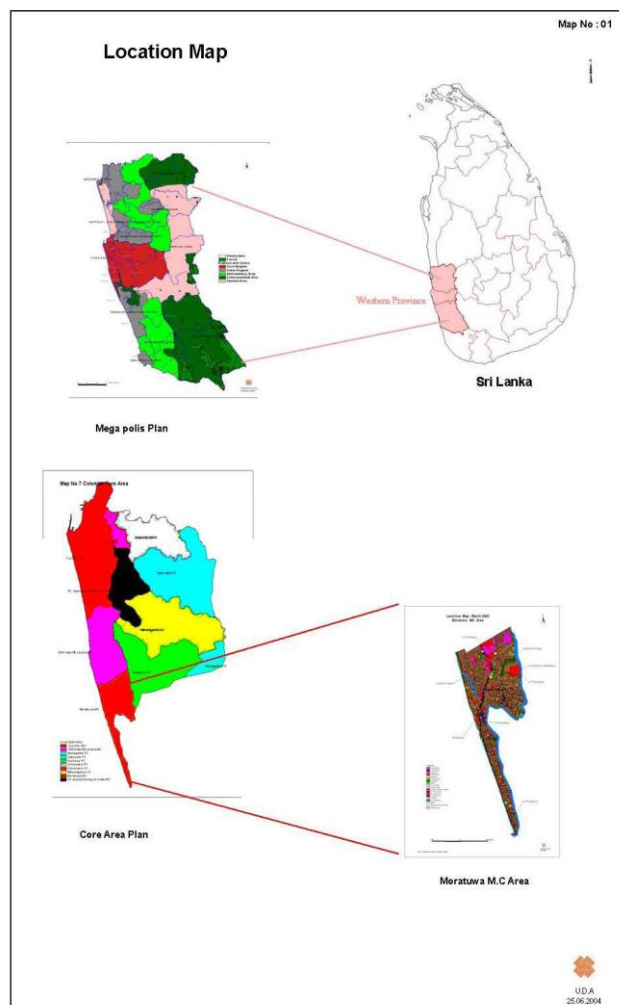


Fig 2.9: Location of Moratuwa DS Division
(Source: Urban Development Authority)

2.6.2. Population Growth

During the past few decades, the population in the Moratuwa DS division has been increased continuously. According to the Table 2.2 the population had been treble within 50 years in comparison to the 1946 Census.

Table.2.7: Population Growth of Moratuwa DS Division

(Source: Census and Statistics Department)

Year	Population	Average Rate of Growth
1946	50698	2.68
1953	60215	2.84
1963	77333	3.06
1971	96668	4.08
1981	135610	3.03
1990	172,706	3.12
2001	177,190	2.59

Population Density:

The highest population density is found in the Korlawella and Egodaunya Ward, where mostly fishing community lives. In calculating population density, the total land area available has been taken into consideration. Moratuwa DS division has a higher population density. It is 34 persons per area. Although it covers a total land area of 1972 hectares, it includes 290 hectares of water courses also. Accordingly the developable land available is limited to 1682 hectares. This indicates that the land consumption per person is as low as 4.7 perches. This extent will be further expected to reduce to 3.2 perches by the year 2015.

This higher population density can be attributed to the factors such as the large numbers especially of fishing community living in temporary dwellings in areas like Korlawella and Egodaunya and in the neighborhood of beach and the low income settlements that have come up adjacent to the marshy lands in Lunawa area.

When lands coming under public places, roads reservation and marshy areas are excluded the land consumption values will be further reduced. Accordingly Moratuwa town will have to face a large number of issues due to population growth and expansions.

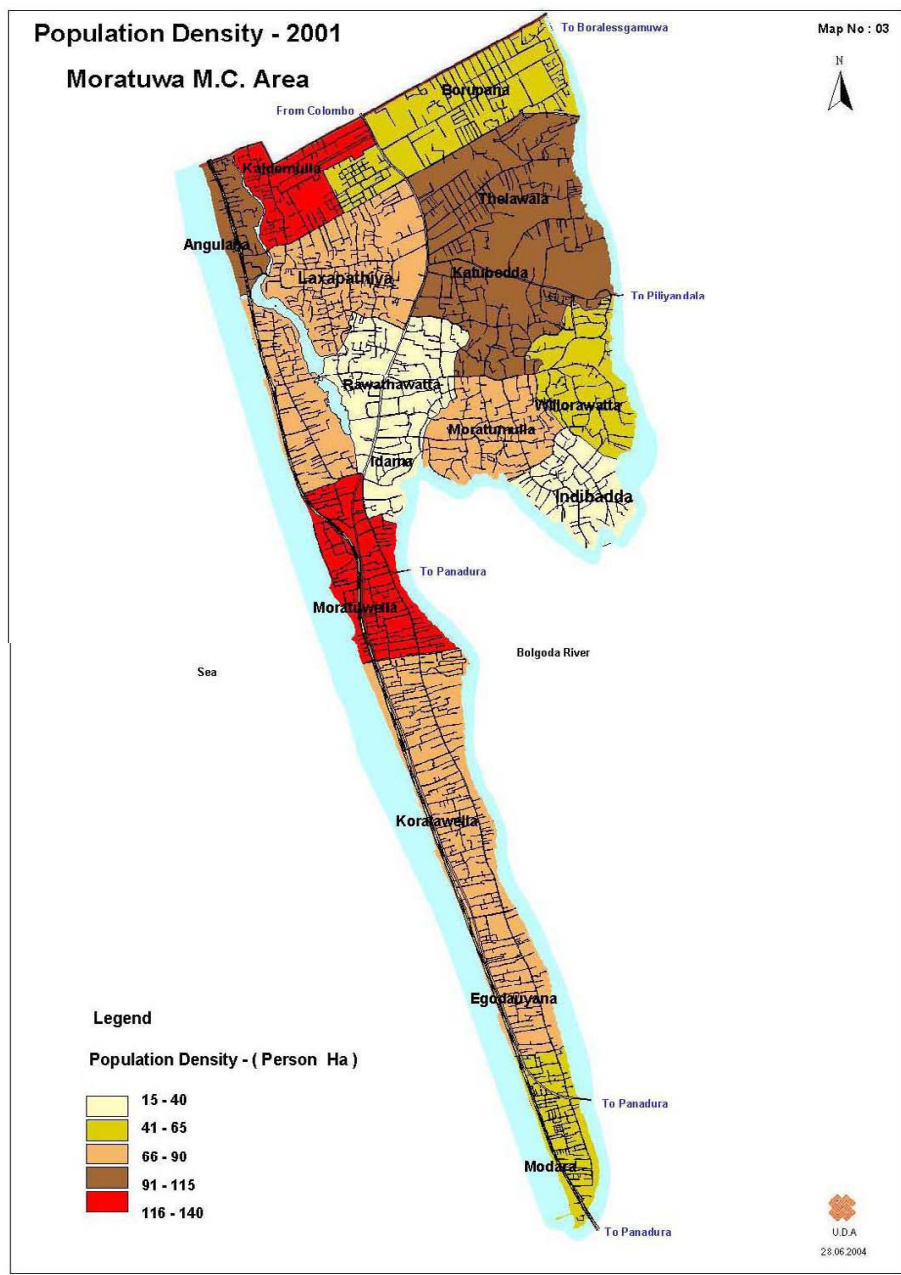


Fig 2.10: Population Density of Moratuwa DS division-2001
(Source: Urban development Authority)

2.6.3. Housing Categories and Distribution

The Table 2.3 indicates that the numbers of houses were 24,656 in 1981 and it has increased by 3% in 1991, at an annual incremental rate of 1.3%. By 2001 it has increased to 40,168 annual rate of increase of 3.2%.

Table 2.8: Increase in Number of Housing in Moratuwa DS Division

(Source: Census and Statistics Department)

Year	No. of Houses	Increase per Year
1981	24,656	-
1991	32,143	748
1994	33,541	466
1999	37,335	758
2001	40,168	1416

According to the reports of GN divisions, there were 40168 houses available within the Moratuwa DS division in the year 2001. But the number of families was 42188. This clearly shows there was a shortage of 2020 houses. This shortage indicates the presence of shanties⁶. Especially in shanties two or more families occupy one housing unit. The houses in Moratuwa urban area can be classified in to three main categories.

1. Single housing units
2. Condominium housing units
3. Under served settlements

Table 2.9: Composition of Housing Units in Moratuwa DS Division

(Source: Census and Statistics Department)

Category	%
Single Houses	82.3
Flat Houses/condominium	6.5
Sub-houses	6.0
Line houses	1.0
Shanties	3.8
Total	100.0

Average Household Size:

According to Colombo Metropolitan Regional Structural Plan (1998) the average household size in Sri Lanka is 4.7, but it is 5.4 persons in Moratuwa area.

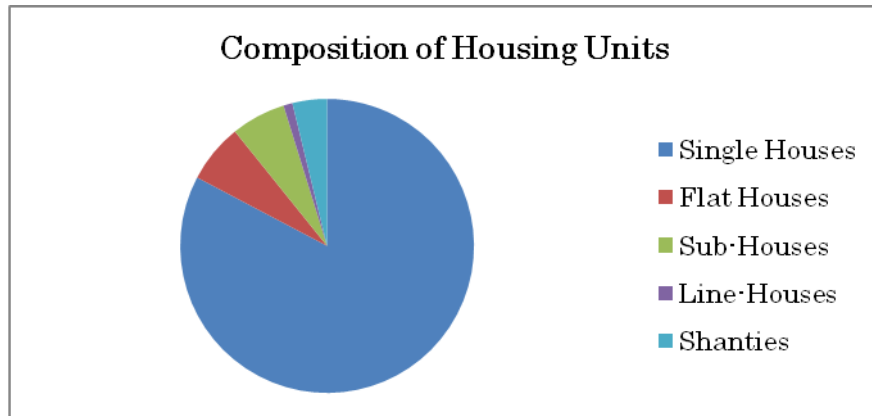


Fig 2.11: Composition of Housing Units of Moratuwa DS Division

(Source: Census and Statistics Department)

Low Income and Under Served Settlement:

A survey conducted in 1994, has revealed the existence of 69 low incomes and underserved Settlements within Moratuwa DS division. With 2668 families in these settlements and this number had been reached up to 4000 by 2001. These settlements are being concentrated mainly along in railway reservation, Koralawella, Egodaunya, Katukurunda, Bolgoda River reservation and in the low lying lands.

Housing Shortage and Future Requirements:

Statistical data indicates that the shortage of houses within the Moratuwa DS division area as 1244 in the year 2001. This is the number of families without any shelter to live. In addition to this there are some other families who live in dwellings not fit for living. The number of such houses has been found to be.

The availability of land within the Moratuwa DS division is not sufficient for the construction of new houses. As an option for fulfilling this housing requirement, the Urban Development Authority has proposed to construct high rise flats as a remedy.

Table 2.10: Housing Requirement and Forecast of Moratuwa DS Division-2020

(Source: Urban Development Authority)

Year	Population	Family Size	Estimated No. of Houses
2003	19467	4.4	44243
2005	204047	4.4	46474
2010	229512	4.4	52161
2015	258155	4.4	58671
2020	290373	4.4	65993

2.6.4. Land Use Pattern

Table.2.6 and Fig.2.9 indicate the land use pattern in Moratuwa DS division in 2003.

Table 2.11: Land Use Pattern of Moratuwa DS Division-2003

(Source: Urban Development Authority)

Use	Extent(Hectare) ha	Percentage %
Residential	1126.0	57.1
Commercial	52.6	2.7
Industries	85.2	4.3
Wood based Industries	32.9	1.7
Institutional	136.2	6.9
Entertainments and Sports	12.9	0.7
Religious	27.2	1.4
Cemeteries	3.8	0.2
Agricultural lands	29.23	1.5
Roads and Reservations	103.4	5.2
Marshy Lands	33.5	1.7
Open Space	16.9	0.9
Beach	21.2	1.0
Water Courses	290.5	14.7
Total	1972.0	100.0

Residential Use;

About 57.1% of land area is used for residential purposes. The average lot size is about 6-10 perches. Vacant lands are not available at the moment for further development. A large land area is being occupied by low income group. Most of them are found along New Galle road, which can be put to use in a better economical manner.

Commercial Use;

Of the total land area within the Moratuwa DS division limits 2.6% are being used for commercial activities which are located mainly along the Galle road and in the town centre. The main business activities that take place are retail trade, services and carpentry work.

Industrial Use;

For industries 5.9% of the total land area is being used. Wood-based industries take a significant area and it's 1.7%. Industries other than the wood-based industries use 4.3% of the total land area. The industries can be identified under the following three categories according to their location.

- Large scale industries
- Medium scale industries
- Small scale industries

Most of the industries are being owned by the private sector. They target both export and local markets. The workforce requirements of these industries are being supplied by the neighborhood towns.

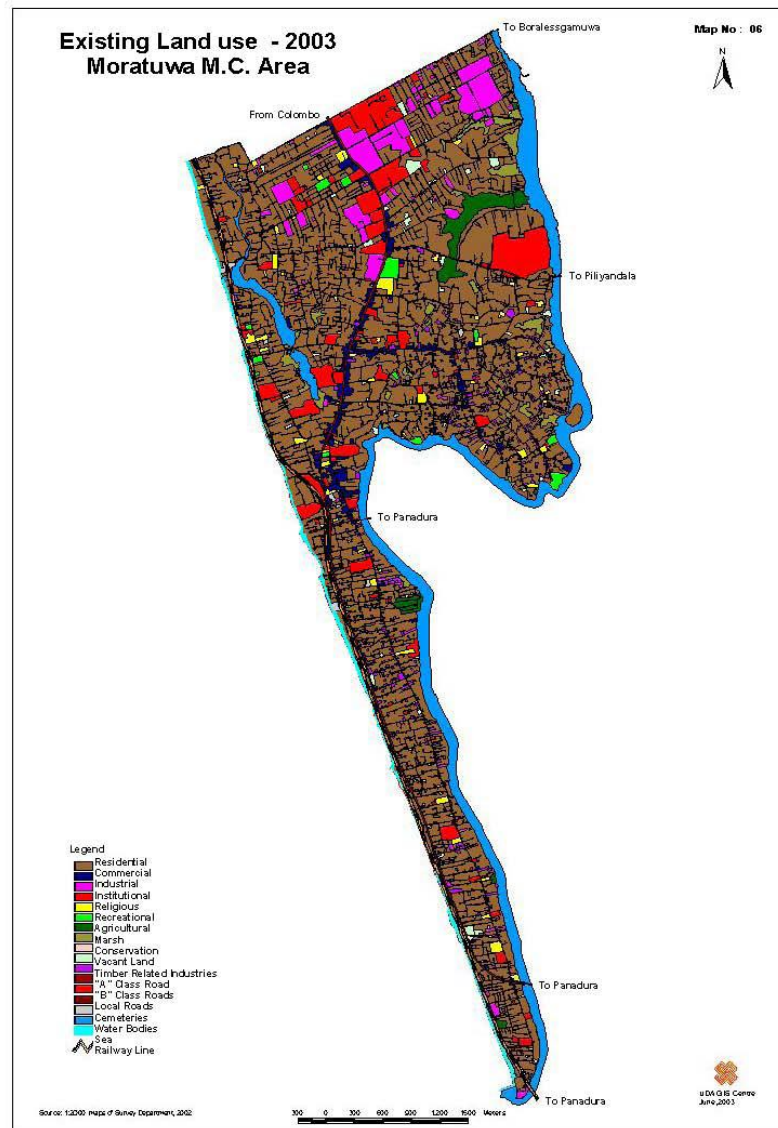


Fig.2.12: Population Density of Moratuwa DS Division-2001

(Source: Urban development Authority)

Leisure and Recreation;

The land allocated within the Moratuwa Municipal Council area for leisure and recreational use is only 0.65%. This is insufficient when compare with the residential population. In Moratuwa there are water bodies that could be used to promote recreational activities. Only 6 hectares of land is being used for playgrounds and it is only 0.3% of the total land area. The standards of

the Urban Development Authority is 1.4 hectares of land for every 1000 people for leisure and recreational. Accordingly 177 hectares of land should be allocated for leisure and recreation as per perch.

Undeveloped area;

The undeveloped area of land is 18.3%. It includes open/marshy lands, cultivated lands and water courses. They are being used as water drainage area and nature reserves. The unauthorized filling of these lands and disposal of wastes into these areas has polluted the environment.

Land Value

The highest land values are seen along Galle Road and in the town center. Land prices in these areas are ranging from 200, 000 to 300,000 LKR per perch⁷, but along “Panadura” River and coastal areas prices are about 75, 000-100,000LKR. The main attributive causes for these reduced prices are the concentration of low income houses in these area and problems relating to drainage system in the areas. Further, the land values along the new Galle road⁸ have come down due to the concentrated settlement of shanties and slum⁹ dwellers in these areas.

2.6.5. Statistics* of Tsunami Damages Western Coast line

Table 2.12: Number of Damaged** Housing Units due to Tsunami in a Selected DS Division of Colombo District (Source: Department of Census and Statistics)

Affected DS Division	Number of Housing Units Surveyed			Total Number of Damaged Housing Units Listed
	Completely Damaged	Partially Damaged (Unusable)	Partially Damaged (Usable)	
Moratuwa	2532	418	2100	5050

Table 2.13: Percentage Distribution of Housing Units by Type of Damage in a Selected DS Division of Colombo District

(Source: Department of Census and Statistics)

Affected DS Division	Percentage of Housing Units Surveyed			Total %	Total Number of Damaged Housing Units Listed
	Completely Damaged %	Partially Damaged (Unusable) %	Partially Damaged (Usable) %		
Moratuwa	50.1	8.3	41.6	100	5050

Table 2.14: Distribution of Damaged Housing Units by Type of Damage and Distance to the Sea in a Selected DS Division of Colombo District

(Source: Department of Census and Statistics)

Affected DS Division	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Moratuwa	2351	180	1	2532	357	61	0	418	1454	646	0	2100	4162	887	1	5050

Table 2.15: Percentage Distribution of Damaged Housing Units in a Selected DS Division by Material Used for Construction of Colombo District

(Source: Department of Census and Statistics)

Affected DS Division	Material used for roof				Material used for wall				Material used for floor				Total No.
	P	T	NS	Total	P	T	NS	Total	P	T	NS	Total	
	%	%	%	%	%	%	%	%	%	%	%	%	
Moratuwa	62.0	37.9	0.1	100	41.4	58.6	-	100	96.5	3.4	0.1	100	5050

P-Permanent

T-Temporary

NS-Not Stated

Table 2.16: Percentage Distribution of Damaged Housing Units in a Selected DS Division by Floor Area of the Housing Unit of Colombo District

(Source: Department of Census and Statistics)

Affected DS Division	Floor Area of the Housing Units (Sq.feet)					
	<100	100-999	1000-9999	NS	Total	
	%	%	%	%	No.	%
Moratuwa	3.2	92.7	4.0	0.1	5050	100

Table 2.17: Percentage Distribution of the Damaged Housing Units in a Selected DS Division by Ownership of the Land Colombo District

(Source: Department of Census and Statistics)

Affected DS Division	Ownership of the Land											
	Belongs to a family member	Rent/lease	Free from rent	Land belongs to government	River conservation	Coastal conservation	Railway conservation	Road conservation	Other	NS	Total	
	%	%	%	%	%	%	%	%	%	%	No.	%
Moratuwa	34.6	4.3	2.1	9.3	1.2	39.7	6.7	0.1	2.0	-	5050	100

Table 2.18: Percentage Distribution of Completely Damaged Housing Units in a Selected DS Division by Reported Monthly Income of the Housing Units of Colombo District (Source: Department of Census and Statistics)

Affected DS Division	Monthly Income of the Housing Units (LKR)					
	Less than 5,000	5,000-9,999	10,000 And above	NS	Total	
	%	%	%	%	No.	%
Moratuwa	59.8	29.9	9.8	0.5	2532	100

*Statistics given here are only for the selected DS divisions as case studies

**Completely damaged, partially damaged usable/unusable building units only were considered damaged

2.7. Pre-disaster and Post-disaster Situation of Southern Coast line

2.7.1. Background- Galle DS Division and Matara, Hambantota Districts

Galle is the capital of southern province and situated 120 km away from Colombo capital while Matara district about 160 km and Hambantota 220 km. Galle city is the largest urban center located in the southern coastal belt. The Urban Development plans¹⁰ which proposed by Urban Development Authority is being going on in these three districts.

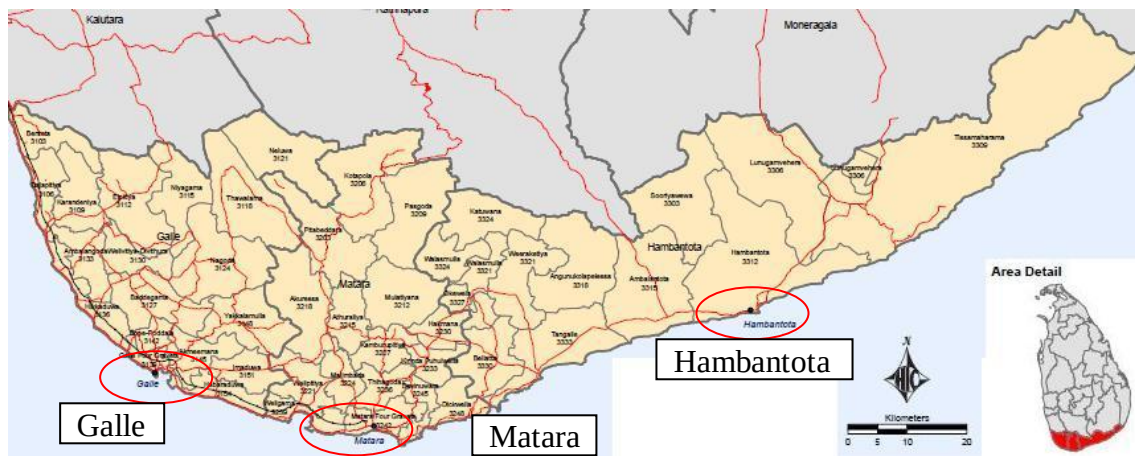


Fig.2.13: Locations of Galle, Matara and Hambantota Districts in Southern Province

(Source HIC map)

2.7.2. Population Growth

The population of the Galle DS division indicates in Table 2.19. Galle DS division is an urban center with comparatively high level of population in the southern province. Due to the in-migration from the Matara district the growth of population has increased in Galle DS division although there is an out-migration to Hambantota district.

Table 2.19: Total Population and its Growth in Galle DS Division

(Source: Department of Census and Statistics)

Year	Total Population	Male	Female	Average Annual Growth Rate
1963	65,636	-	-	-
1971	71,277	34,608	36,658	1.1
1981	77,183	38,164	38,699	0.8
1991	81,,830	40,810	41,880	0.6
2001	90,934	45,550	45,384	0.9

Table 2.20: Migration within Southern Province from Galle DS Division.

(Source: Department of Census and Statistics)

District	In migration % (to Galle)	Out migration % (from Galle)	Net Migration
Matara	27.3	23.4	+4.9
Hambantota	6.5	7.6	-1.1
Net migration	33.8	31.0	+2.8

The distribution pattern of population in Galle DS division shows the high density in central part and net density of population was 44 persons per ha in 1981 has increased to 52 persons per ha by 2001.

2.7.3. Housing Categories and Distribution

The housing stock in Galle DS division has increased from 10,954 -1981 to 17,794-2001. The existing housing stock has categorized in to permanent, semi-permanent and temporarily houses by the National Housing Development Authority.

Table 2.21: Category of Housing in Galle DS Division in 2001

(Source: National Housing Development Authority)

Type	No. of Unit	% of Total
Permanent	13,360	76.2
Semi-permanent	2,670	15.2
Temporarily	1,490	8.4
Other	50	0.2
Total	17,570	100

About 23% of total housing was semi-permanent or temporary houses in Galle DS division. And about 8% of housing in temporary category belongs to unauthorized structures and most of these houses were located on the railway line reservations and canal reservations later highly affected by tsunami. Average house hold size of the area is 4.5.

2.7.4. Land Use Pattern

The land area which covers the Galle DS division is about 1,742 ha with 50 ha of internal water bodies. Residential activities occupy major share of land use and the other main occupants of land uses are cultivations such as coconut, rice paddy and rubber.

Accordingly the major share of land is consumed by residential activities including homestead areas account more than 58%, circulation 14% and recreational activities 6% of the total area.

The only predominant historical settlement could be identified in Dutch Fort area. And some low income unauthorized settlements could be found in GN divisions such as Mahamodara, Katugoda and Dewata on the lands, which suitable for recreation and tourism activities. All of these kinds of settlements are vulnerable to natural hazards. Commercial activities accounts for 3% of the land concentrated mainly in the areas closer to railway station and main bus terminal. Galle is not flourished in the context of commercial activities in comparing to Matara and it can be observed high percentage of informal sector activities blend with the other economic activities in the city center.

2.7.5. Statistics* of Tsunami Damage in Southern Coast line

Table 2.22: Number of Damaged Housing Units due to Tsunami of Selected DS Divisions of Southern Province

(Source: Department of Census and Statistics)

Affected DS Division	Number of Housing Units Surveyed			Total Number of Damaged Housing Units
	Completely Damaged	Partially Damaged (Unusable)	Partially Damaged (Usable)	
Hikkaduwa	2391	479	2826	5696
Galle Four Gravets	703	246	1117	2066
Habaraduwa	547	162	959	1668
Matara Four Gravets	604	248	1509	2361
Ambalantota	104	21	65	190

Table 2.23: Percentage Distribution of Housing Units by Type of Damage of Selected DS Divisions of Southern Province

(Source: Department of Census and Statistics)

Affected DS Division	Percentage of Housing Units Surveyed			Total %	Total Number of Damaged Housing Units
	Completely Damaged %	Partially Damaged (Unusable) %	Partially Damaged (Usable) %		
Hikkaduwa	42	8.4	49.6	100	5696
Galle Four Gravets	34	11.9	54.1	100	2066
Habaraduwa	32.8	9.7	57.5	100	1668
Matara Four Gravets	25.6	10.5	63.9	100	2361
Ambalantota	54.7	11.1	34.2	100	190

Table 2.24: Distribution of Damaged Housing Units by Type of Damage and Distance to the Sea of Selected DS Divisions of Southern Province.

(Source: Department of Census and Statistics)

Affected DS Division	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Hikkaduwa	1072	1288	31	2391	162	305	12	479	747	2003	76	2826	1981	3596	119	5696
Galle Four Gravets	494	194	15	703	112	128	6	246	351	734	32	1117	957	1056	53	2066
Habaraduwa	354	185	8	547	87	69	6	162	385	556	18	959	826	810	32	1668
Matara Four Gravets	416	229	-	797	130	150	-	280	490	1243	-	1733	1188	1622	-	2810
Ambalantota	41	63	0	104	12	9	0	21	2	62	1	65	55	134	1	190

Table 2.25: Percentage Distribution of Damaged Housing Units in the Affected DS Divisions by Material used for Construction of Selected DS Divisions of Southern Province

(Source: Department of Census and Statistics)

Affected DS Division	Material used for roof				Material used for wall				Material used for floor				Total No.
	P	T	NS	Total	P	T	NS	Total	P	T	NS	Total	
	%	%	%	%	%	%	%	%	%	%	%	%	
Hikkaduwa	86.2	13.6	0.2	100	84.7	15.1	0.2	100	94.5	5.3	0.2	100	5696
Galle Four Gravets	82.9	17.0	0.1	100	81.2	18.5	0.3	100	96.1	3.7	0.2	100	2066
Habaraduwa	86.3	13.5	0.2	100	85.4	14.5	0.1	100	91.2	8.6	0.2	100	1668
Matara Four Gravets	90.4	9.5	0.1	100	89.4	10.5	0.1	100	96.2	3.6	0.2	100	2361
Ambalantota	71.8	28.2	-	100	76.3	23.7	-	100	73.4	26.6	-	100	190
P-Permanent T-Temporary NS-Not Stated													

Table 2.26: Percentage Distribution of Damaged Housing Units in the Affected DS Divisions by Floor Area of the Housing Unit of Selected DS Divisions of Southern Province

(Source: Department of Census and Statistics)

Affected DS Division	Floor Area of the Housing Units (Sq.feet)					
	<100	100-999	1000-9999	NS	Total	
	%	%	%	%	No.	%
Hikkaduwa	2.9	71.4	24.2	1.5	5696	100
Galle Four Gravets	4.8	74.1	20.6	0.5	2066	100
Habaraduwa	5.7	69.7	23.7	0.9	1668	100
Matara Four Gravets	1.5	65.6	31.6	1.3	2361	100
Ambalantota	1.7	87.0	11.3	-	190	100

Table 2.27: Percentage Distribution of the Damaged Housing Units in the Affected DS Divisions by Ownership of the Land of Selected DS Divisions of Southern Province

(Source: Department of Census and Statistics)

Affected DS Division	Ownership of the land											
	Belongs to a family member	Rent/lease	Free from rent	Land belongs to government	River conservation	Coastal conservation	Railway conservation	Road conservation	Other	NS	Total	
	%	%	%	%	%	%	%	%	%	%	No.	%
Hikkaduwa	73.8	2.4	1.7	1.3	0.4	13.6	0.4	0.1	5.4	0.9	5696	100
Galle Four Gravets	50.5	6.4	2.6	2.5	1.7	30.5	3.7	0.1	1.8	0.2	2066	100
Habaraduwa	80.3	2.3	3.7	0.3	0.7	5.5	0.1	0.6	5.7	0.8	1668	100
Matara Four Gravets	83.7	4.1	1.5	3.9	0.3	1.5	-	0.1	4.5	0.4	2361	100
Ambalantota	88.8	1,1	5.6	1.1	0.6	-	-	-	2.8	-	190	100

Table 2.28: Percentage Distribution of Completely Damaged Housing Units in the Affected DS Divisions by Reported Monthly Income of the Housing Unit of Selected DS Divisions of Southern Province

(Source: Department of Census and Statistics)

Affected DS Division	Monthly Income of the Housing Units (LKR)					
	Less than 5,000	5,000-9,999	10,000 And above	NS	Total	
	%	%	%	%	No.	%
Hikkaduwa	51.8	22.8	23.3	2.1	2391	100
Galle Four Gravets	42.1	28.5	28.3	1.1	703	100
Habaraduwa	57.7	21.6	19.1	1.6	547	100
Matara four gravets	42.9	23.2	30.9	3.0	604	100
Ambalantota	67.0	19.0	14.0	-	104	100

*Statistics given here are only for the selected DS divisions as case studies

**Completely damaged, partially damaged usable/unusable building units only were considered damaged

Notes:

¹ A mixture of soil and wood sticks which used for construction of walls at the ancient time. It can be found wattle and daub houses or buildings in the rural or suburban areas even today also.

² A kind of natural stone common in Sri Lanka which can be used for construction of walls.

³ All the affected households outside the buffer zone that are able to demonstrate ownership to land will be entitled to a grant by the government. Household that do not have ownership to the land are not entitle to this assistance. Grant of 250,000 LKR disbursed in four stages for fully damaged households and grant of 100,000 LKR disbursed in two stages, irrespective of the level of damage for partially damaged households.

⁴ “*Samurdhi*”, which means “prosperous”, is the main cash transfer program, addressing chronic poverty in Sri Lanka.

⁵ Galle is a town situated on the southwestern tip of Sri Lanka. It was the main port on the island before the arrival of the Portuguese in the 16th century. Galle reached the height of its development in the 18th century, before the arrival of the British, who developed the harbor at Colombo. Galle is a best example of a fortified city as well as a residential town built by Europeans in South and Southeast Asia showing the interaction between European architectural styles and south Asian traditions. Galle fort is a world heritage site and the largest remaining fortress in Asia built by European occupiers.

⁶ These consist of improvised and unauthorized shelter, constructed by the urban squatters on state or privately owned land, without any legal rights of occupancy. The areas are badly serviced and very often unsanitary.

⁷ Sri Lanka uses an old English system of land measurement, "perches" which is not commonly in use outside of some Asian countries. Although land is generally priced per “Perch” for smaller areas and by "Acres" for larger plots of land: 1 Perch = 25 square meters and 160 Perches = 1 Acre (4000 square meters)

⁸ The coastal line main road via southern province towards eastern province; continue from Colombo capital of Sri Lanka. From Colombo city up to Galle DS division the road known as Galle road.

⁹ These are old deteriorating tenements or subdivided derelict houses. Those are built mostly of permanent materials, are very often single roomed and compactly arranged in back-to-back rows. The occupants have a definite legal status of occupancy.

¹⁰ Several urban areas of Sri Lanka have been declared as Urban Development Areas with urban development plans, under section 03 (1) and (2) of the UDA Law No 41 of 1978 by extraordinary gazette by the Minister in charge of Urban Development.

CHAPTER 3- Permanent Housing Reconstruction Programs, Implementation,

Impact on Livelihoods and Evaluation

This chapter introduces the post disaster permanent housing reconstruction programs in urban and sub urban contexts, to analyze the adequacy of facilities provided and satisfaction of beneficiaries and to discuss about the achievements, shortcomings and problems of different post disaster housing reconstruction approaches.

3.1. Donor Driven Housing Reconstruction Program

3.1.1. Institutional Arrangements

The dedicated Tsunami Housing Reconstruction Unit (THRU) was created under the ministry of Urban Development and Water Supply. THRU offices were established in the Tsunami Unit of all tsunami affected districts and divisional secretariats and works with village rehabilitation committees operating at village level.

3.1.2. Case Study 1- “Egodaunya” Housing Settlement

i. Coastal Housing Settlements

The Egodaunya GN Division in Moratuwa DS division is located along the western coastline of the island, 20 km from the capital city of Colombo (Fig.3.1). This is a sprawling area of congested, structurally unsound, unhygienic and poorly serviced illegal housing that extends outward from Colombo City along the coast (Fig.3.2). The high population density of the area is due to the availability of employment, transportation as well as the proximity to commercial, social and educational facilities, all of which are facilitated by the close proximity to Colombo. Two main housing types could be identified based on structural conditions.



Fig.3.2: Living Environment Organization Egodaunya GN Division (Source: Google Earth)

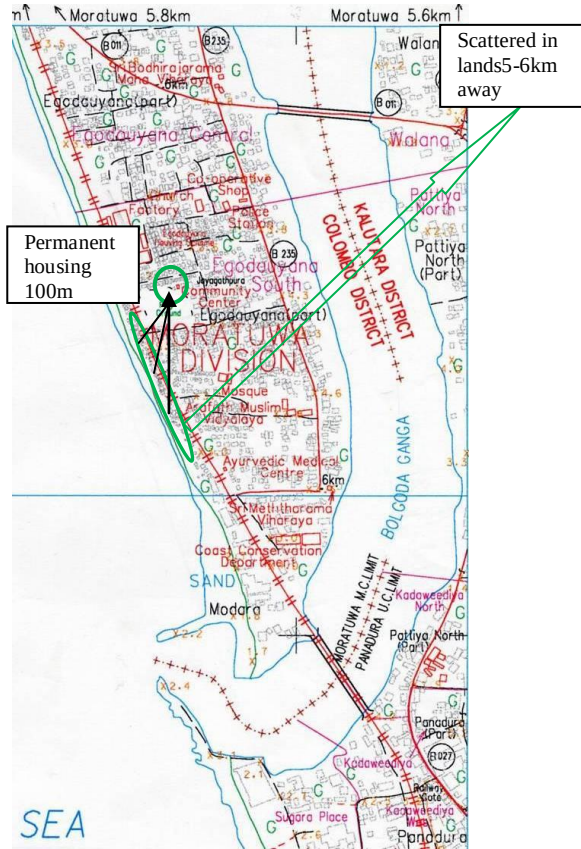


Fig.3.3: Locations of Few Original and Re-located Settlements in Moratuwa DS Division (Source: Survey Department of Sri Lanka)

Table 3.1: Distribution of Damaged Housing Units in a Selected GN Division by Type of Damage and Distance to the Sea.

(Source: Department of Census and Statistics)

Affected GN Division	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Egodaunya - south	438	90	1	529	41	47	0	88	53	375	0	428	532	512	1	1045

iii. Livelihoods

Table 3.2: Details of Selected Livelihoods of the Victims of Egodaunya Settlement, Colombo District (by author)

Occupation	No. of People of the Previous Settlements %	No. of People of the Post-disaster Housing %
Fishery (fisherman)	23	18
Other coastal line occupations (tourist guides, etc.)	8	5
Home based small industries and businesses (boutique/restaurant /sawing/ coir/ hand crafts/ coconut trade/fish selling)	30	12
Skilled Services (drivers, mason, carpenters, etc.)	10	9
Labor service	25	38
Other occupations	2	6
Non-occupation	2	12

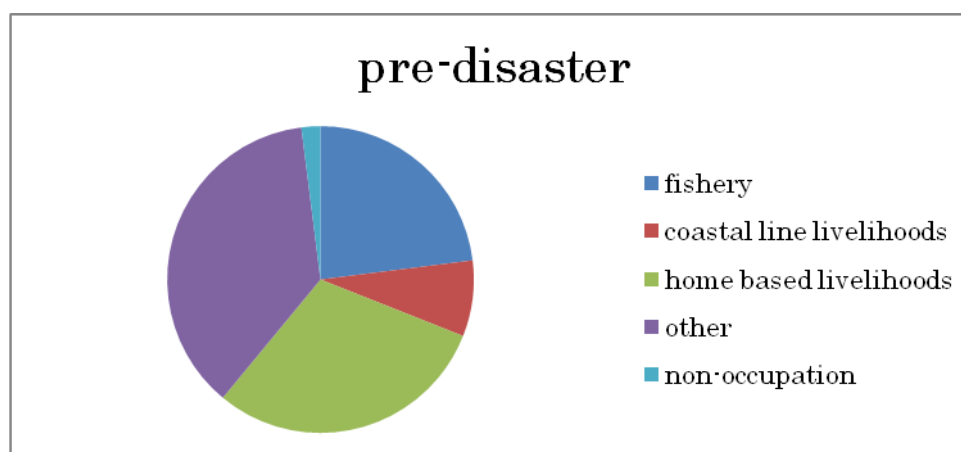


Fig.3.4: Distribution of the Pre-disaster Livelihoods of the Victims of Egodaunya Settlement, Colombo District (by author)

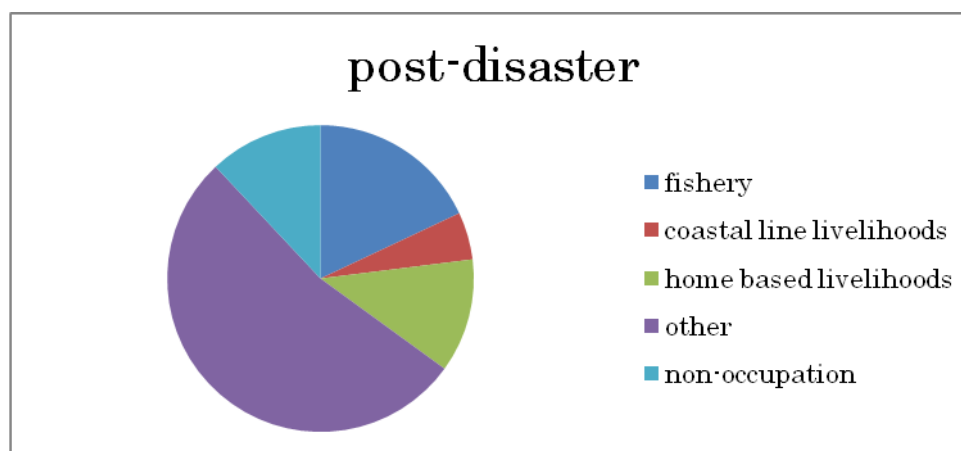


Fig.3.5: Distribution of the Post-disaster Livelihoods of the Victims of Egodaunya Settlement, Colombo District (by author)

A considerable change could be seen in pre and post disaster livelihoods (Table 3.2, Fig.3.4 and Fig.3.5). The number of people involved in fishery industry and home based livelihoods had been declined. And a clear increase of the number of non occupation people can be found.

iv. Post Disaster Reconstruction

Funds- Permanent Housing : Sri Lankan Government

Transitional Housing: IOM –International Organization for Migrants (INGO)

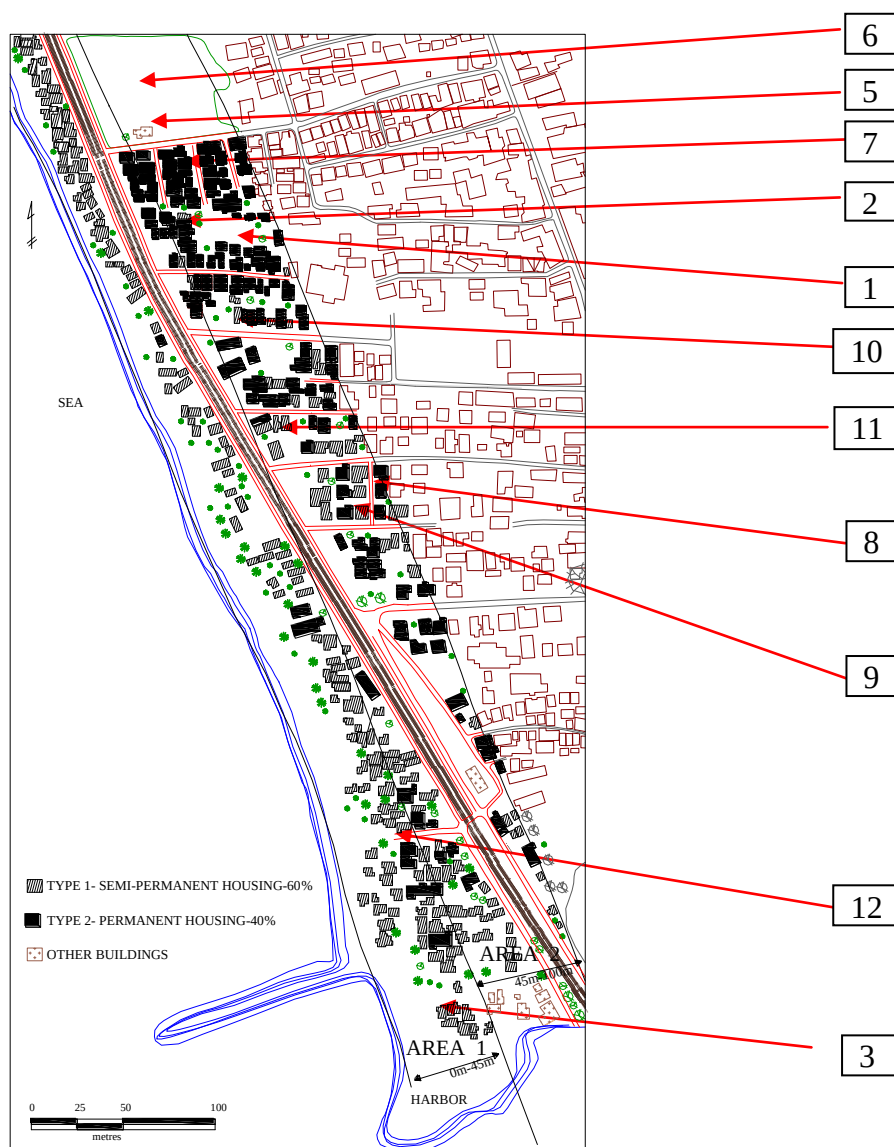


Fig.3.6: Locations of the Affected and Reconstructing Houses (by author)

v. **Tsunami Affect and Reconstruction Process of Post Disaster Permanent Housing**

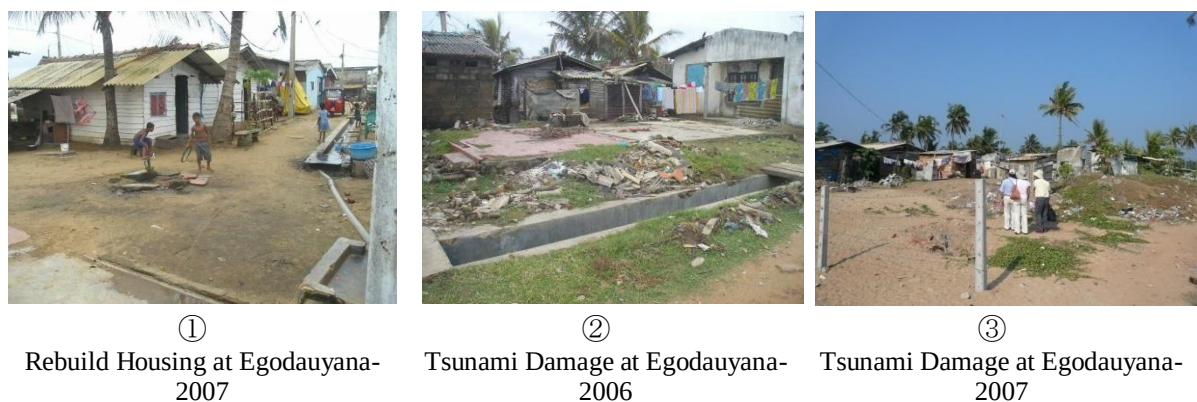


Fig.3.7: Damage of Tsunami and Post Disaster Situation after Years of Egodaunya Settlement at Moratuwa



Fig.3.8: IOM Transitional Housing Camps at Moratuwa



Fig.3.9: Reconstructions of Permanent Housing Outside the Buffer-zone of Egodaunya Settlement at Moratuwa



⑩

Fully Damaged Permanent House-
Temporarily Repaired-2006



⑪

Fully Damaged Permanent
Houses-Temporarily Repaired-
2007



⑫

Fully Damaged Squatter
camps/Semi-Permanent Houses-
Rebuild-2008

Fig.3.10: Unauthorized Reconstructions inside the Buffer-zone of Egodaunya Settlement at Moratuwa

vi. Reconstruction and Living Environment 3 years after the Tsunami

In this case reconstruction programs have not functioned properly. Because of that the affected people still live in the transitional houses and rebuild temporary houses/squatter camps inside the buffer zone. Only about 50% of victims outside the buffer zone are completely rebuilding their damaged houses. It could be said the delay of permanent establishment of the victims as a one resin for the decline of home based livelihoods.

3.1.3. Case Study 2 – “Walahanduwa – Salsberg Village” Permanent Housing

Settlement

i. Coastal Housing Arrangements

Housing of Galle DS division along the coastal line main road known as Galle road were highly affected by tsunami disaster. Mainly in the Dewata, Katugoda, Mahamodara, Pettigalawatta, Magalle, Kaluwella and other few GN Divisions. Those houses had been arranged in either sides of the Galle main road.



Fig.3.11: Living Environment and Housing Arrangement of Galle DS Division
(Source: Google Earth)

The majority of the affected people of those areas had been engaged in fishery trade and related occupations. So mainly it was an interdependent economic activity based on fishery trade. Most of the other villagers were guides, small boutique/restaurant/hotel owners, tri-shaw drivers, masons, carpenters, government sector workers or home based small trades.

ii. Relocation of the Community

The affected people in above mentioned coastal areas relocated in Permanent housing settlement known as Salsberg village. Salsberg village is one of the 6-7 kilometers inward permanent housing settlements from the shoreline mainly for the victims of

Dewata(45%), Pettigalawatta, Magalle (12%), Kaluwella(12%) Katugoda(10%), Mahamodara(10%),and other (11%) GN Divisions and they were living within 100 meters distance from the shoreline. (Fig.3.12)

Table 3.3: Distribution of Damaged Housing Units in the Selected Affected GN Divisions by Type of Damage and Distance to the Sea: Galle Four Gravets DS Division of Galle District

(Source: Department of Census and Statistics)

Affected GN Division	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Mahamodara	61	0	3	64	18	7	5	30	108	42	16	166	187	49	24	260
Pettigalawatta	39	27	5	71	23	9	1	33	19	59	1	79	81	95	7	183
Kaluwella	19	0	0	19	8	0	0	8	74	1	12	87	101	1	12	114
Magalla	16	40	0	56	4	29	0	33	0	164	1	165	20	233	1	254
Dewata	101	16	0	117	13	17	0	30	25	29	0	54	139	62	0	201
Katugoda	117	41	1	159	17	20	0	37	24	97	0	121	158	158	1	317
Total	353	124	9	486	83	82	6	171	250	392	30	672	686	598	45	1329

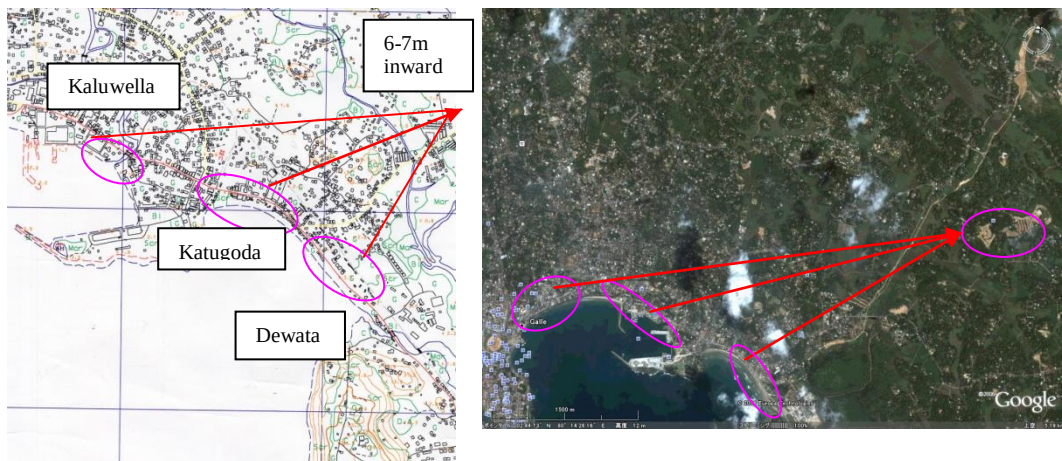


Fig.3.12: Locations of the Original Housing and Relocated Settlements
(Source: HIC map and Google Earth)

iii. Post Disaster Reconstruction

Funds- Permanent Housing: Salsberg, Austria

Post Disaster Permanent Housing Settlement –Walahanduwa- Salsberg Village

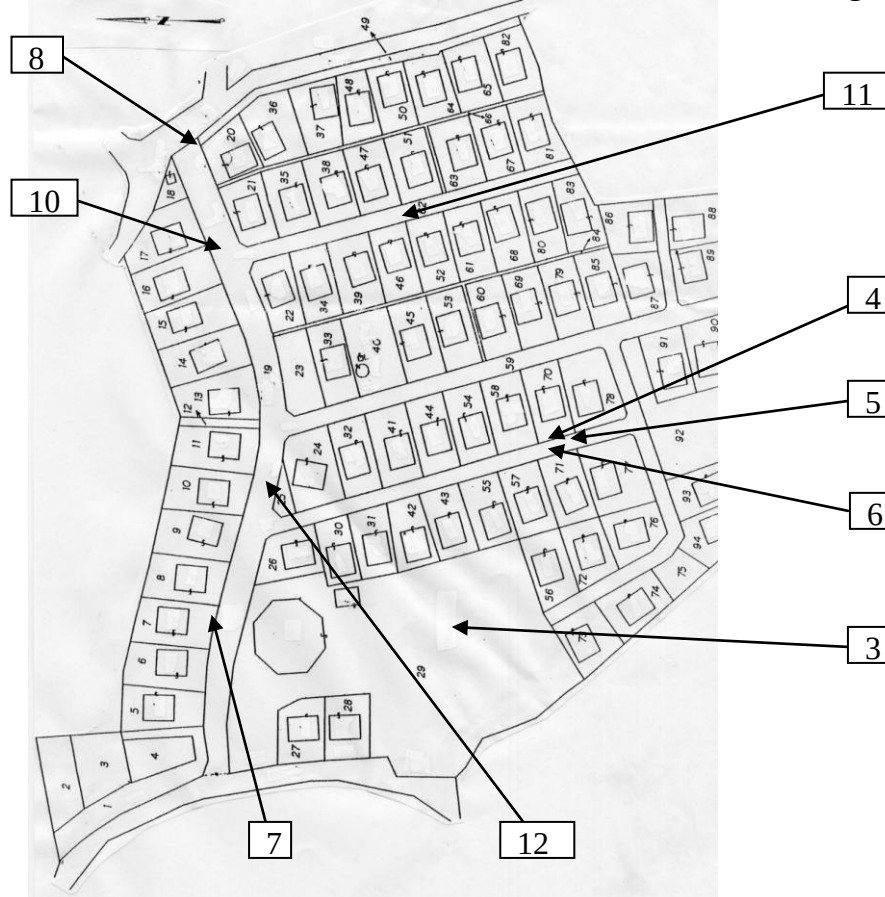


Fig.3.13: Locations of the Houses in the Walahanduwa-Salsberg Village New Settlement (by author)

iv. Tsunami Affect and Reconstruction Process of Post Disaster Permanent Housing

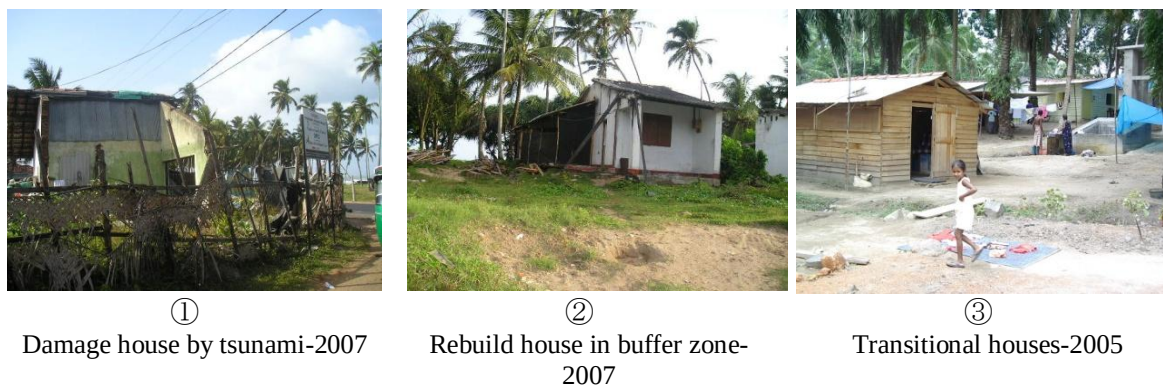


Fig.3.14: Affect to the Previous Living Environment and Transitional Houses Soon after the Disaster



Fig.3.15: Walahanduwa- Salsberg Village Permanent Housing Settlement at Under Construction Stage on 2005

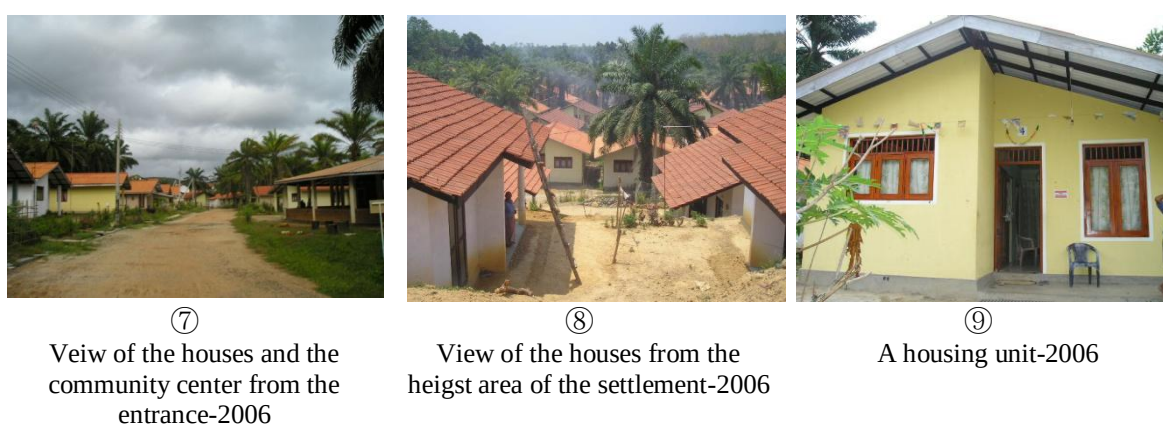


Fig.3.16: Walahanduwa- Salsberg Village Permanent Housing Settlement after Distribution to Beneficiaries on 2006

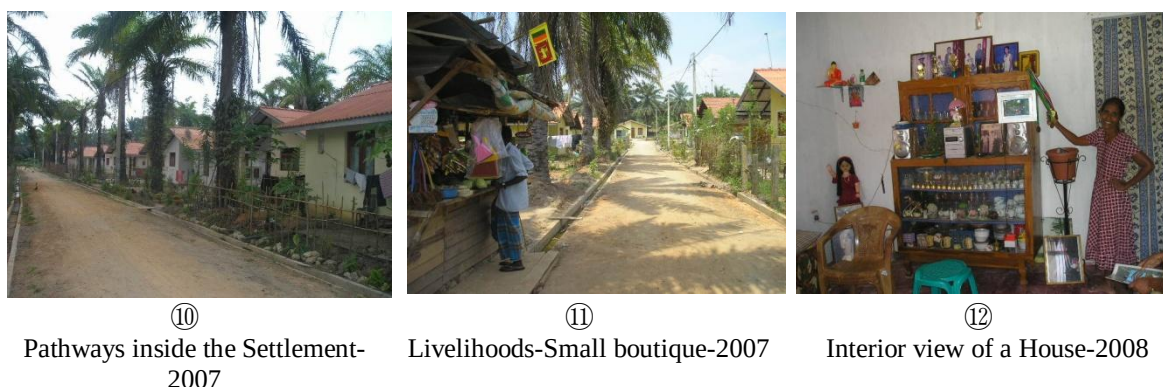


Fig.3.17: Walahanduwa- Salsberg Village Permanent Housing Settlement at Present

Walahanduwa estate is developed by 4 stages known as Salsberg village (78 units), Kinsbury Village(16 units), YMCA village (23 units) and Alience Trust Village (35 units). All of housing units with 10-12 perches (about 250 square meters) land for each unit have been proposed. The community is a mixed of victims of several coastal villages in Galle DS division.

Normally the ground floor area of one housing unit is about 55m² and consisting with two bedrooms, living room, kitchen, bathroom, toilet and two verandahs.

The common facilities such as well, community center and open play area had been proposed to level up the village facilities and promote the interrelationships between each community.

v. **Livelihoods**

After the tsunami disaster it could be find a decrease of coastal line occupation and an increase of other livelihoods of the settlement. (Table 3.4, Fig.3.18 and Fig.3.19)

Table 3.4: Details of Selected Livelihoods of the Beneficiaries of Walahanduwa Settlement, Galle District (by author)

Occupation	No. of People of the Previous Settlements %	No. of People of the Post-disaster Housing %
Fishery (fisherman)	30	25
Other coastal line occupations (tourist guides, etc.)	6	1
Home based small industries and businesses (boutique/restaurant /sawing/ coir/ hand crafts/ coconut trade/fish selling)	10	8
Skilled Services (drivers, mason, carpenters, etc.)	10	17
Labor service	15	22
Other occupations	15	11
Non-occupation	14	16

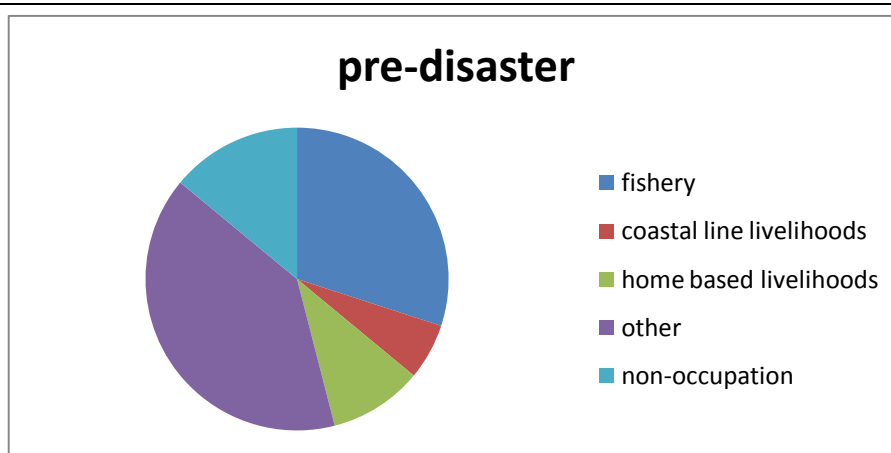


Fig.3.18: Distribution of the Pre-disaster Livelihoods of the Beneficiaries of Walahanduwa Settlement, Galle District (by author)

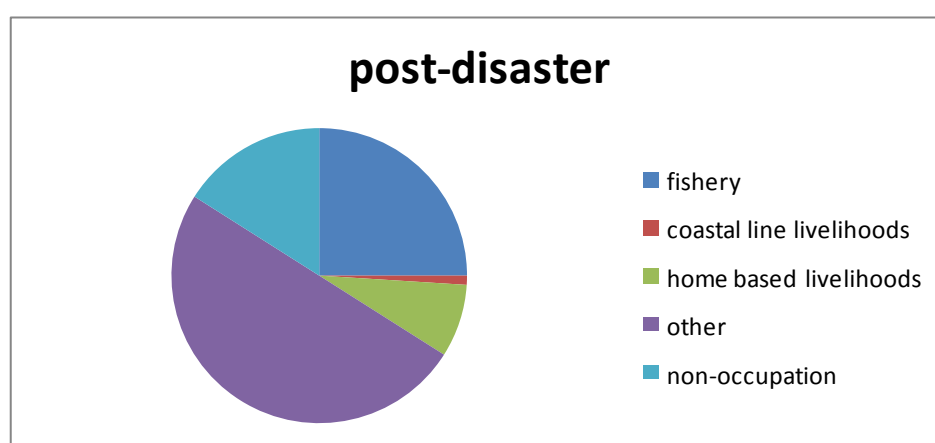


Fig.3.19: Distribution of the Post-disaster Livelihoods of the Beneficiaries of Walahanduwa Settlement, Galle District (by author)

vi. Post Disaster Settlement and Livelihoods 3 years after the Tsunami

Through analyzed data on livelihoods of the beneficiaries of pre and post communities, a vast change could not be identified since most of them are trying to continue their previous or inherit occupation amidst any kind of obstacle, due to their limited knowledge or resources specially those who were involved in fishing industry (Table 3.4, Fig.3.18 and Fig.3.19).

Although beneficiaries of this settlement were complaining about the inability to continue fishing while residing in an inward settlement, are still carrying out the original livelihood by most of them, amidst problems such as less travelling and equipment storage facilities.

But it could be identified a significant change in other coastal line occupations such as guiding, peddling, etc. and it could be supposed that they have started new occupations such as driving, masonry or carpentry or other livelihood. It could be find an attempt to start self employments and it is evident through boutiques, bicycle repair centers, and saloons which have been started inside the settlement.

3.1.4. Case Study 3-“Monrovia Estate” Permanent Housing Settlement

i. Coastal Housing Arrangements

Housing of Hikkaduwa DS division along the coastal line main road known as Galle road were highly affected by tsunami disaster (Fig.3.20). Mainly in the Telwatta, Hikkaduwa-Nagarikaya, Dodanduwa, Ratgama, Boossa, and Pitiwella GN Divisions. Those houses had been arranged in either sides of the Galle main road.



Fig.3.20: Living Environment and Housing Arrangement of Hikkaduwa

(Source: Google Earth)

The majority of the people of those areas had been engaged in fishery trade and related occupations. In these areas also mainly there were an interdependent economic activities based on fishery trade similar with Galle Four Gravets DS division. Most of the other villagers were guides, small boutique/restaurant/hotel owners, tri-shaw drivers, masons, carpenters, government sector workers or home based small traders using coastal line raw materials from coconut plants or beach.

ii. Relocation of the Community

The affected people in above mentioned coastal areas relocated in Permanent housing settlement known as Monrovia Estate (Fig.3.21). Monrovia estate is one of the 5-6 kilometers inward permanent housing settlements from the shoreline mainly for the victims of Telwatta-6.4 %, Hikkaduwa-Nagarikaya-22.5%, Dodanduwa-6.5%, Ratgama-38.7%, Boossa-8.1%, and Pitiwella 17.8% GN Divisions and they were living within 100 meters distance from the shoreline.



Fig.3.21: Locations of the Original Housing and Relocated Settlements
(Source: HIC map)

Table 3.5: Distribution of Damaged Housing Units in the Selected Affected GN Divisions by Type of Damage and Distance to the Sea: Hikkaduwa DS Division of Galle District

(Source: Department of Census and Statistics)

Affected GN Divisions	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Telwatta	64	184	2	250	2	13	0	15	0	76	0	76	66	273	2	341
Hikkaduwa town	8	44	0	52	11	13	0	24	37	96	1	134	56	153	1	210
Hikkaduwa town	0	15	0	15	0	1	0	1	0	31	0	31	0	47	0	47
Ratagama	21	3	1	25	4	2	0	6	62	25	12	99	87	30	13	130
Bossa	7	2	0	9	4	1	0	5	6	3	0	9	17	6	0	23
Pitiwella North	36	2	0	38	8	2	0	10	67	4	0	71	111	8	0	119
Pitiwella South	7	0	0	7	6	0	0	6	19	0	0	19	32	0	0	32
Total	143	250	3	396	35	32	0	67	191	235	13	439	369	517	16	902

iii. Post Disaster Reconstruction

Funds- Permanent Housing: Unilever Ltd. Sri Lanka

Post Disaster Permanent Housing Settlement – Monrovia Estate

Monrovia estate is developed by 3 stages and for all of housing units of stage 1, about 10 perches (250 square meters) lands have been provided. The community is a mixed of victims of several coastal villages in Hikkaduwa DS division.

Normally the ground floor area of one housing unit is about 55m² and consisting with two bedrooms, living room, kitchen, bathroom and toilet.

The common facilities such as shrine, community center, play area, sport building, bank, commercial area and pre-school have been proposed to level up the village facilities and promote the interrelationships between every community groups.

Monrovia Estate Map

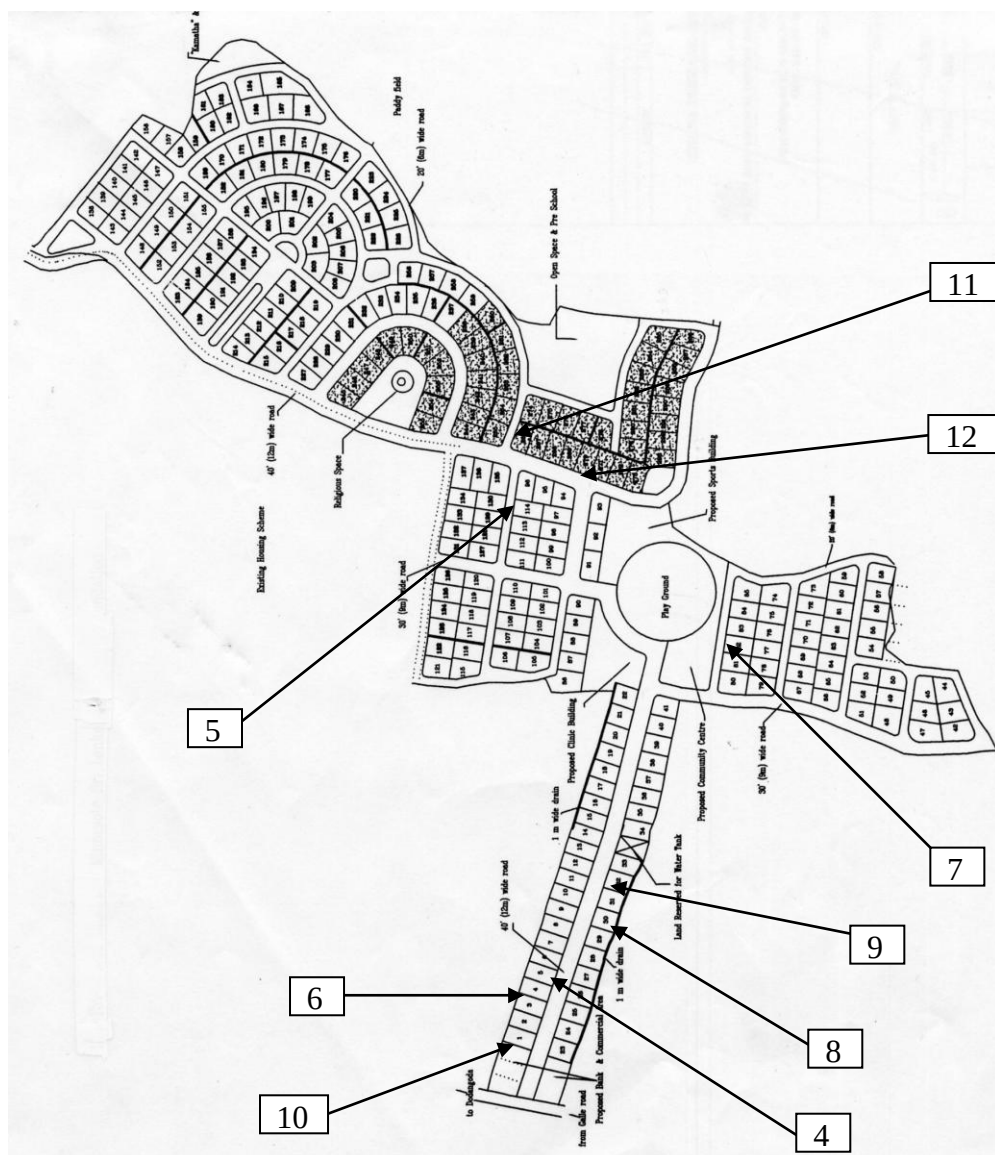


Fig.3.22: Locations of the Observed Post-tsunami Permanent Houses in the Settlement (by author)

iv. Tsunami Affect and Reconstruction of Post Disaster Permanent Housing



①
Totally damaged permanent house at Hikkaduwa-2006



②
Emergency camp at Hikkaduwa-2006



③
Temporary shelter inside the buffer-zone at Hikkaduwa-2006

Fig.3.23: Affect to Previous Living Environment and Emergency Camps soon after the Disaster at Hikkaduwa, Galle District



④
View of the settlement at the entrance-2006



⑤
Inside view of the settlement-2006



⑥
Interior view of a house-2006

Fig. 3.24: Monrovia Estate Permanent Housing Settlement, Galle District on 2006



⑦
Inside view of the settlement-2007



⑧
Temporarily abandoned housing of the settlement -2007



⑨
Temporarily abandoned housing of the settlement -2007

Fig.3.25: Monrovia Estate Permanent Housing Settlement, Galle District on 2007



Fig.3.26: Monrovia Estate Permanent Housing Settlement, Galle District on 2008

v. Livelihoods

A considerable decrease could be seen only in coastline livelihoods (Table 3.6, Fig.3.27 and Fig.3.28).

Table 3.6: Details of Selected Livelihoods of Beneficiaries of Monrovia Estate, Galle District (by author)

Occupation	No. of People of the Previous Settlements %	No. of People of the Post-disaster Housing %
Fishery (fisherman)	40	35
Other coastal line occupations(tourist guides)	7	2
Home based small industries and businesses (boutique/restaurant /sawing/ coir/ hand crafts/ coconut trade/fish selling)	20	25
Skilled Services (drivers, mason, carpenters)	12	13
Labor service	10	12
Other occupations	7	8
Non-occupation	4	05

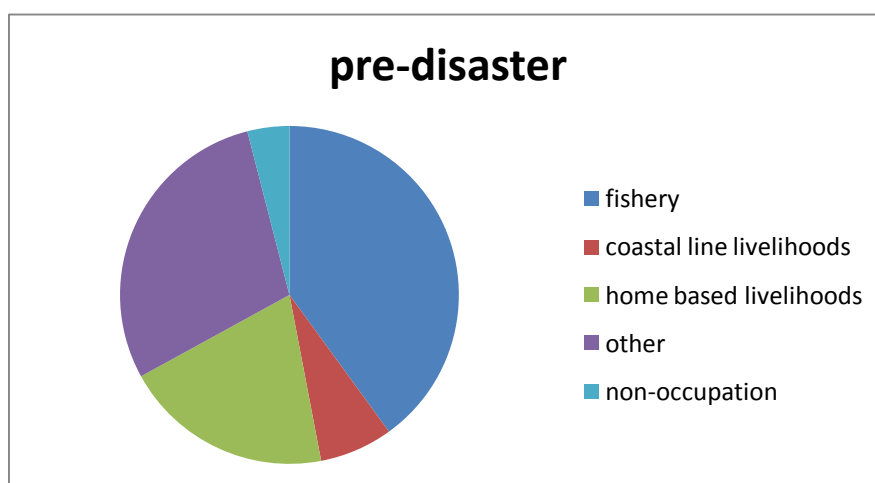


Fig.3.27: Distribution of the Pre-disaster Livelihoods of the Beneficiaries of Monrovia Estate, Galle District (by author)

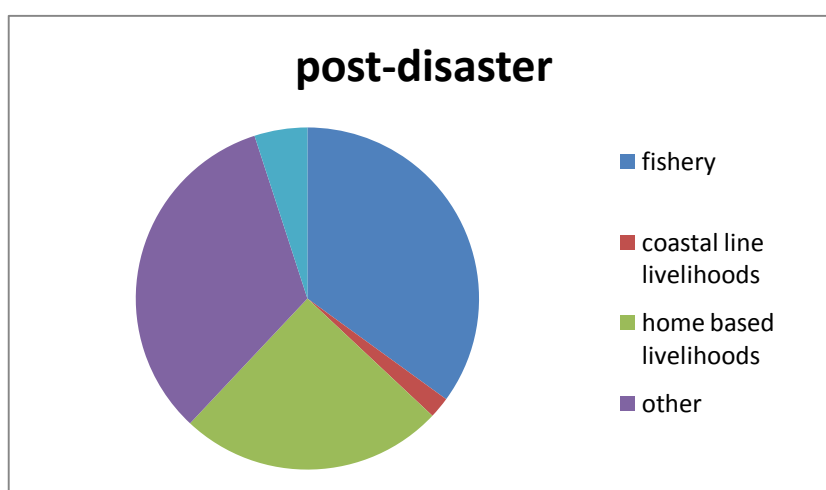


Fig.3.28: Distribution of the Post-disaster Livelihoods of the Beneficiaries of Monrovia Estate, Galle District (by author)

vi. **Post Disaster Settlement and Livelihoods 3 years after the Tsunami**

Through analyzed data on livelihoods of the beneficiaries of pre and post communities, a vast change could not be identified since most of them are trying to continue their previous or inherit occupation amidst any kind of obstacle, due to their limited knowledge or resources specially those who were involved in fishing industry.

Although beneficiaries of this settlement were complaining about the inability to continue fishing while residing in an inward settlement, are still carrying out the original livelihood by most of them, amidst problems such as less travelling and equipment storage facilities (Table 3.6, Fig.3.27 and Fig.3.28).

But it could be identified a significant change in other coastal line occupations such as guiding, peddling, etc. and it could be supposed that they have started new occupations such as driving, masonry or carpentry. It could be find an attempt to start self employments and it is evident through 10 boutiques, 2 bicycle repair centers, 2 home based coir industry centers and about 10 tri-shaws, which have been started inside the settlement (Fig.3.29).



Fig.3.29: Organization of Livelihoods inside the Monrovia Estate in Galle District
(by author)

3.1.5. Case Study 4 – “Mirihanawatta” Permanent Housing Settlement

i. Coastal Housing Arrangements

Housing of Habaradoowa DS division along the coastal line main road known as Matara road¹ were highly affected by tsunami disaster (Fig.3.30). Mainly in the Kataluwa, Ahangama, Goviyapana, Talpe and other few GN Divisions.



Fig.3.30: Living Environment and Housing Arrangement of Kataluwa DS Division
(Source: Google Earth)

The affected people of those areas had been mainly engaged in fishery trade, related occupations, running boutique/restaurant, tri-shaw drivers, masons, carpenters, government sector workers or home based small traders.

ii. Relocation of the Community

The affected people in above mentioned coastal areas relocated in Permanent housing settlement known as “Mirihanawatta” estate (Fig.3.31). It is an about 1 kilometer inward permanent housing settlements from the shoreline mainly for the victims of Kataluwa (about 60%), Ahangama (about 20%), Goviyapana, Talpe, and other GN Divisions and they were living within 100 meters distance from the shoreline.



Fig.3.31: Locations of the Original and Relocated Settlements in Habaraduwa DS Division (Source: Google Earth)

Table 3.7: Distribution of Damaged Housing Units in the Selected Affected GN Divisions by Type of Damage and Distance to the Sea: Habaraduwa DS Division of Galle District (Source: Department of Census and Statistics)

Affected GN Division	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Talpe South	1	0	0	1	0	0	0	0	14	0	0	14	15	0	0	15
Talpe East	8	6	0	14	2	3	0	5	14	25	0	39	24	34	0	58
Kataluwa West	17	13	0	30	5	1	0	6	27	19	0	46	49	33	0	82
Kataluwa East	23	28	0	51	4	6	0	10	3	25	0	28	30	59	0	89
Ahangama(Central)	6	0	0	6	2	0	0	2	28	14	0	42	36	14	0	50
Ahangama East	13	3	0	16	6	1	0	7	7	50	0	57	26	54	0	80
Goviyapana	11	2	0	13	3	0	0	3	23	3	1	27	37	5	1	43
Total	79	52	0	131	22	11	0	33	116	136	1	253	217	199	1	417

iii. Post Disaster Reconstruction

Funds-

Permanent Housing : “Kurier” Aids Austria

Transitional Housing : Sri Lankan Government-Ministry of Fisheries and Water Resources

Post Disaster Permanent Housing Settlement – Mirihanawatta

This permanent housing construction project completed from the funds of Austria. It had been taken more than two years to complete the project up to the current stage. The construction and design failures occurred in the previous project had been made such delay. At the first stage designers and contractors had been tried to introduce a new house design which beneficiaries couldn't follow. At the same time construction and material problem had been occurred. Due to such reasons all the construction happened to demolish and rebuild the houses according new design. It was resulted a high wastage of funds and time due to unavailability of proper planning and design methods.

All of housing units are consisting with 10-12 perches (about 250 square meters) land. Normally the ground floor area of one housing unit is about 55m² and consisting with two bedrooms, living room, kitchen, bathroom, toilet and front hood. The common facilities such as well, community center and open play area had been proposed to level up the village facilities and promote the interrelationships between each community.

Locations of Pre-disaster Housing and Post-disaster Permanent Housing

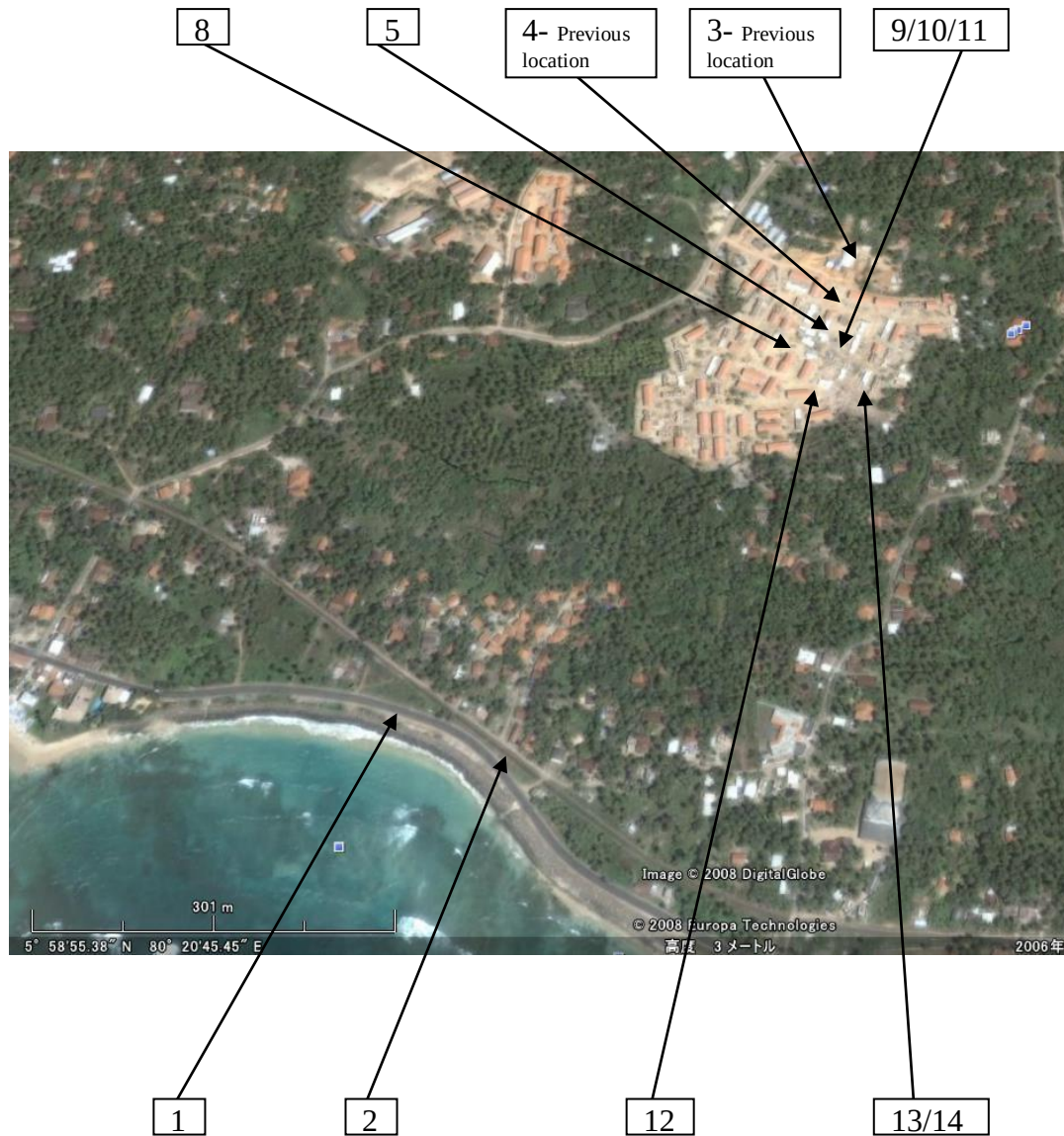


Fig.3.32: Selected Locations of the Pre-tsunami Houses and Post-tsunami Houses of Tsunami Victims of Habaraduwa DS Division (by author)

iv. Tsunami Affect and Reconstruction of Post Disaster Permanent Housing



Fig.3.33: Previous Living Environment, Tsunami Affect and Transitional Houses

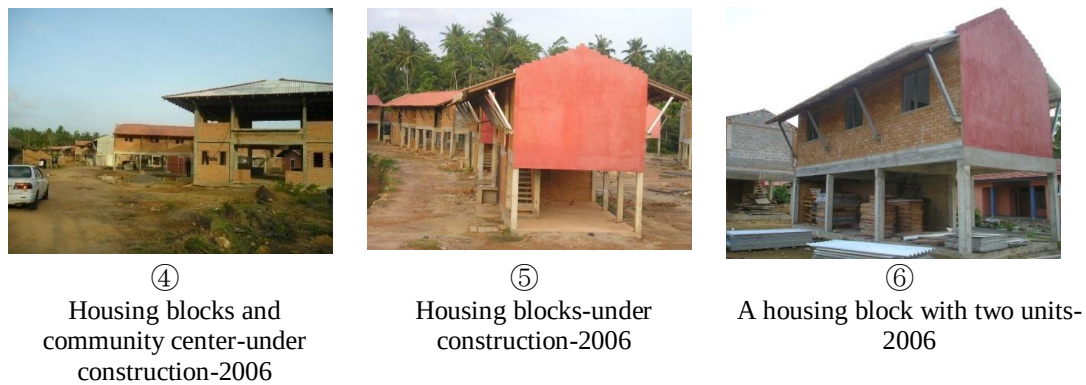


Fig.3.34: Mirihanawatta Permanent Housing Settlement at Construction Failure Stage on 2006



Fig.3.35: Construction Failures and Experimental Model House on 2006



Fig.3.36: Mirihanawatta Permanent Housing Scheme – under construction 2007



View after completion of roads In side views of the well established settlement -2008

Fig.3.37: Mirihanawatta Permanent Housing Settlement after completion on 2008

v. Livelihoods

A considerable change could not be found in pre and post disaster livelihoods (Table 3.8, Fig.3.38 and Fig.3.39)

Table 3.8: Details of Selected Livelihoods of the Beneficiaries of Mirihanawatta Permanent Housing Settlement, Galle District (by author)

Occupation	No. of People of the Previous Settlements	No. of People of the Post-disaster Housing
Fishery (fisherman)	48	45
Other coastal line occupations (tourist guides, etc.)	12	10
Home based small industries and businesses (boutique/restaurant /sawing/ coir/ hand crafts, etc.)	10	8
Skilled Services (drivers, mason, carpenters, etc.)	13	14
Labor service	10	12
Other occupations	7	10
Non-occupation	0	1

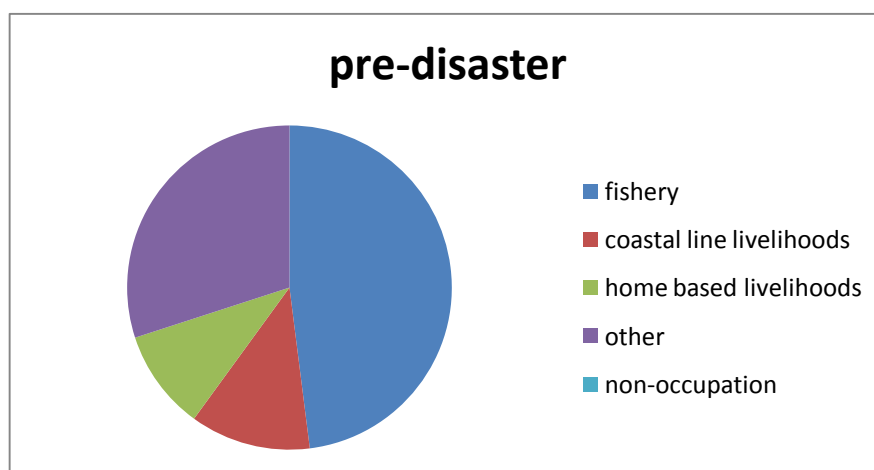


Fig.3.38: Distribution of the Pre-disaster Livelihoods of the Beneficiaries of Mirihanawatta Permanent Housing Settlement, Galle District (by author)

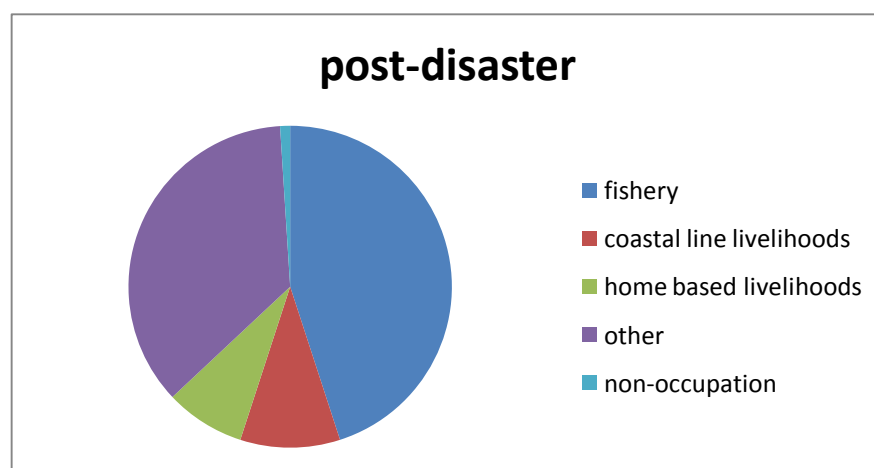


Fig.3.39: Distribution of the Post-disaster Livelihoods of the Beneficiaries of Mirihanawatta Permanent Housing Settlement, Galle District (by author)

vi. Post Disaster Settlement and Livelihoods 3 years after the Tsunami

Through the analyzed data on livelihoods of the beneficiaries of pre and post communities, a vast change could not be identified according to the suitable location of the new permanent housing village (Table 3.8, Fig.3.38 and Fig.3.39). In home based livelihood sector a considerable decrease could be found due to unavailability of basic fund to restart the previous industry or the unsuitable location to run a boutique or restaurant, etc.

3.1.6. Case Study 5- “Minsiripura” Permanent Housing Settlement

i. Pre-disaster Coastal Settlements

“Kalametiya” village of Hatagala GN division and Ambalantota DS division along the coastal line of Hambantota district, were highly affected by tsunami disaster.

The original settlements existed with about 19 houses and 30 families and it was arranged along the Kalametiya beach 5 kilometers away from the main road. The community gathering was based along the sea where the fishing activities were happening most of the time of the day with the collaboration of many people. The original community existed adjacent to a wild reservation with its own territory.

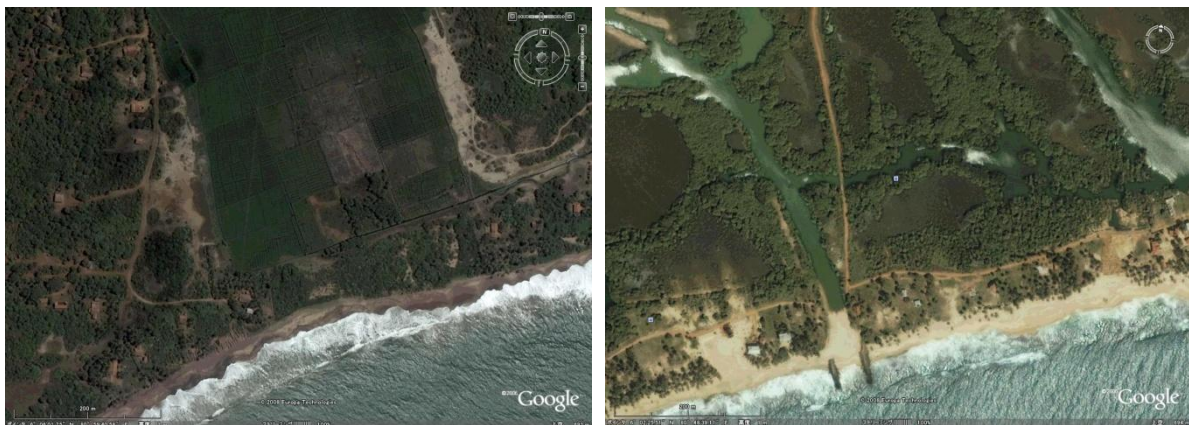


Fig.3.40: Coast line Housing and Living Environment Organization of Ambalantota
(Source: Google Earth)

ii. Relocation of the Community of Ambalantota DS Division

Minsiripura village in Hatagala GN division is the permanent housing settlement for the victims of Kalametiya village and they were living within 100 meters distances from the shoreline.(Fig.3.41)

After the tsunami disaster the original Kalametiya fisherman village along the coastal line severely damaged except of one house. Due to the severe damage low quality constructions of the permanent housing also could be assumed. All the houses of the

original settlement were re-established about 4 kilometers away from its original location, towards the main road known as Kataragama road².

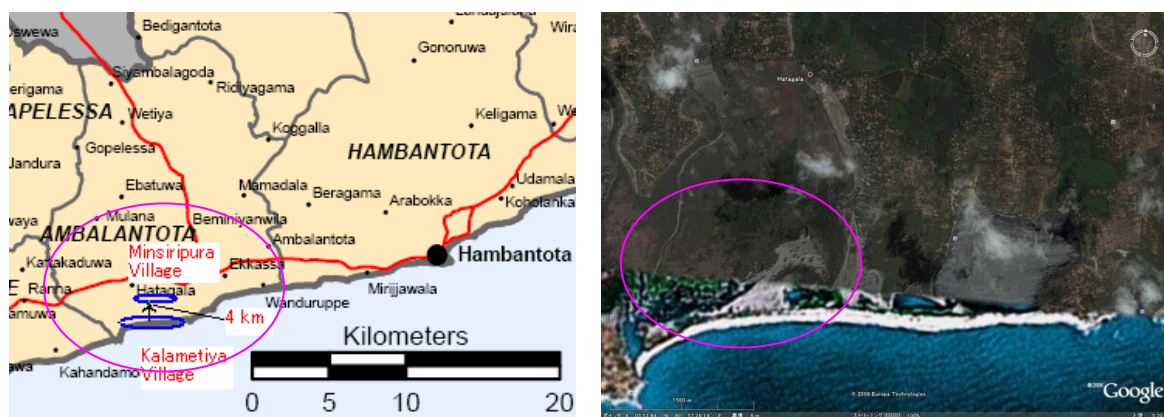


Fig.3.41: Locations of the Original and Re-located Settlements in Hatagala GN Division
(Source: HIC map and Google Earth)

iii. Livelihoods

Table 3.9: Details of Selected Livelihoods of the Beneficiaries of Minsiripura
Permanent Housing Settlement, Hambantota District (by author)

Occupation	No. of People of the Previous Settlements %	No. of People of the Post-disaster Housing %
Fishery (fisherman)	87	87
Other coastal line occupations (tourist guides, etc.)	0	0
Home based small industries and businesses (boutique/restaurant /sawing/ coir/ hand crafts/ coconut trade/fish selling)	12	9
Skilled Services (drivers, mason, carpenters, etc.)	1	2
Labor service	0	0
Other occupations	0	2
Non-occupation	0	0

A small increase could be found in post disaster other livelihoods category (Table 3.9, Fig.3.42 and Fig.3.43). The fishery community did not have the livelihood problem before the tsunami disaster. Through the questionnaire survey it could found about 26 families of the whole village engaged in fishery industry, 2 families in fish selling and 1 family was running a boutique at the pre-disaster situation. And many cases had an extra income from coconut trade which lost after the movement.

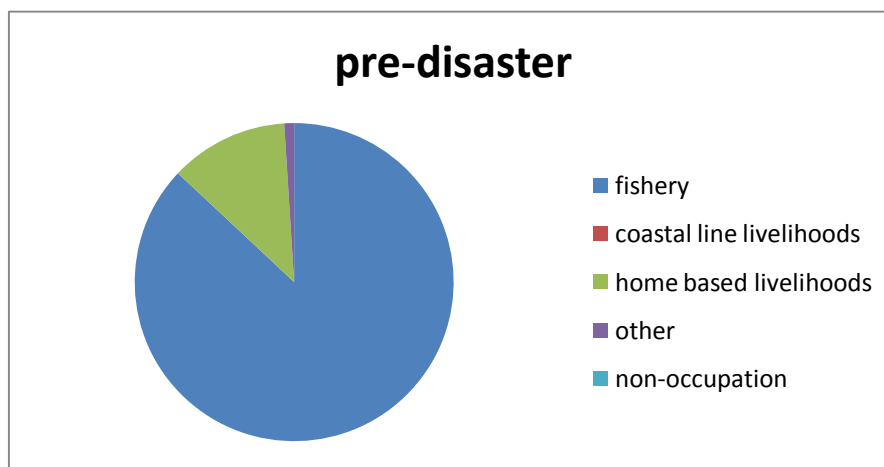


Fig.3.42: Distribution of the Pre-disaster Livelihoods of the Beneficiaries of Minsiripura Permanent Housing Settlement, Hambantota District (by author)

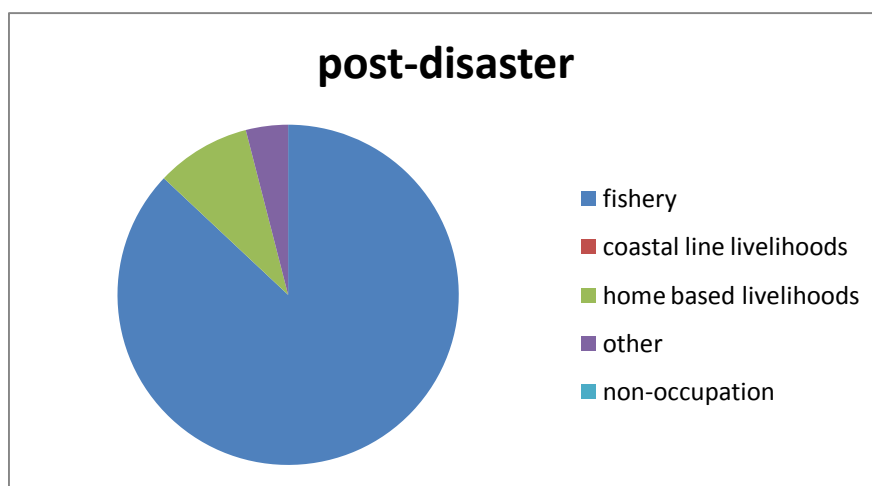


Fig.3.43: Distribution of the Post-disaster Livelihoods of the Beneficiaries of Minsiripura Permanent Housing Settlement, Hambantota District (by author)

Locations of Pre-disaster Housing and Post-disaster Permanent Housing

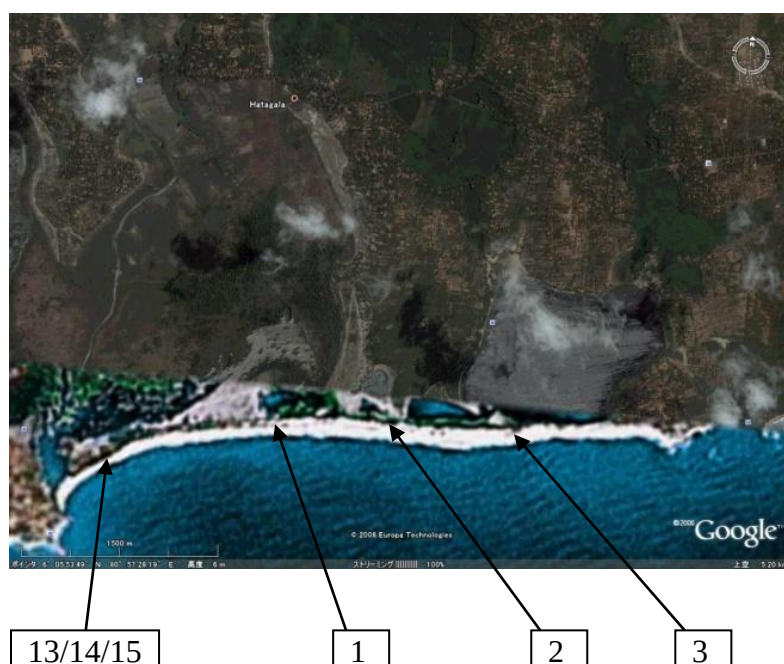


Fig.3.44: Locations of Affected Housing along the ‘Kalametiya Beach’ of Hambantota District (Source: Google Earth)

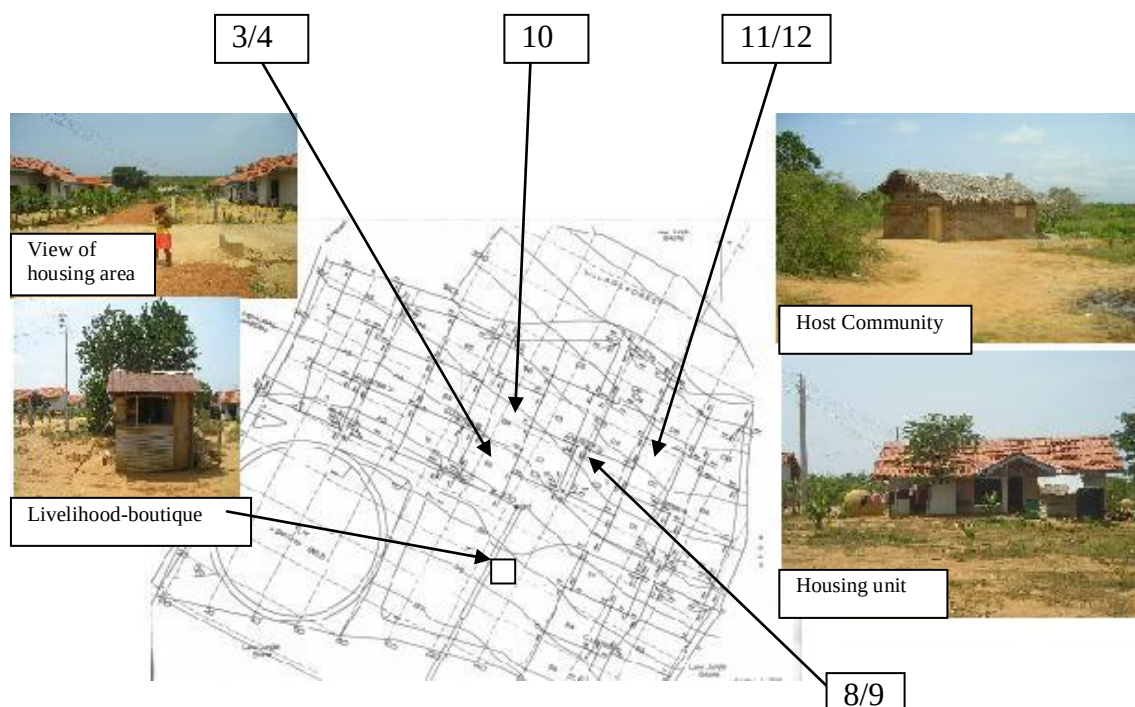


Fig.3.45: Locations of Selected Post-tsunami Permanent Houses in Minsiripura Settlement of Hambantota District

iv. **Tsunami Affect and Reconstruction of Post Disaster Permanent Housing**



Fig.3.46: Affect to the Previous living Environment and Situation after Tsunami Disaster

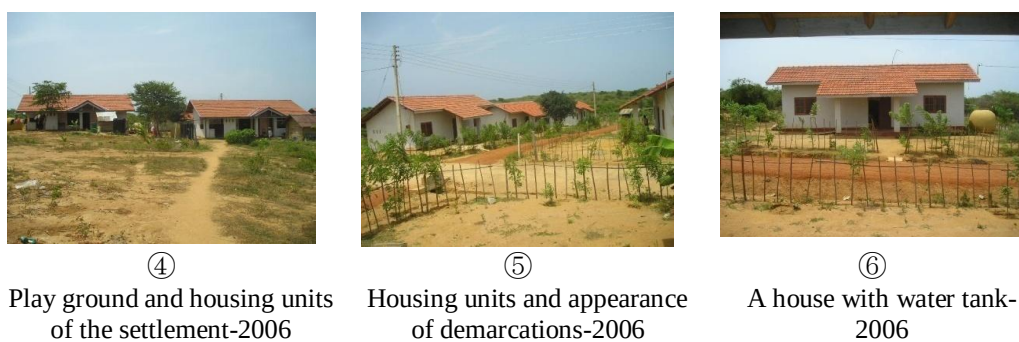


Fig.3.47: Minsiripura Permanent Housing Settlement soon after the Distribution on 2006

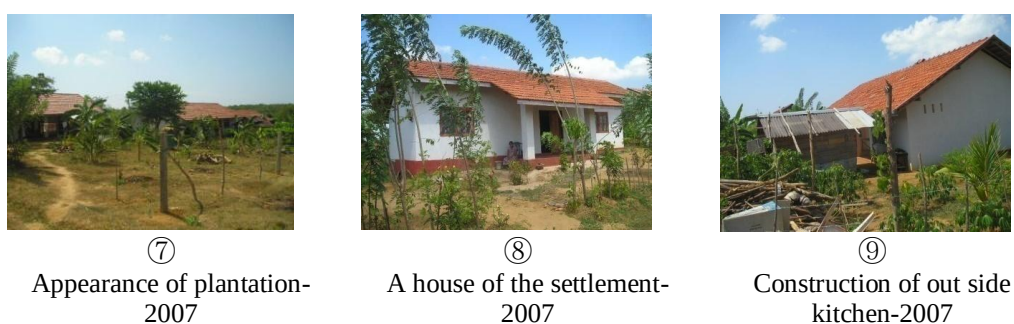


Fig.3.48: Minsiripura Permanent Housing Settlement and Extra Constructions by Residents on 2007



⑩

A house of the settlement



⑪

Interior reform



⑫

Exterior reform

Fig.3.49: Minsiripura Permanent Housing Settlement and Interior and Exterior Reform by Residents on 2008



⑬



⑭



⑮

Fig.3.50: New Facilities for Livelihoods (store room for fisherman) on 2008

Table3.10: Distribution of Damaged Housing Units in a Selected GN Division by Type of Damage and Distance to the Sea of Hambantota District

(Source: Department of Census and Statistics)

Affected GN Division	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Hatagala	19	1	0	20	8	0	0	8	0	1	0	1	27	2	0	29

v. Post Disaster Reconstruction and Housing Settlement- Minsiripura Village

Funds- Permanent Housing : Under the Green Movement-GMSL Sri Lanka
Canadian International Development agency-CIDA, Sahana project-USA, The development fund Norway-DF, Coastal campaign of Norway, Goal Ireland-GOAL, United nations development-UNDP, Coastal resources management project (CRMP) Sri Lanka, Byron Bay Community group-Australia, Team Architrave Sri Lanka

Minsiripura village is consisting of 30 housing units with 20 perches (500 square meters) land per each unit and all the houses have been handed over at present. The current community is consisting of 30 families and it is an unmixed community of victims of Kalametiya fisherman village. Normally the ground floor area of one housing unit is about 60m² and consisting with two bedrooms, living room, kitchen, front and rear verandahs, bathroom and toilet. An additional water tank with special system to collect rainwater has been given for each family.

The common facilities such as community center and play area have been proposed to level up the village facilities and promote the interrelationships between each family. Here also through the analyzed data on livelihoods of the beneficiaries of pre and post communities, a vast change could not be identified since most of them are trying to continue their previous or inherit occupation. After three years of the tsunami it could be found that most of the victims have been get used for their new settlement and as well as travelling to the sea. A proper store room with locking facility for fishermen's equipments also had been built on the beach by a NGO as a solution for their previous main problem. To promote the livelihood of the new village the donor side has proposed several programs such as home garden, and home based industries like batiks and sawing for women. It could be found most of the beneficiaries are reforming their houses according to their own choice which depicts the complications with house designs and planning.

3.2. Home-owner Driven Housing Reconstruction Program

3.2.1. Institutional Arrangements

The Southwest Housing Reconstruction Unit (SWHRU) functioned under TAFREN (later merged to RADA) and North East Housing Reconstruction Unit (NEHRU) operated under the Ministry of Relief, Rehabilitation and Relocation is responsible for all the Home-owner driven housing reconstruction projects. At the local level, focal points for coordination and implementation in the respective districts are the District Secretaries and the Divisional Secretaries. Under this program, a house is either classified as a partially damaged house or a fully damaged house by the officers.

3.3.2. Case Studies-Owner-driven Programs

Case Study 6-“Totamuna” Permanent Housing Settlement

i. Pre-disaster Coastal Settlements

Settlements of Totamuna and Polhena GN divisions of along the coast line Matara Four Gravets DS Division were highly affected by tsunami disaster. The majority of the affected people of those settlements had been engaged in fishery and other coast line related occupations.

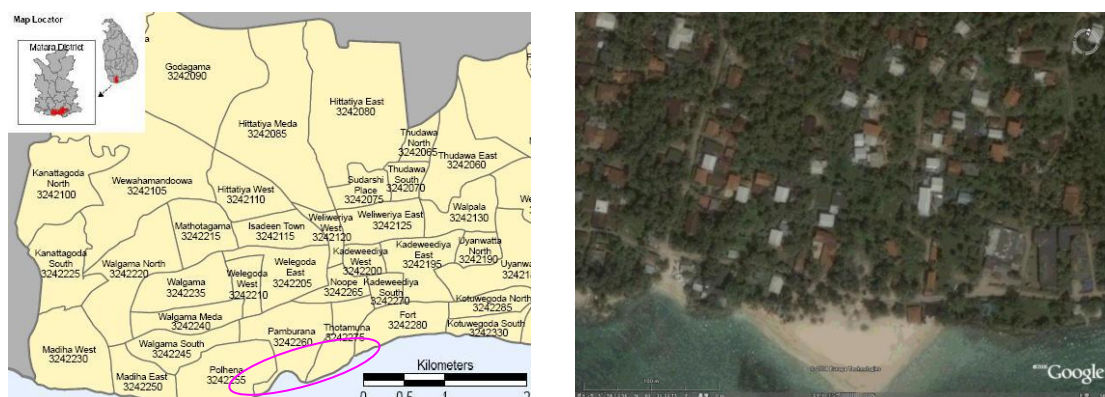


Fig.3.51: Location of the Coastal Settlements and Living Environment Organization of Totamuna GN Division around “Polhena Beach” (Source: HIC map and Google Earth)

Table 3.11: Distribution of Damaged Housing Units in the Selected Affected GN Divisions by Type of Damage and Distance to the Sea: Ambalantota DS Division of Hambantota District (Source: Department of Census and Statistics)

Affected GN Divisions	Completely Damaged				Partially Damaged (Unusable)				Partially Damaged (Usable)				Total			
	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total	Within or on the 100m Boundary line	Outside the 100m Boundary line	Not Identified	Total
Polhena	69	47	-	116	26	36	-	62	31	339	-	370	126	422	-	548
Totamuna	160	57	-	217	5	39	-	44	3	157	-	160	168	253	-	421
Total	229	104	-	333	31	75	-	106	34	496	-	530	294	675	-	969

ii. Post Disaster Reconstruction

Funds- Permanent Housing: “Padova” City Council- Italy

Reconstruction Process of Thotamuna-‘ Siyathena’ Housing Project



Partially damage (unusable) permanent house



Reconstruction of a partially damage house



Land of a totally damaged house

Fig.3.52: Previous Housing of Totamuna GN Division and Damage after the Tsunami Disaster on 2005 and 2006 (Source: Matara District Secretaries)

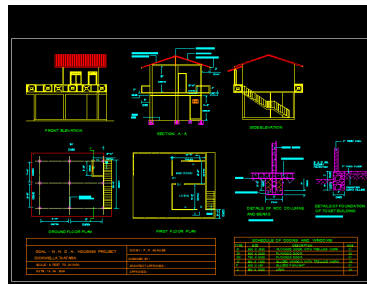
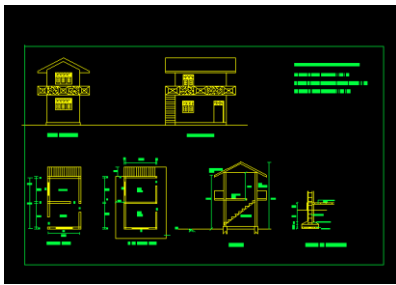


Fig.3.53: Post Disaster Reconstructions- Proposed Housing Designs by UDA
(Source: Matara District Secretaries)



Fig.3.54: Home-owner Driven Reconstruction Phase 1- 2005 (Source: Matara District Secretaries)



Completed house up to basic finishes level-2007



Completed house up to structural level-2007



Completed house up to finishes level-2007

Fig.3.55: Home-owner Driven Reconstruction Phase 1 and 2- Situation on 2007



Completed house up to basic finishes level-2008



Completed house up to basic finishes level-2008



Completed house

Fig.3.56: Home-owner Driven Reconstruction Phase 2 and 3 – Situation on 2008

With the reduction of the buffer zone regulation, the original limit of 100m changed to 35m in Totamuna GN Division which increased the home-owner driven reconstruction cases of the area. A two storied house design had been proposed by UDA which could be occurred a minimum damage in future tsunami occasions. According to the proposed design ground floor should be open or temporarily covered for simple work and upper floor should be use for living purposes.

iii. Livelihoods

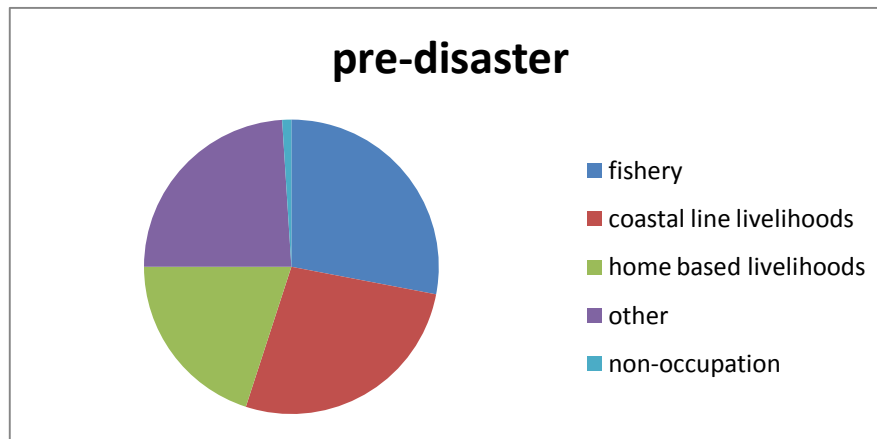


Fig.3.57: Distribution of the Pre-disaster Livelihoods of the Beneficiaries of Totamuna Settlement, Matara District (by author)

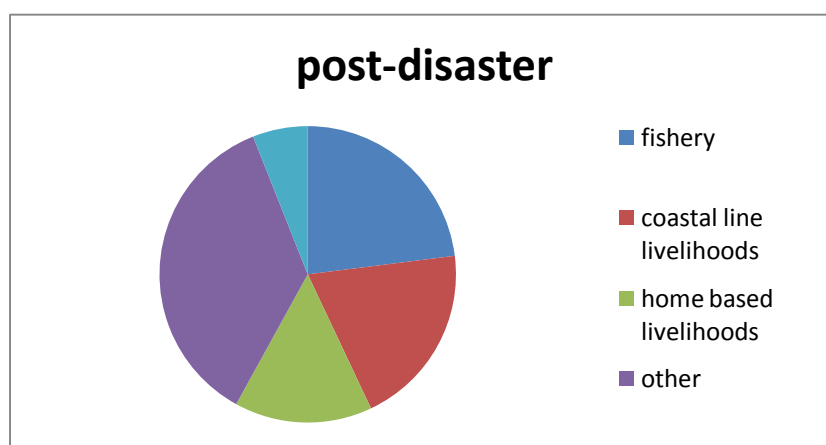


Fig.3.58: Distribution of the Post-disaster Livelihoods of the Beneficiaries of Totamuna Settlement, Matara District (by author)

Table 3.12: Details of Selected Livelihoods of the Beneficiaries of Totamuna Settlement,
Matara District (by author)

Occupation	No. of People of the Previous Settlements %	No. of People of the Post- disaster Housing %
Fishery (fisherman)	28	23
Other coastal line occupations (tourist, guides, etc.)	27	20
Home based small industries and businesses (boutique/restaurant/sawing/coir/hand crafts/coconut trade/fish selling)	20	15
Skilled Services (drivers, mason, carpenters)	15	17
Labor service	07	12
Other occupations	02	07
Non-occupation	01	06

A decrease of post disaster situation could be seen in fishery, coastal line livelihoods and home based livelihood categories (Table 3.12, Fig. 3.57 and Fig.3.58)

iv. Reconstruction and Living Environment 3 years after the Tsunami

It could be found the affected people still live in the houses which under construction. Although beneficiaries followed the proposed house designs by UDA they have been unable to balance the budget and construction limit. Because of that heavy, high cost construction have been appeared and most of the cases are still under construction.

3.3. Analysis of Case Studies

In order to compare the satisfaction level regarding the fulfilled requirements of the occupants and facilities provided of the six post disaster case studies below table has been prepared.

Degree of appropriateness of the each requirement has been evaluated according to the “Likert” scale from 0 to 3.

- Level 3 means the requirement has been fulfilled, also it is adequate and beneficiaries are satisfied.
- Level 2 means the requirement has been fulfilled but it is inadequate and beneficiaries are somewhat satisfied.
- Level 1 means the requirement has been provided but it is inappropriate and beneficiaries are unsatisfied.
- Level 0 means non-provided requirements.

In the questionnaire if 60-100% satisfy with requirement that put to Level 3, if 40-60% to Level 2 and 1-40% Level 1.

3= Fulfilled, adequate and satisfied

2=Fulfilled, inadequate and somewhat satisfied

1= Fulfilled, inappropriate and unsatisfied

0=Non-provided

Table 3.13: Adequate Level of Facilities Provided for Post-disaster Permanent Housing
(based on questionnaire for the residents by author)

Requirements	Satisfaction Level					
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Location of PH	1	1	1	3	1	3
Livelihood Facilities	1	1	1	2	2	3
Community facilities	2	2	2	2	2	2
Design of house	1	3	1	2	1	3
Spatial arrangement	1	3	1	2	1	3
Floor area	1	3	2	3	2	3
Kitchen	1	1	1	2	1	3
Bathing facility	2	2	2	2	1	3
Toilet facility	2	1	2	2	1	3
Infrastructure	2	3	2	2	2	2
Construction materials	-	2	1	2	1	3
Construction quality	-	2	1	2	1	3
Amount of grant	1	-	-	-	-	2
Total	15	24	17	26	16	36
No of Valid Cases	11	12	12	12	12	13
Overall Satisfaction and Adequate Level (mean value)	1.3	2.0	1.4	2.1	1.3	3

It could be found in 3 case studies, the mean value which stands for the overall satisfaction and adequate level of post disaster permanent housing lie below the 1.5 which imply inappropriate and unsatisfied situation while other 3 cases imply a certain satisfaction. It can be said that according to the location, design and reconstruction processes of post disaster permanent housing, 50% of the case studies which imply the remain post-disaster reconstruction projects of Sri Lanka has been unable to satisfy the beneficiaries.

3.4. Evaluation of the Pre and Post Settlements

3.4.1. Comparison of Pre and Post Disaster Settlements of Case Study 1

In this case study it is difficult to compare the pre and post disaster settlements regarding many cases since considerable number of community groups still live in transitional houses or temporary /semi-permanent squatter camps inside the buffer zone. Post disaster living environment was with many living environment defects. The area was highly congested by the semi-permanent/shanty or permanent squatter camps. About 80% of the semi permanent structures were inside the buffer zone and through the reconstruction programs, half of the area has become vacant and maintaining by the Coastal Conservation Department at present. Remaining area with squatter camps and have relocate the community prudently. The area outside the buffer zone also poorly planned and highly congested. Only about 50% of the damaged houses have been repaired or reconstructed properly.

The communities still live in the transitional houses are struggling to buy a cheap land, and those who have bought the cheap lands are struggling with the permanent house building by an insufficient grant with high cost construction in the urban areas. Since the people who bought lands happened to move from the transitional houses soon as possible, again they have built structurally unsound semi-permanent houses in their new lands and continuing a similar life to the coastal squatter camps. The average satisfaction level (mean value 1.3) of the beneficiaries is low.

3.4.2. Comparison of Pre and Post Disaster Settlements of Case Study 2

By getting an opportunity to settle in a well established settlement like Walahanduwa-Salsberg village most of the beneficiaries are satisfying with the new community. For

them those who were residing in squatter camps, new village which provide a high living standard with their dream home in an acceptable social level. But at the same time they complain about the long distance to the sea that they happened to travel without proper transportation facilities all the time from their homes, as most of them were fishermen who do not have enough knowledge to start another job. Due to this barrier of their lives still number of people of the new settlement passing time with the other unemployed colleagues which could create so many social problems in near future. It could be said proper livelihoods, those are able to create a positive thinking and a hope about their future in their minds, are the immediate necessities for their establishment in the new community.

Most of the beneficiaries satisfying about the housing design and spatial arrangements but having problems with kitchen and toilet. Inside kitchen which is suitable for gas use is unaffordable to most of them. And seems to be many people unable to get used to the new system toilet also. The average satisfaction level (mean value 2.0) of the beneficiaries regarding the new settlement is high and it can be identified as success project.

3.4.3. Comparison of Pre and Post Disaster Settlements of Case Study 3

Relocation of the permanent housing village has been done in an outer urban periphery. It gives many merits as well as demerits for the beneficiaries. Most of the beneficiaries satisfy with the new community since their living standard became high with their dream home in an acceptable social level, which their children will be able to grow up and get a bright future.

But at the same time they complain about the long distance to the sea that they happened to travel without proper transportation facilities all the time from their homes. It would have been a relief for the beneficiaries if they could get homes next to their relations, friends or previous neighbors in the new villages. Since such an environment helps to built up their new lives and it would be a sensitive and intellectual way other than a lottery system. Because we could find through the interviews with the beneficiaries, from a lottery system it can avoid only external conflicts with each other. The beneficiaries of stage 1 have got a home with modern type gas use kitchen. It is expensive and unaffordable for them because they have got used to cheap wood use kitchens with chimneys. But with this new lay out beneficiaries happened to afford the high living cost or build an additional kitchen for wood use. It is evident through this fact that living standard of a certain community should be level up while concerning their living cost as well. Due to the repetition of the same design the identity of each in the neighborhood is not playing any vital character to the residents. As Monrovia estate became to a mixed community, still some of the beneficiaries struggle with this vast change of their life styles and living patterns. This makes a delay in the building of sense of belonging to their new community. The average satisfaction level (mean value 1.4) of the beneficiaries regarding the new settlement is low.

3.4.4. Comparison of Pre and Post Disaster Settlements of Case Study 4

Since the location of this settlement close to the original living environment most of the beneficiaries did not find difficulties with livelihoods and neighborhood environments. A considerable change could not be found in pre and post disaster livelihoods (Table 3.8, Fig.3.38 and Fig.3.39). Due to the construction failures at the first stage of the project

victims happened to stay long period in unmaintained transitional housing with lot of difficulties. As it was the very early stage of the new life in the new settlement from the transitional housing most of the beneficiaries were quite satisfied about their living standard. The average satisfaction level (mean value 2.1) of the beneficiaries regarding the new settlement is high.

3.4.5. Comparison of Pre and Post Disaster Settlements of Case Study 5

This is an idealistic project with the high concentration on natural environment. It could be found a better flowing of the community of new settlement since the whole original community shifted to the new location.

In this program also it could be found a kind of un-satisfaction regarding their post disaster permanent housing location and design. The original village was a pure fisherman community along the coast with their own territory. The long distance from the new permanent housing to the sea originally seemed to be as making their only occupation impossible. And also as making rural lives much harder and cost to share a vehicle to travel. Because before the disaster people shared a vehicle to go to the city for their necessities only once a week happened to repeat several times per day for their livelihood. But with the time the complains about the travelling distance to the shoreline seems to be reduced since most of the people involved in fishery industry have been get used to an affordable travelling method. And a lockable building to store the fisher mens' equipments also had been provided by a NGO. Such facilities have been reduced the burden of beneficiaries of this new settlement.

Complains on housing designs and repetition of those depicts the conflicts between clients' satisfaction and planning and architectural concepts. The temporary extensions

and interior reform which had been done by residents has become permanent after two years living period. Most of kitchen and bathing areas are under reforming and seems to be inappropriate for many people.

It could be seen that the poor host community around the new village, is disgusted about their living standard comparing to the new comers is as a beginning of another kind of social problem. The average satisfaction level (mean value 1.3) of the beneficiaries regarding the requirements of the new settlement is low.

3.4.6. Comparison of Pre and Post Disaster Settlements of Case Study 6

The previous living environment was arranged by many single storied structurally unsafe housing which affected fully or partially by tsunami. Reconstruction approved according to UDA basic plan and design. A grant of LKR 400,000 from the Italian INGO had been given to the victims except the government grants of LKR 250,000 or LKR 100,000. But most of the affected housing outside the buffer zone still under construction and there it could be found high cost multi storied constructions as reasons for many cases. According to the UDA proposed design regulation, new permanent house should be at least two storied with enough seismic strength and the ground floor should not use for living purposes; all the living space should be arranged on uppers levels. The proposed housing design has been highly concentrate on preventing from future tsunami disaster and could be considered as appropriate program. But this case study reveals the importance of a certain balance between construction cost and housing design. The average satisfaction level (mean value 3.0) of the beneficiaries as regards to the requirements of the new settlement is high and it can be identified as success project.

Notes:

¹ The coastal line main road via southern province towards eastern province; continue from Colombo capital of Sri Lanka. From the end of Galle Four Gravets DS division up to Matara Four Gravets DS division the road known as Matara road.

² The coastal line main road via southern province towards eastern province; continue from Colombo capital of Sri Lanka. From the end of Matara Four Gravets DS division via Hambantota district up to Kataragama DS division the road known as Kataragama road.

CHAPTER 4 - Transformations of Living Environments and Domestic Spatial Arrangements

A drastic change of living environments and domestic spatial arrangements could be found in many tsunamis affected coastal settlements. This chapter describes about such transformations, which occurred in two selected case studies in urban and suburban coastal areas of western and southern provinces.

4.1. Case Study 1- Egodaunya GN Division-Colombo District

Method

In the Egodaunya area, a layout survey of about 350 houses had been conducted. In order to create a more detailed survey, 23 relocated families had been selected. The houses of 12 of these families were located inside the new buffer zone, while the remaining 11 were outside the new buffer zone. During this spatial survey and analysis, data had been analyzed from two viewpoints: 1) local living environment organizations, and 2) domestic spatial arrangements and availability, over three different stages. These stages were categorized as, a) pre-tsunami layout b) post-tsunami layout (shortly after the disaster) c) post-tsunami layout (2.5 years after the disaster).

Initially, the local living environment organizations had been studied in an area covering about 0.5 km² and prepared three-stage maps to compare the changes at each stage, and to identify the amount of damage sustained by each housing type. A detailed study of the 23 selected cases had been conducted, categorizing them into two different housing types: 1) semi-permanent housing and 2) permanent housing, in order to ascertain the changes in domestic spatial arrangements and availability associated with the

reconstruction processes.

A line 100 m parallel to the coastline had been selected as the boundary for the study area based on the original (previous) buffer zone regulations.

The study area could be divided into two major sections based on the two sets of buffer zone regulations.

Area 1- 0 – 45 m (new buffer zone limitation)

Area 2 - 45 – 100 m (area belonging to previous buffer zone limitation only)

4.1.1. Pre-disaster Local Living Environment Organizations

The observations showed that 60% of the existing houses within the 100 m study area were type 1 (semi-permanent houses) while 40% were type 2 (permanent houses). (Table 4.1)

And such semi-permanent or permanent house could be a squatter camp according the location. All houses inside the buffer zone consider as squatter camps.

Table 4.1: Housing Types in Egodaunya Based on Structural Conditions (by author)

Housing Type	Category	Description
Type 1	Semi-permanent house (SPH) - 60%	Low quality construction material used. (Waste wood or low quality bricks and mixed cement used in construction.) Unstable structures without proper foundations.
Type 2	Permanent house (PH) - 40%	Long-term construction materials (bricks, cement and permanent roofing materials) used in construction. Stable structures with proper foundations.

4.1.1.1. Pre-disaster Housing Arrangement Layout

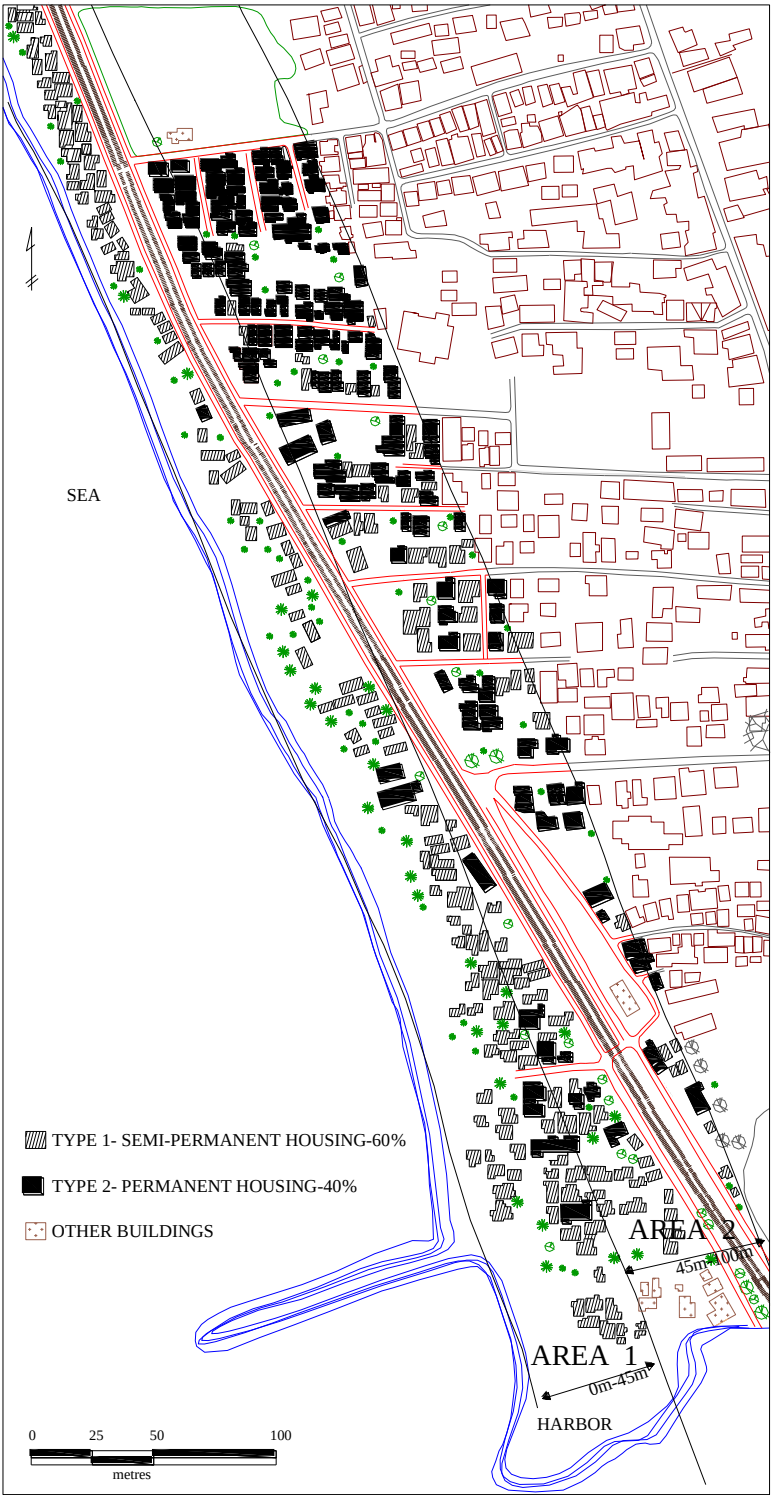


Fig.4.1: Pre-disaster Housing Layout in Egodaunya GN Division (by author)

4.1.2. Pre-disaster Domestic Spatial Arrangements

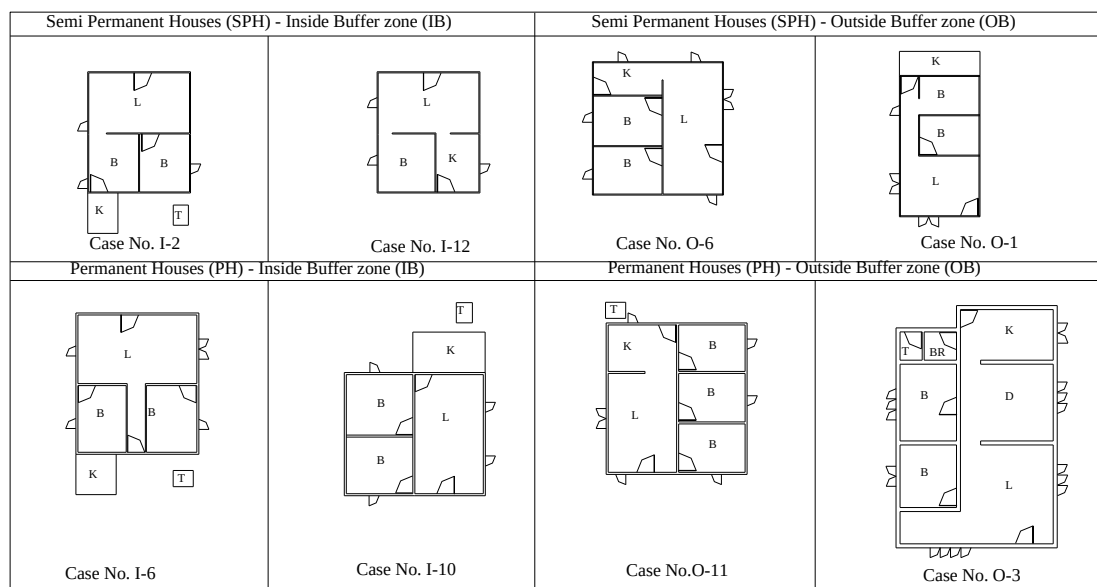


Fig.4.2: Domestic Spatial Arrangement of Selected Cases Inside and Outside the Buffer-zone at Egodaunya (by author)

A clear spatial utilization could be found in pre-disaster squatter camps (SP/PH) as well as other authorized coastal housings. But about 80% of houses inside the buffer zone shows a low household occupancy than standard level of 10m² (HHO-m²/person).

4.1.3. Post- disaster Local Living Environment Organizations

4.1.3.1. Post-disaster Housing Arrangement Layout-shortly after the tsunami

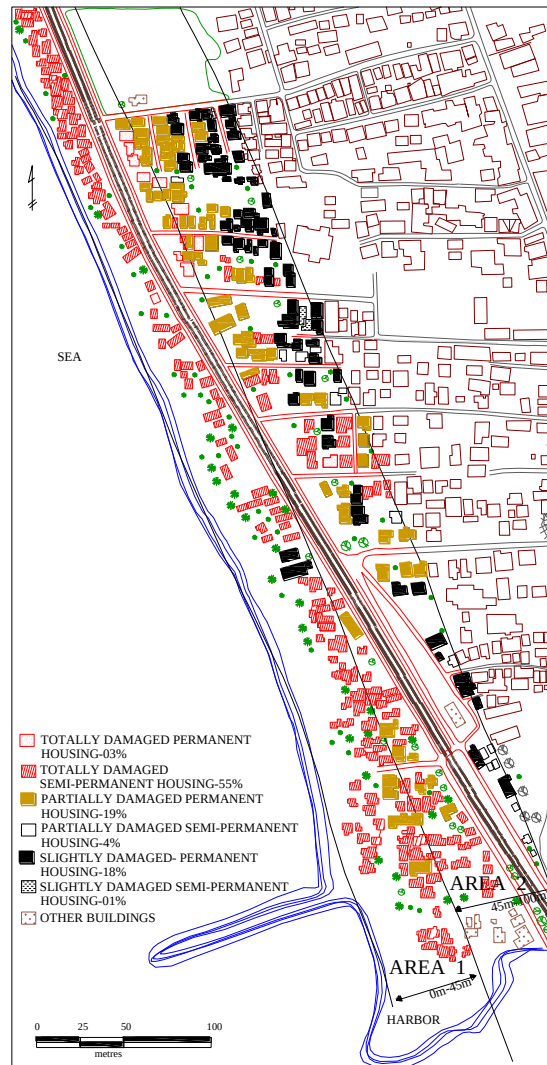


Fig.4.3: Affect and Housing Layout Shortly after the Tsunami Disaster at Egodaunya
(by author)

Table 4.2: Damage Level to the Egodaunya Housing Shortly after the Disaster
(by author)

Damage level	Semi-permanent Houses %	Permanent Houses %
Totally destroyed	55	03
Partially damaged	04	19
Slightly damaged	01	18

The level of damage to houses observed shortly after the disaster is shown in Table 4.2. and Fig.4.3

4.1.3.2. Post-disaster Housing Arrangement Layout-2.5 years after the tsunami

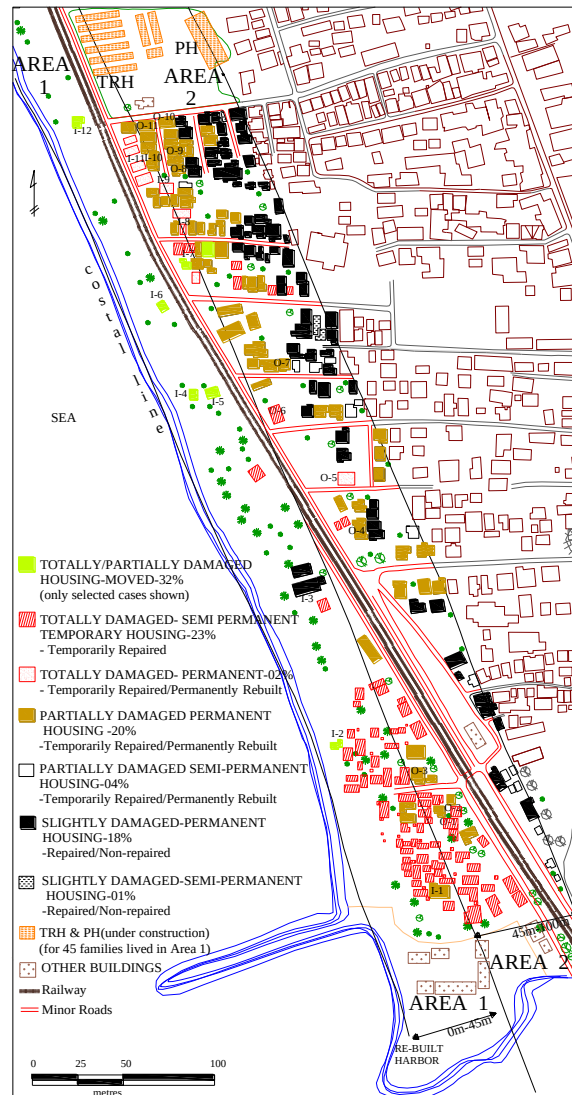


Fig.4.4: Affect and Housing Layout 2.5 years after the Tsunami Disaster at Egodaunya (by author)

Table 4.3: Current Housing Types in the Egodaunya Study Area (by author)

Housing Category	No of Houses %
Temporary housing - temporary repaired	25
Partially damaged housing - temporarily or permanently rebuilt	24
Slightly damaged housing - repaired or non-repaired	19

As shown in Table 4.3 and Fig.4.4, in this stage it could be identified three types of housing that designated as either semi-permanent or permanent before the disaster and located in the 0 m - 100 m area.

4.1.4. Post-disaster Domestic Spatial Arrangements

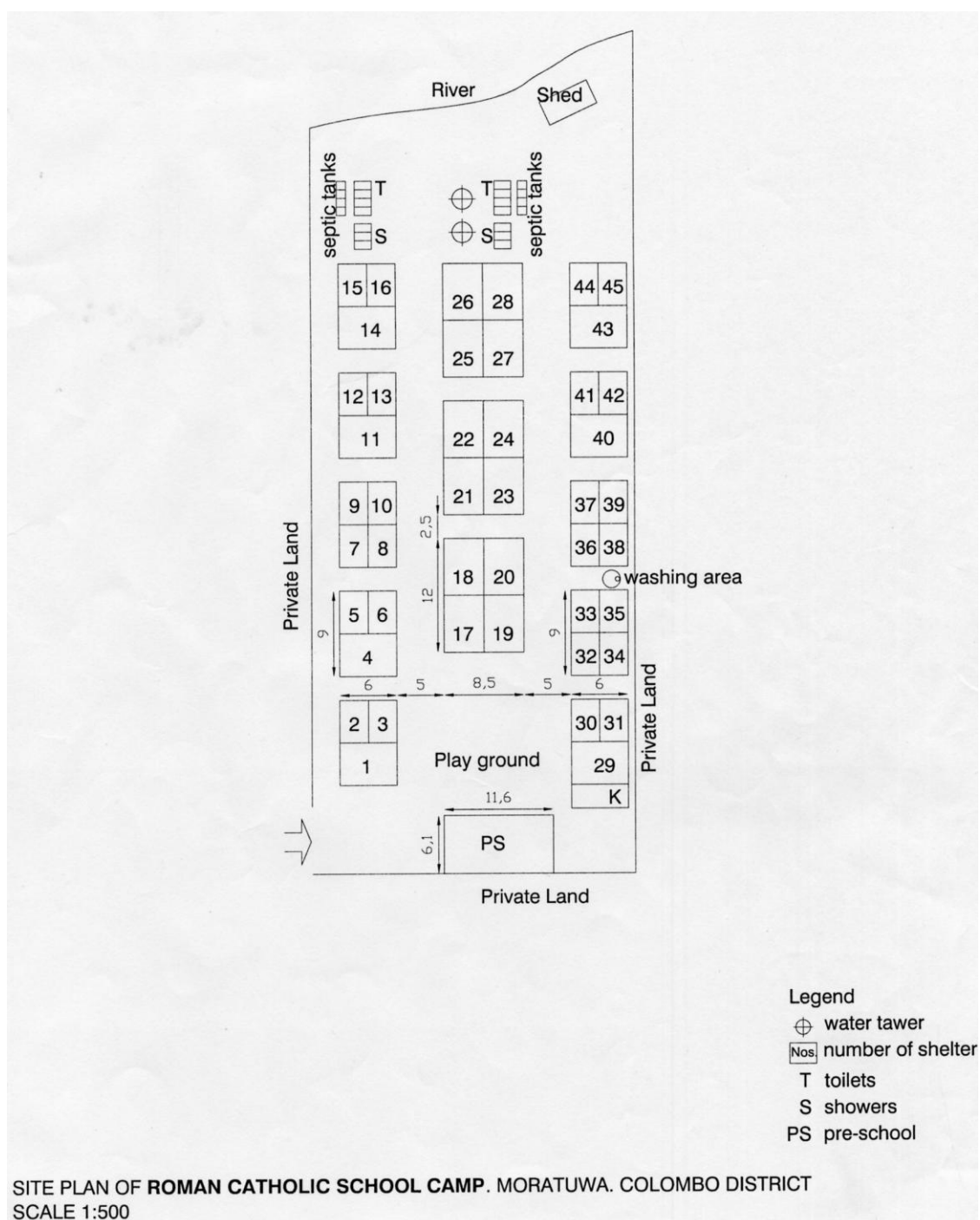


Fig.4.5: Housing Layout of IOM Transitional Camp-Roman Catholic School Site, for the Victims of Egodaunya

(Source; IOM-International Organization for Migrants)

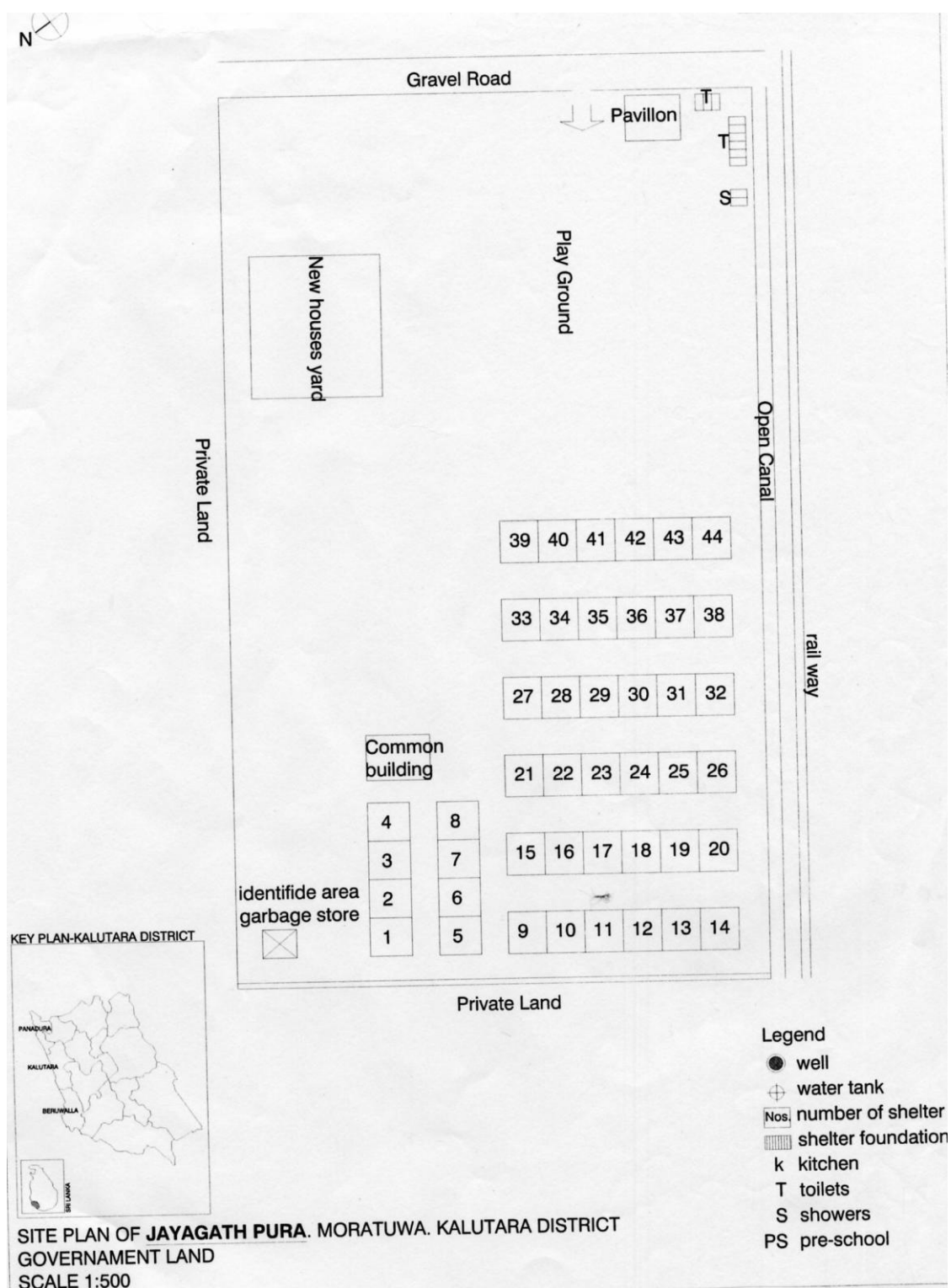


Fig.4.6: Housing Layout of IOM Transitional Camp -Jayagathpura for the Victims of Egodaunya

(Source; IOM-International Organization for Migrants)

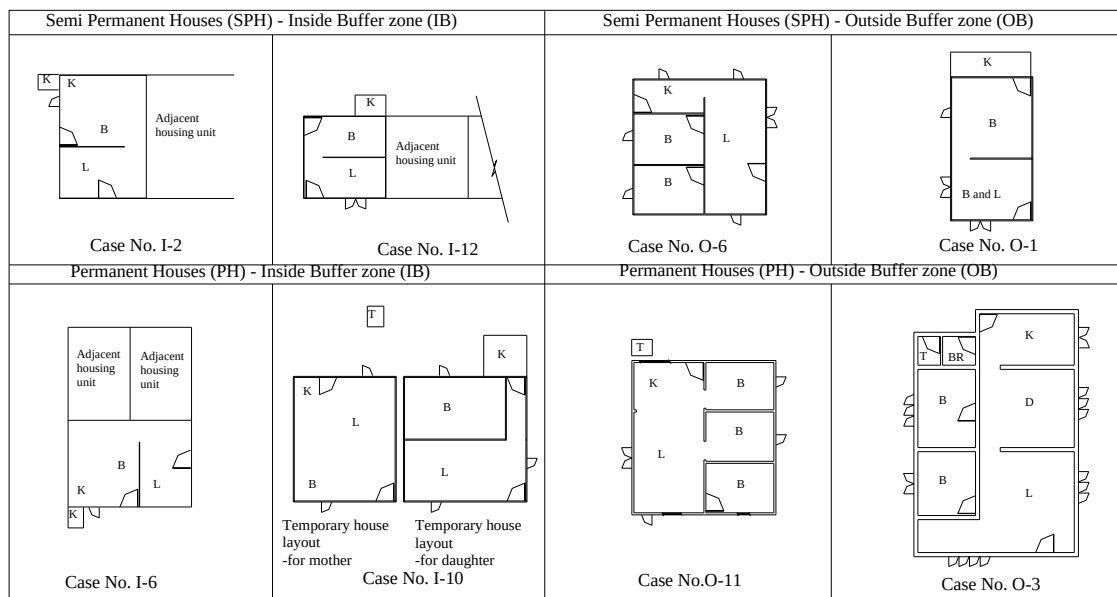


Fig.4.7: Domestic Spatial Arrangement of Selected Cases in Transitional Housing Camps, Inside and Outside Buffer-zone at Egodaunya (by author)

A spatial utilization could not be found in about 50-60% post disaster cases due to their residence in transitional houses or temporarily fixed shelters. At the same time household occupancy (HHO) also still less than the standard level.

4.1.5. Transformation of Local Living Environment



Fig.4.8: Coastal Housing Distribution and Living Environment Transformation of Egodaunya GN Division (by author)

After the Tsunami disaster, 33% of the community had relocated and 67% remained in Areas 1 and 2 (0 – 100 m). The investigation showed that most of the residents that moved were employed in sectors other than fishing, while the residents that remained were involved in the fishing industry. It could be found that community groups that should have relocated to new areas had built temporary houses on their original properties. The reasons for their reluctance to move included cases where the government grant for purchasing new land and building a house in urban areas was insufficient (LKR. 100,000 or 250,000), difficulties in finding another livelihood and unwillingness to settle in a completely different inland neighborhood.

About 60% or more of the homeowners/squatter camp owners inside Area 1 (0 - 45 m) inside the buffer zone had relocated to different sites, while 40% remained. This statistic highlights the largest remaining problem. Due to the shortage of urban land, the government and donor groups have been unable to find sufficient land to effectively relocate the affected community. As a result, 38% of the home owners in this community requested permission to stay on their original land or requested a grant that would be sufficient to purchase another permanent house sufficiently near the coast for them to continue their livelihood. Another 2% asked for extra grants that would compensate them for the actual value of the property they were being asked to vacate.

Many of the homeowners living inside Area 2 (45–100 m)/ previous buffer zone area were confused by the reduction of the buffer zone and were subsequently permitted to stay in their original homes. It could be determined that the progress of the recovery processes in Area 2 was also low due to the inability of many homeowners to provide adequate legal documents/deeds proving previous ownership, as well as the existence of confusion regarding the regulations accompanying the reduction of the buffer zone.

4.1.6. Transformation of Domestic Spatial Arrangements

Regarding the difference of floor area (DFA) of the 23 cases; 13 cases show negative values and difference of household occupancy (DHHO); 14 cases show negative values.

Table 4.4: Profile of Pre- and Post-disaster Coastal Housing of Egodaunya (by author)

Pre-Settlement (PS)	Housing type (HT)	Re-established Site (RS)	Transitional Process (TP)	FS	F A	OFA (m ²)	NFA (m ²)	DFA (m ²) NFA - OFA	OHHS person	NHHS person	OHHO (m ² /person)	NHHO (m ² /person)	DHHO (m ²) NHHO - OHHO
I-1	PH	OB	PH— <u>TRH</u> ---LPH	SLG	F	55	24	-31	05	06	11.0	4.0	-7.0
I-2	SPH	OB	SPH— <u>TRH</u> ---LPH	SLG	F	34	24	-10	05	05	6.8	4.8	-2.0
I-3	PH	IB	PH—Other— <u>PH</u>	OS	-	65	65	00	05	05	13.0	13.0	0.0
I-4	SPH	OB	SPH— <u>TRH</u> ---LPH	SLG	F	48	24	-24	02	06	24.0	4.0	-20.0
I-5	SPH	OB	SPH— <u>TRH</u>	OS	-	32	24	-08	04	06	8.0	4.0	-4.0
I-6	PH	OB	PH— <u>TRH</u> ---LPH	SLG	F	32	24	-08	04	04	8.0	6.0	-2.0
I-7	SPH	IB	SPH—Other— <u>TH</u>	OS	-	40	20	-20	05	05	8.0	4.0	-4.0
I-8	SPH	IB	SPH—Other— <u>TH</u>	NGO	P	46	46	00	04	06	11.5	7.6	-3.9
I-9	PH	IB	PH—Other— <u>TH</u>	OS	-	48	28	-20	07	07	6.8	4.0	-2.8
I-10	PH	IB	PH—Other— <u>TH</u>	OS	-	58	31	-27	06	01	9.6	31.0	21.4
I-11	PH	IB	PH—Other— <u>TH</u>	OS	-	40	25	-15	05	05	8.0	5.0	-3.0
I-12	SPH	IB	SPH— <u>TRH</u> ---LPH	INGO	F	24	18	-06	06	06	4.0	3.0	-1.0
O-1	SPH	OB	SPH—Other— <u>TH</u>	OS	-	30	30	00	05	05	6.0	6.0	0.0
O-2	SPH	OB	SPH—Other— <u>TH</u>	OA	P	30	20	-10	05	04	6.0	5.0	-1.0
O-3	PH	OB	PH—Other— <u>PH</u>	OS	-	62	62	00	06	06	10.3	10.3	0.0
O-4	PH	OB	PH—Other— <u>TH</u>	OA	P	40	30	-10	05	04	8.0	7.5	-0.5
O-5	PH	OB	PH—Other— <u>PH</u>	OA	F	60	70	10	05	05	12.0	14.0	2.0
O-6	SPH	OB	SPH—Other— <u>TH</u>	OS	-	38	34	-04	06	07	6.3	4.8	-1.5
O-7	PH	OB	PH—Other— <u>PH</u>	OA	F	45	45	00	05	05	9.0	9.0	0.0
O-8	PH	OB	PH—Other— <u>TH</u>	OS	-	40	40	00	04	05	10.0	8.0	-2.0
O-9	PH	OB	PH—Other— <u>PH</u>	INGO	F	50	50	00	03	03	16.6	16.6	0.0
O-10	PH	OB	PH— <u>TRH</u> — <u>PH</u>	SLG	F	54	54	00	03	03	18	18	0.0
O-11	PH	OB	PH—Other---PH	OS	-	56	-	-	08	-	8.0	-	-
OFA	Original Floor Area		OHHO	Original Household Occupancy		FS	Funding Source		FA	Funding Amount			
NFA	New Floor Area		NHHO	New Household Occupancy		OA	Other Assistance		OS	Owner Savings			
DFA	Difference of Floor Area		DHHO	Difference of Household Occupancy		F	Fully		P	Partially			
OHHS	Original Household Size		NGO	Non-Government Organization									
NHHS	New Household Size		INGO	International Non-Government Organizations									
IB	Inside Buffer zone		SLG	Sri Lanka Government									
OB	Outside Buffer zone		XXX	Current Residence									

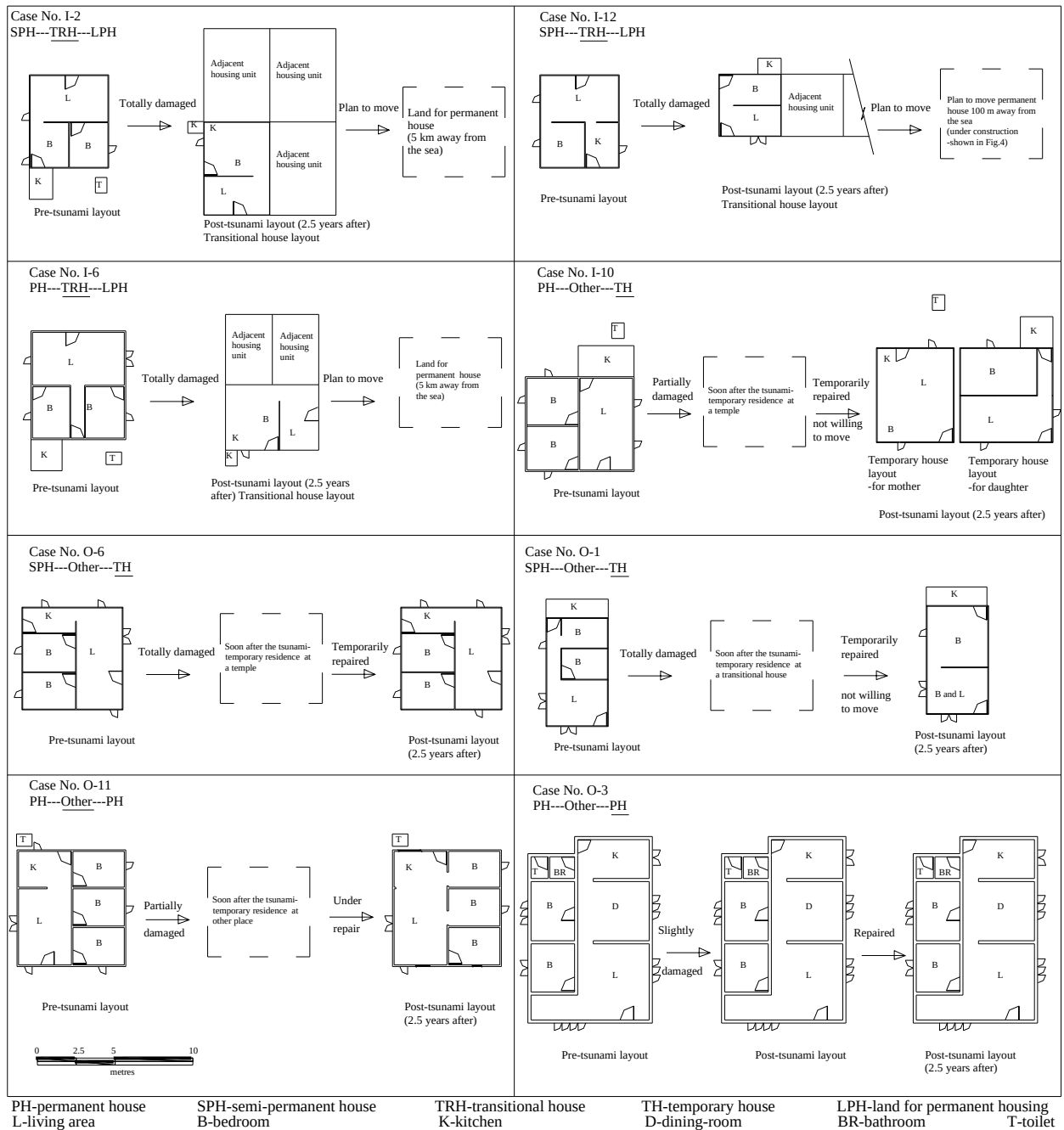


Fig.4.9: Transformation of Domestic Spatial Arrangements and Present Situation of Egodaunya (by author)

4.1.7. Implication on Living space

4.1.7.1. Difference of Floor Area(m²)

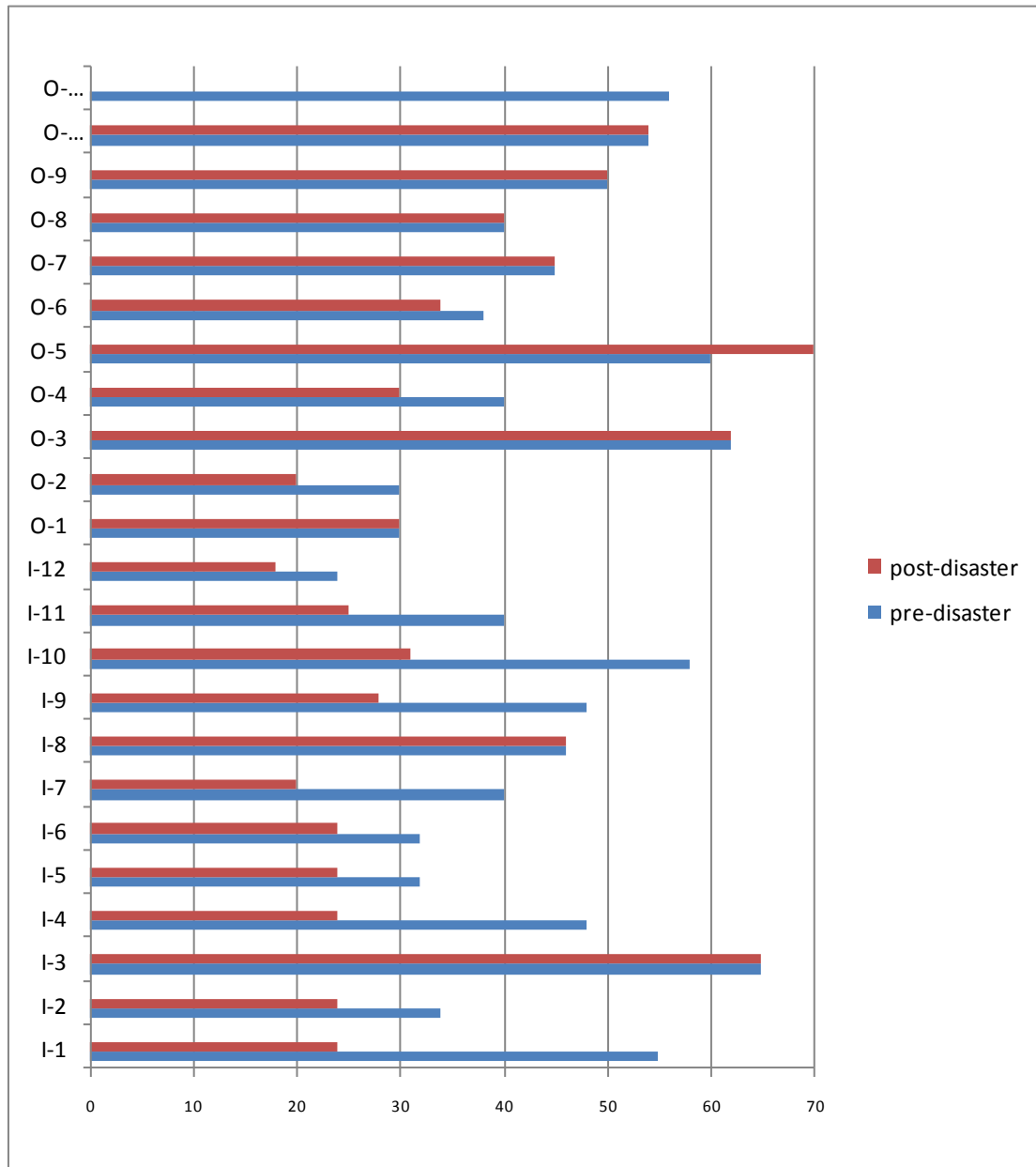


Fig.4.10: Difference of Floor Area Ratio in Pre and Post-disaster Situations of Egodaunya (by author)

Regarding the difference of floor area (DFA) of the 23 cases; 13 cases show negative values, 1 case a positive value and 8 cases no differences.

4.1.7.2. Difference of Household Occupancy-DHHO (m²/person)

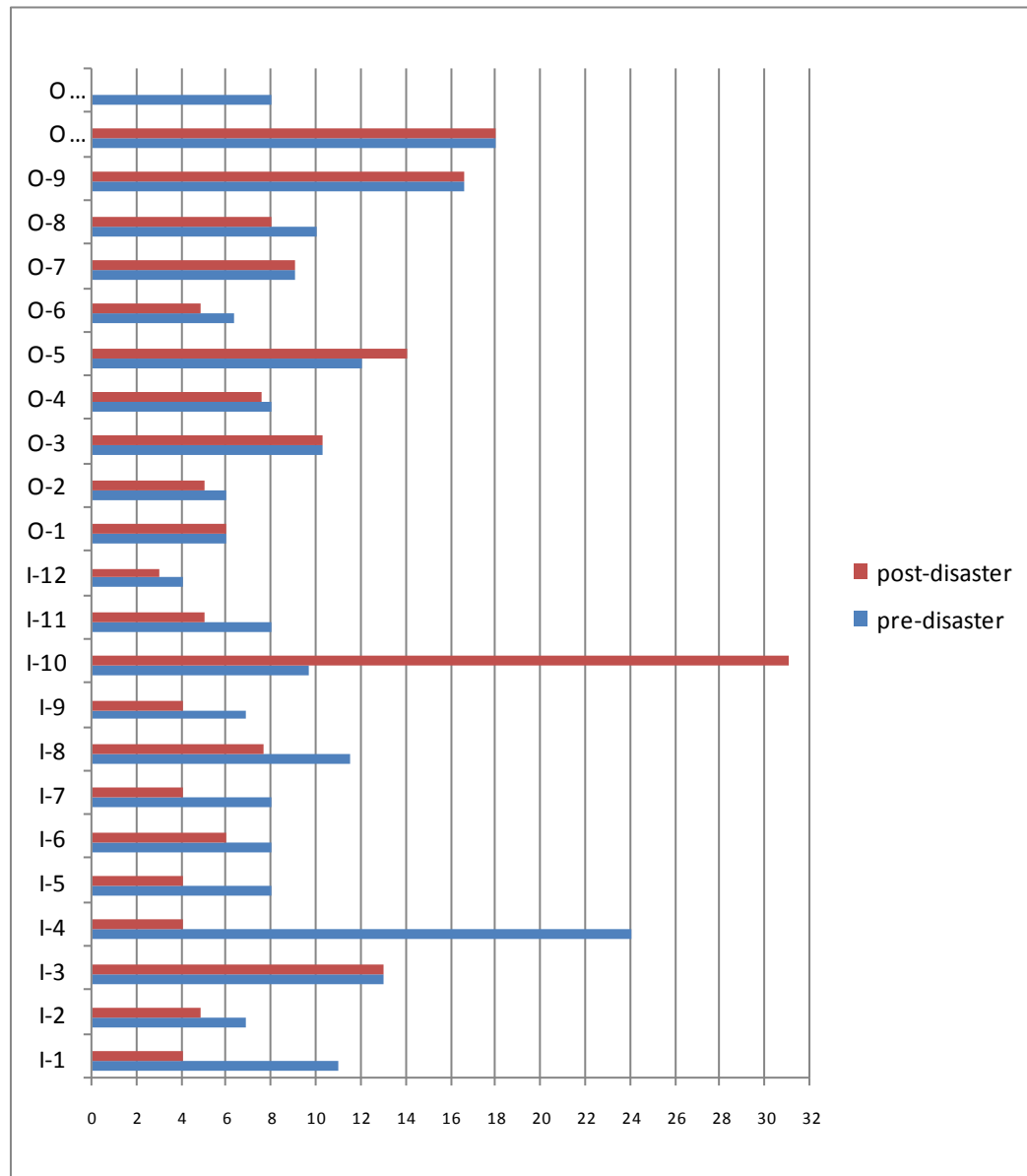


Fig.4.11: Difference of Household Occupancy Pre and Post-disaster Situations of Egodaunya (by author)

Regarding the difference of household occupancy (DHHO) of the 23 cases; 14 cases show negative values, 6 cases positive values and 2 cases no differences.

4.1.8. Housing Relocation/Resettlement and Domestic Spatial Arrangements and Recovery

It could be found a drastic change of housing location and domestic spatial arrangements and availability for both semi-permanent and permanent housing in Area 1. About 60% of the families had moved from their original houses inside the buffer zone and about 25% of those had already moved to relocation sites, while 75% of those (e.g. Case numbers I-2, I-12, and I-6) still lived in small transition houses. About 40% still lived in temporary houses inside the buffer zone. (e.g. Case number I-10)

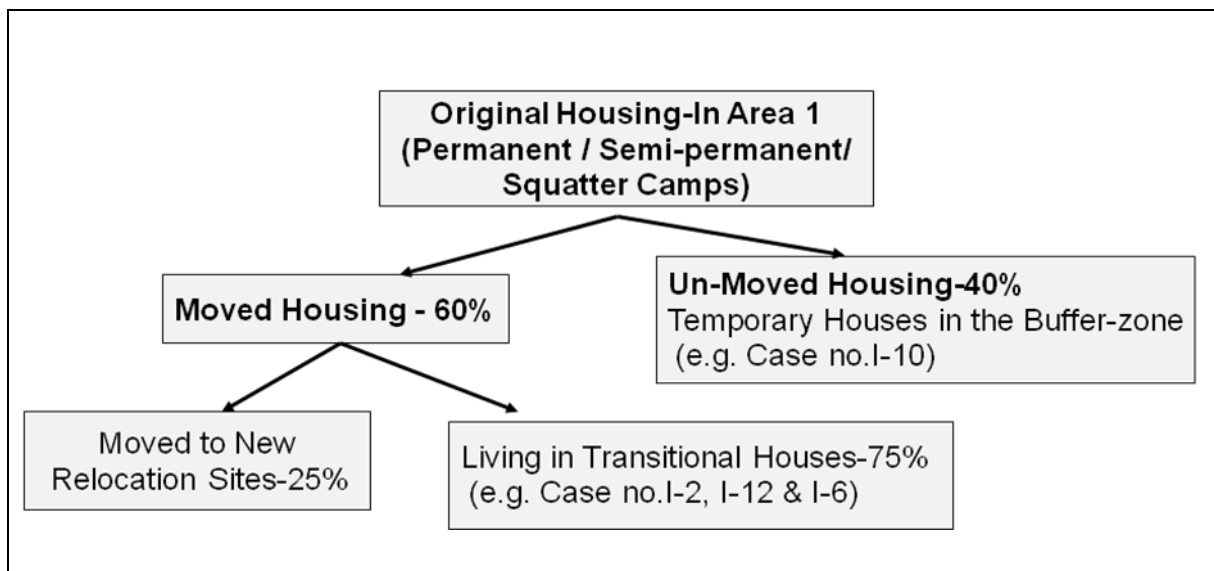


Fig.4.12: Movement of Original Housing in Egodaunya (by author)

Furthermore, in the semi-permanent housing in the area of 45 m – 100 m, it could be found some changes in the domestic spatial arrangements and availability (e.g. Case numbers O-6 and O-1) and fewer changes in permanent housing. (e.g. Case Numbers O-11 and O-3).

Although only two different types of housing reconstruction programs are currently in progress, it is difficult to determine clear transition processes because each individual case is different. It could, however, ascertain several transition processes types, as well as problems being faced by each community group.

In case I-6 the permanent original house/squatter camp inside the buffer zone was totally damaged by the tsunami, and the residents were asked to move to a transition house 3 - 4 km away. Due to their low income, the family (which worked in the fishing industry) had been given a full grant for a new permanent house by the Sri Lankan government. Yet, because of the area's high land value, the residents could buy only a land without a permanent house was about 6 km away from their original house. As a result, they continue residing in their transition house while working to handle their other livelihood problems (Fig.4.9).

In case O-1, the semi-permanent original house that was located outside the buffer zone was totally damaged by the tsunami. After residing for a short period in a transition house, the family moved back into a temporary house built on the original site. Furthermore, since they were unable to prove ownership of the property through a legal deed, they could not obtain a proper grant to allow them to build a permanent house, and thus continue residing in the temporary structure (Fig.4.9).

Cases like these have resulted in an increase in temporary houses built in the area, which can be expected to extend the shanty house problem into the future.

As for domestic spatial availability also, it could be found a clear change in pre- and post-disaster situations.

A difference of floor area (DFA) of about 57% showed negative value and 35% unchanged (Table 4.4 and Fig.4.9).

Regarding the OHHO about 65% of pre-disaster cases showed values under the standard level of $10\text{m}^2/\text{person}$ has increased up to 77% by the post disaster reconstruction and resettlement programs. And a difference of household occupancy (DHHO) of about 61%, indicate negative values (Table 4.4 and Fig.4.9).

These statics imply a decrease in the post disaster housing and community facilities available for use.

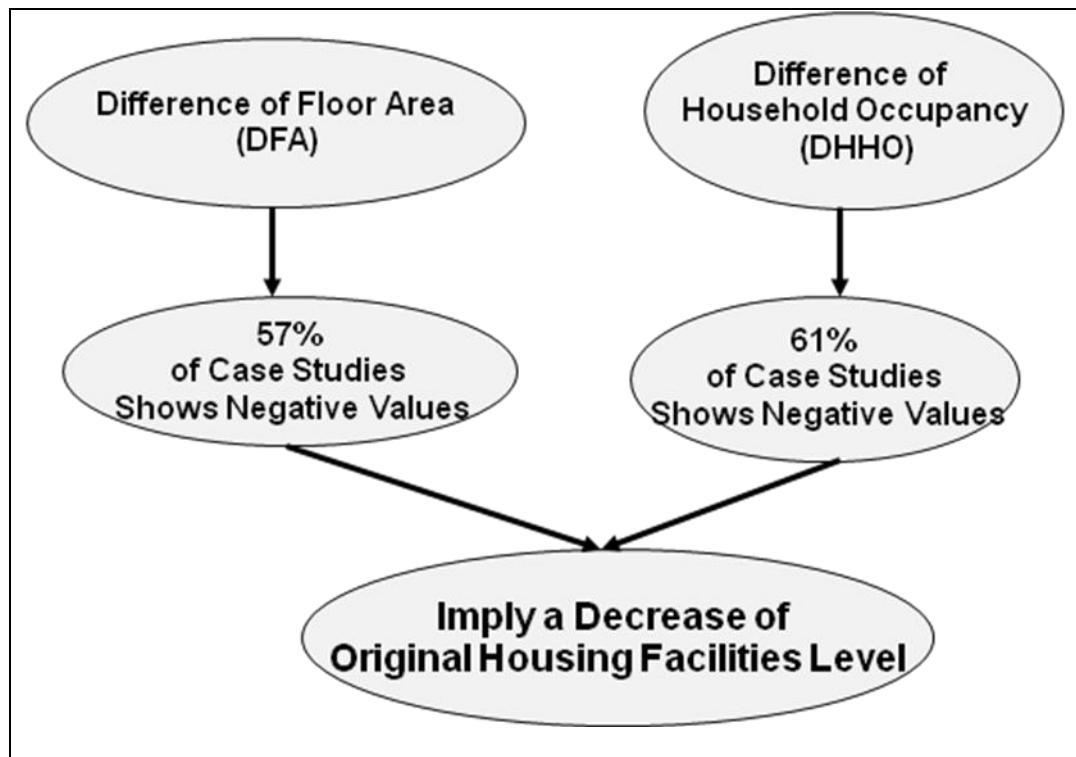


Fig.4.13: Implication on the Original Housing Facilities Level in Egodaunya

(by author)

Even though 2.5 years have passed since the tsunami, reconstruction and recovery processes are not yet fully in place. About 70% of the victims in Area 1 and Area 2 still live in transition houses or in temporary shelters that provide less floor area and low household occupancy. This indicates that the resettlement and relocation programs have implicated domestic spatial arrangements and availability.

Because relocation programs are organized based on the availability of inexpensive land in the area, and do not consider the livelihood or original communities order of the families being relocated, we found a very low rate of community integration among new members of the permanent housing environment. Because of this, some of the relocated residents continue to maintain an additional temporary house on their previous land inside the buffer zone for livelihood purposes, or otherwise spend the majority of their time within their previous neighborhoods. These kinds of problems pass the coastal shanty house/squatter camp problem on to the future and show the necessity of appropriate post disaster reconstruction and planning method for urban areas.

4.2. Case Study 2-Dewata GN Division-Galle District

Method

In the Dewata area, a layout survey of 215 houses/buildings had been conducted. In order to create a more detailed survey, 10 affected families had been selected. Those houses were located inside the previous buffer zone (100m) or close to the boundary line. But eight cases out of ten were squatter camps and necessitated to relocate in another settlement from before the tsunami occurred. During this spatial survey and analysis also, data had been analyzed from two viewpoints: 1) local living environment organizations, and 2) domestic spatial arrangements and availability, over three different stages. These stages were categorized as, a) pre-tsunami layout b) post-tsunami layout (shortly after the disaster) c) post-tsunami layout (2.5 years after the disaster).

Initially, the local living environment organizations had been studied in an area covering about 0.5 km² and prepared three-stage maps to compare the changes at each stage, and to identify the amount of damage sustained by each housing type. A detailed study of the 10 selected cases had been conducted, categorizing them into two different housing types: 1) semi-permanent housing or squatter camps and, 2) permanent housing or building, in order to ascertain the changes in domestic spatial arrangements and availability associated with the reconstruction processes.

A line 100 m parallel to the coastline had been selected as the boundary for the study area based on the original (previous) buffer zone regulations.

The study area could be divided into two major sections based on the two sets of buffer zone regulations.

Area 1 - 0 – 35 m (new buffer zone limitation)

Area 2 – 35 – 100 m (area belonging to previous buffer zone limitation only)

4.2.1. Pre-disaster Local Living Environment Organizations

Table 4.5: Housing Types in Dewata Based on Structural Conditions

(by author)

Housing Type	Category	Description
Type 1	Semi-permanent house (SPH) or Squatter camp (SC) -33%	Low quality construction material used. (Waste wood or low quality bricks and mixed cement used in construction.) Unstable structures without proper foundations.
Type 2	Permanent house or building (PH) -67%	Long-term construction materials (bricks, cement and permanent roofing materials) used in construction. Stable structures with proper foundations.

In the Dewata area it could be identified mainly two housing types such as permanent houses and squatter camps. Most of the existed squatter camps were either sides of the railway line. The observations showed that about 33% of the existing houses within the 100 m study area were type 1 (semi-permanent houses/ squatter camps) while 67% were type 2 (permanent houses or buildings) (Table 4.6)

4.2.1.1. Pre-disaster Housing/building Arrangement Layout



Fig.4.14: Pre-disaster Housing/building Layout at Dewata GN Division (by author)

4.2.2. Pre-disaster Domestic Spatial Arrangements

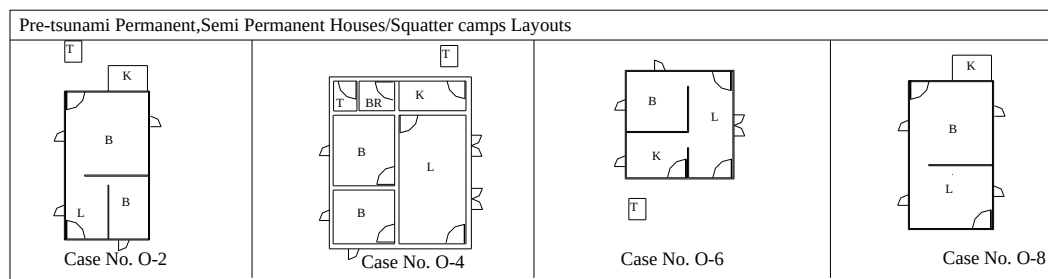


Fig.4.15: Domestic Spatial Arrangement of Selected Cases Inside and Outside Buffer-zone at Dewata (by author)

A clear spatial utilization could be found in pre-disaster squatter camps (semi-permanent/permanent) as well as other authorized coastal housings. But about 80% selected cases shows a low household occupancy than standard level of 10m^2 (HHO- m^2/person). (Fig.4.15)

4.2.3. Post- disaster Local Living Environments Organization

4.2.3.1. Post-disaster Housing Arrangement Layout-shortly after the tsunami

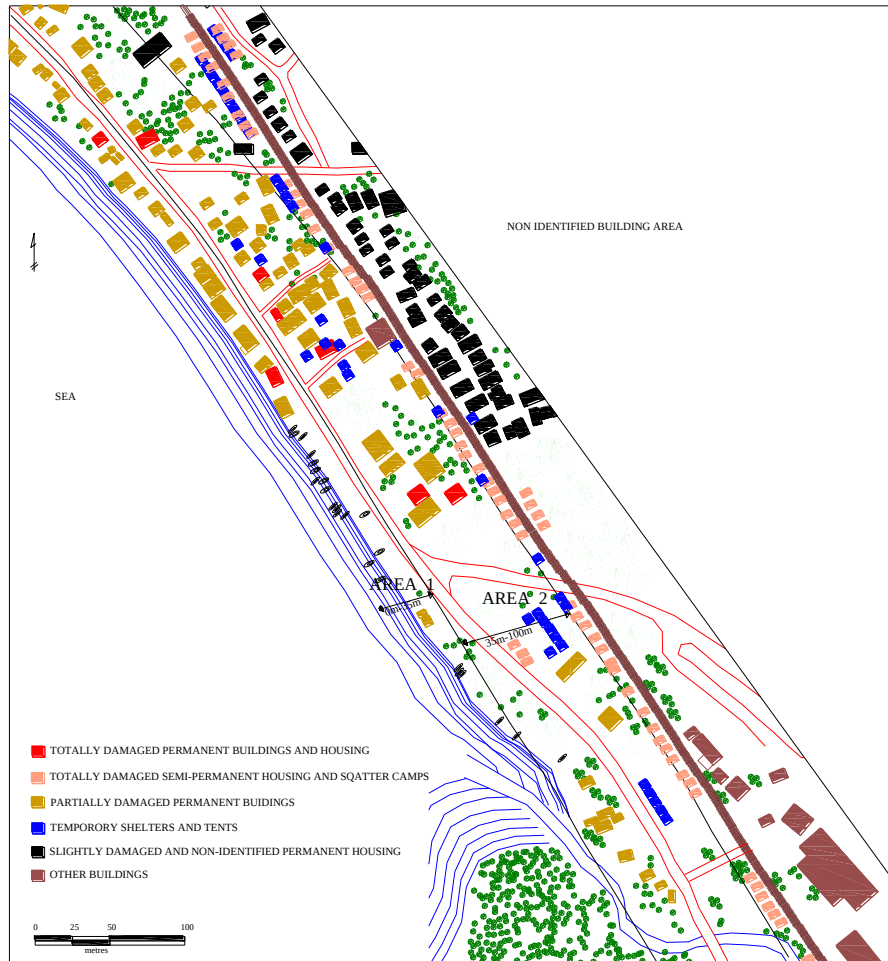


Fig.4.16: Affect and Housing Layout Shortly after the Tsunami Disaster at Dewata
(by author)

Table 4.6: Damage Level to the Dewata Housing Shortly after the Disaster (by author)

Damage level	Semi-permanent Houses (SPH) or Squatter camps (SC) %	Permanent Houses (PH) /buildings %
Totally destroyed	33	4
Partially damaged	-	40
Slightly damaged and Non-identified buildings	-	23

The level of damage to houses observed shortly after the disaster is shown in Table 4.6 and Fig.4.16. It could be found 17% of newly built temporary shelters and tents in the area shortly after the tsunami.

4.2.3.2. Post-tsunami Housing Arrangement Layout-2.5 years after the tsunami

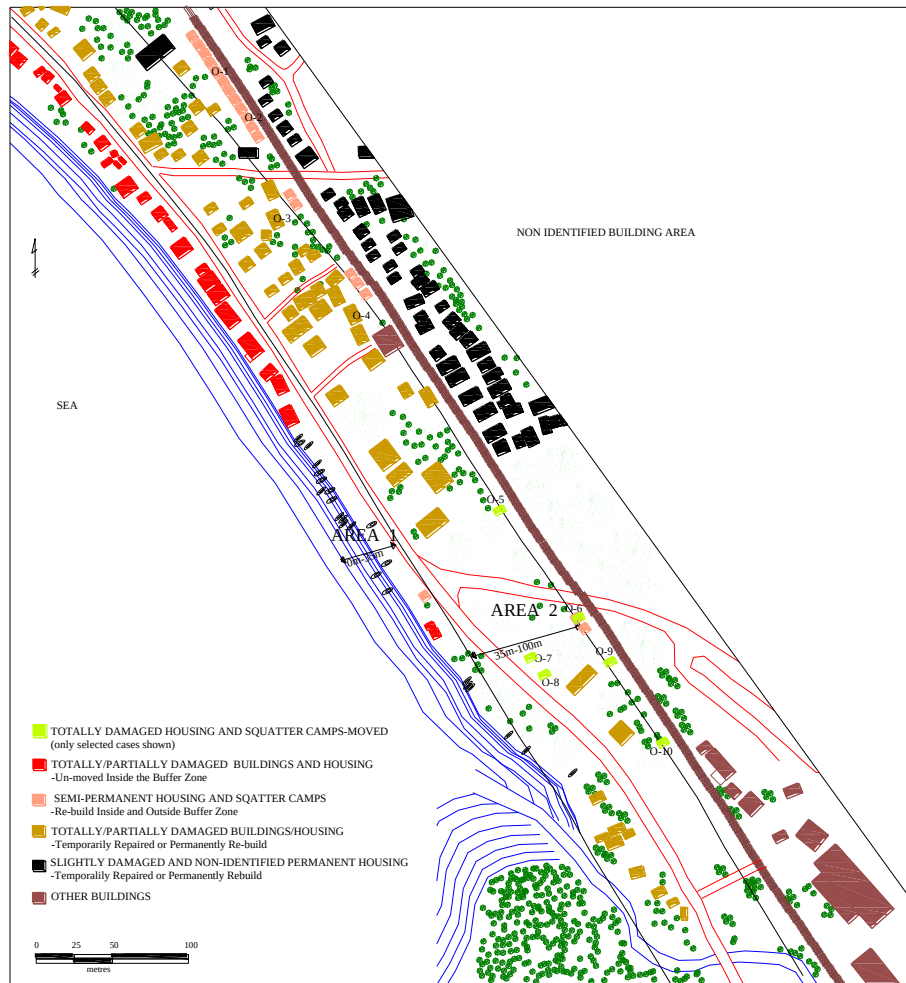


Fig.4.17: Affect and Housing Layout 2.5 years after the Tsunami Disaster of Dewata (by author)

Table 4.7: Current Housing Types in the Dewata Study Area (by author)

Housing Category	No of Houses %
Squatter Camps-Temporary housing	9
Totally/Partially damaged housing- temporarily or permanently rebuilt	28
Slightly damaged housing – Temporarily repaired or permanently rebuild	24

As shown in Table 4.7 and Fig.4.17, in this stage it could be identified three types of housing that designated as either squatter camps/semi-permanent or permanent before the disaster and located in the 0 m - 100 m area.

4.2.3.3. Post-disaster Resettlement

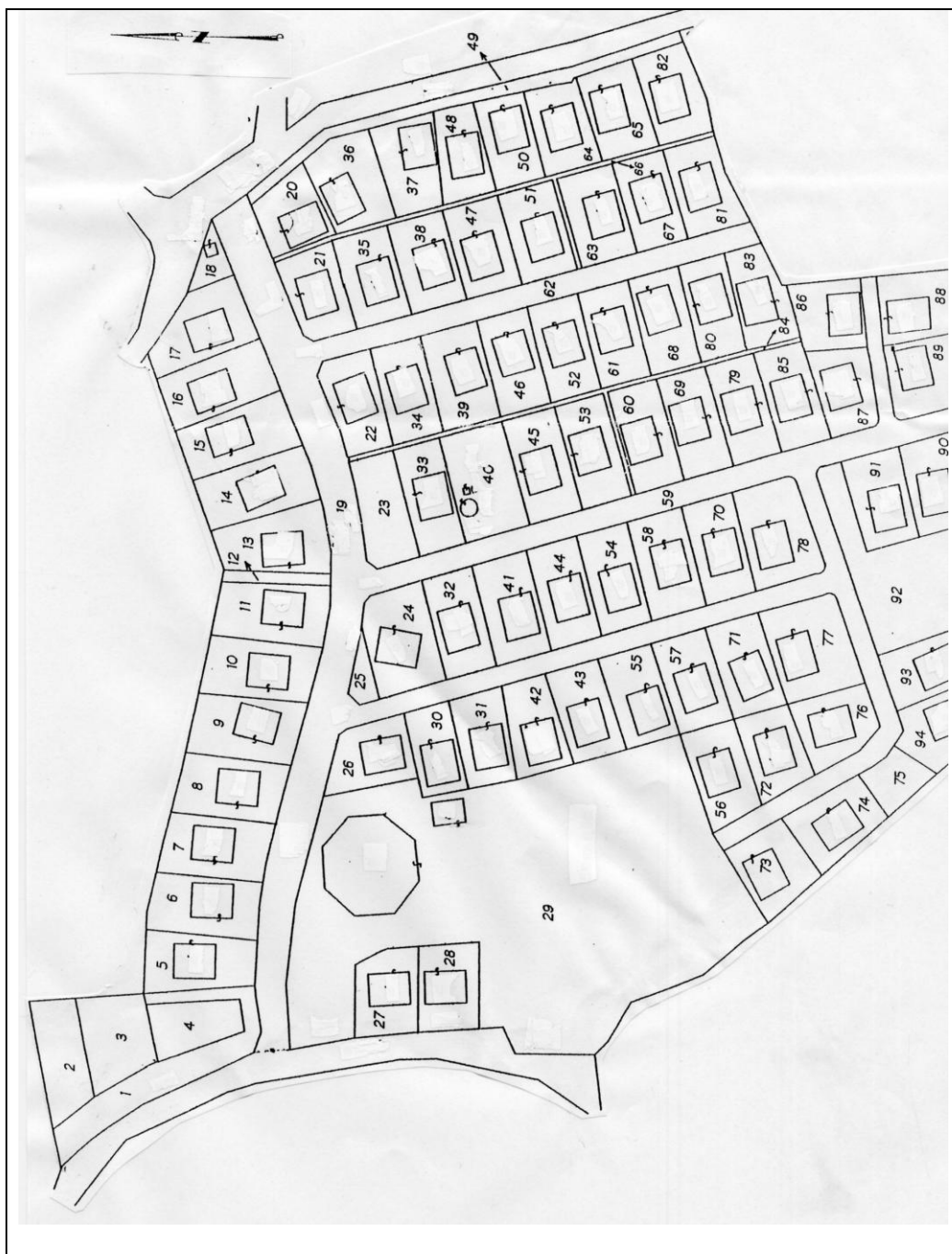


Fig.4.18: Housing Layout of Walahanduwa-Salsburg Village Permanent Housing Settlement (Source; UDA-Urban Development Authority)

About 45% of the beneficiaries of Walahanduwa- Salsburg village, Permanent Housing Settlement are from Dewata GN division.

4.2.4. Post-disaster Domestic Spatial Arrangements

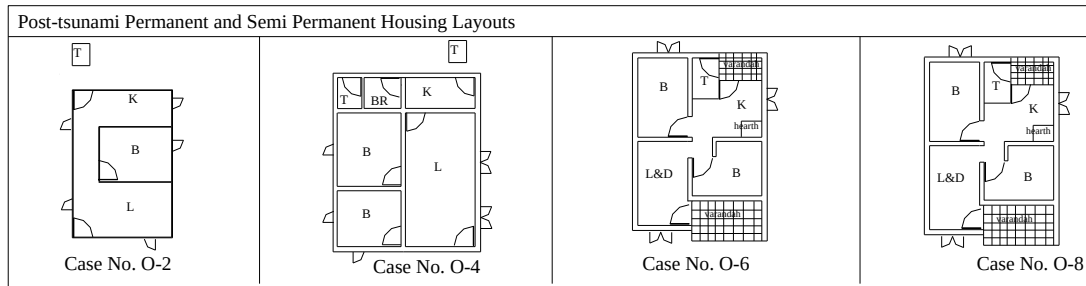


Fig.4.19: Domestic Spatial Arrangement of Selected Cases in Permanent Housing Settlements and Squatter Camps Outside the Buffer-zone (by author)

A spatial utilization could be found in about 90% post disaster cases due to their settling in permanent housing villages or rebuilding of the damage properties. The household occupancy (HHO) is in the standard level of about 80% of the observed cases (Fig.4.19).

4.2.4.1. Details of a Permanent Housing Unit (ex. Case No. O-6 and Case No. O-8)

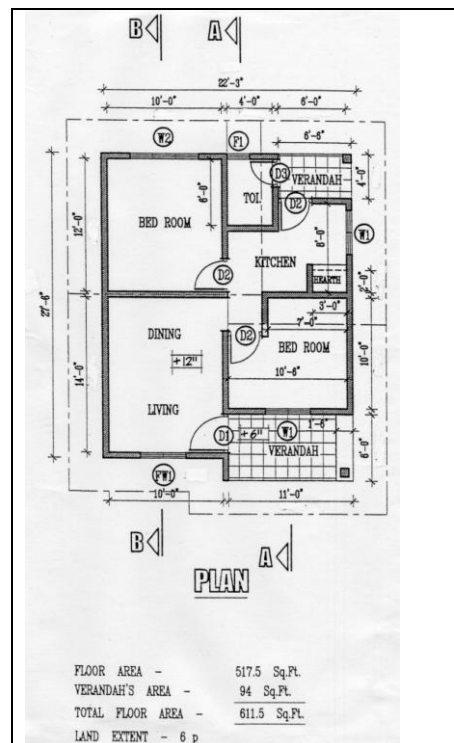


Fig.4.20: Plan of a Permanent House of Walahanduwa-Salsberg Village Permanent Housing Settlement (Source: Urban Development Authority)

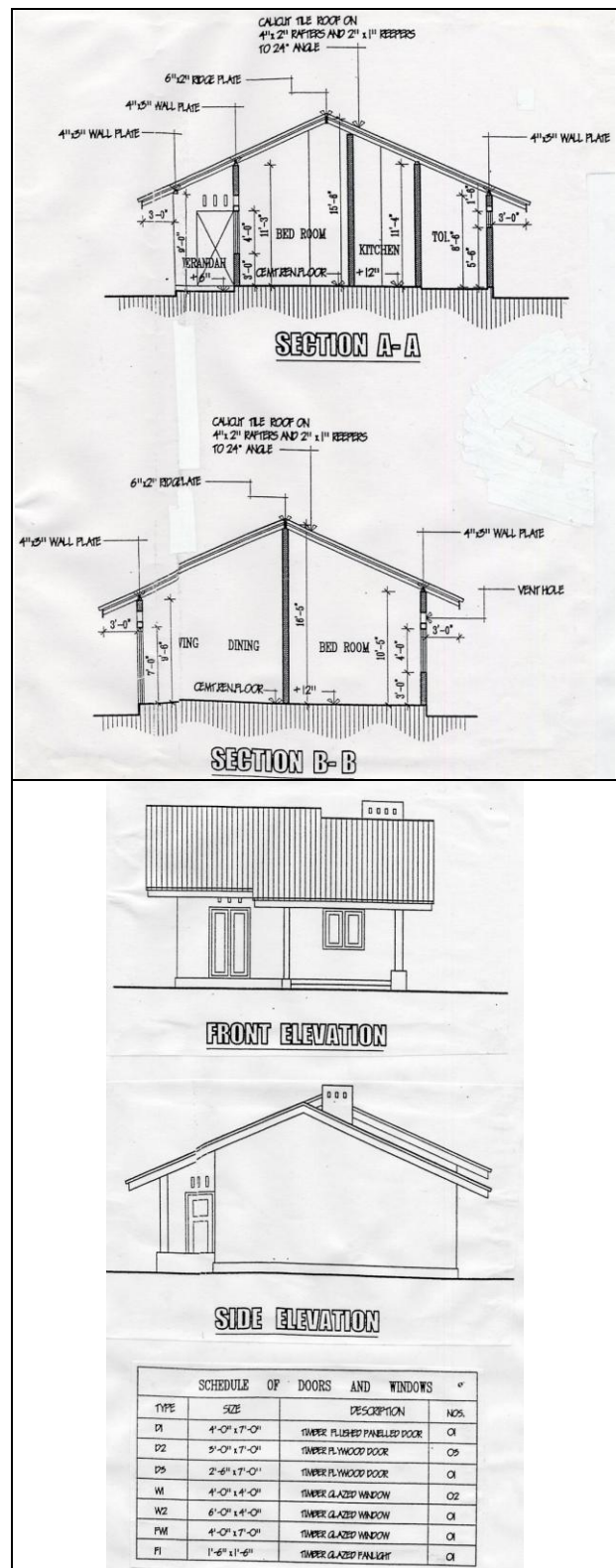


Fig.4.21: Sections and Elevations of a House of Walahanduwa-Salsberg Village
Permanent Housing Settlement (Source: Urban Development Authority)

4.2.5. Transformation of Local Living Environment

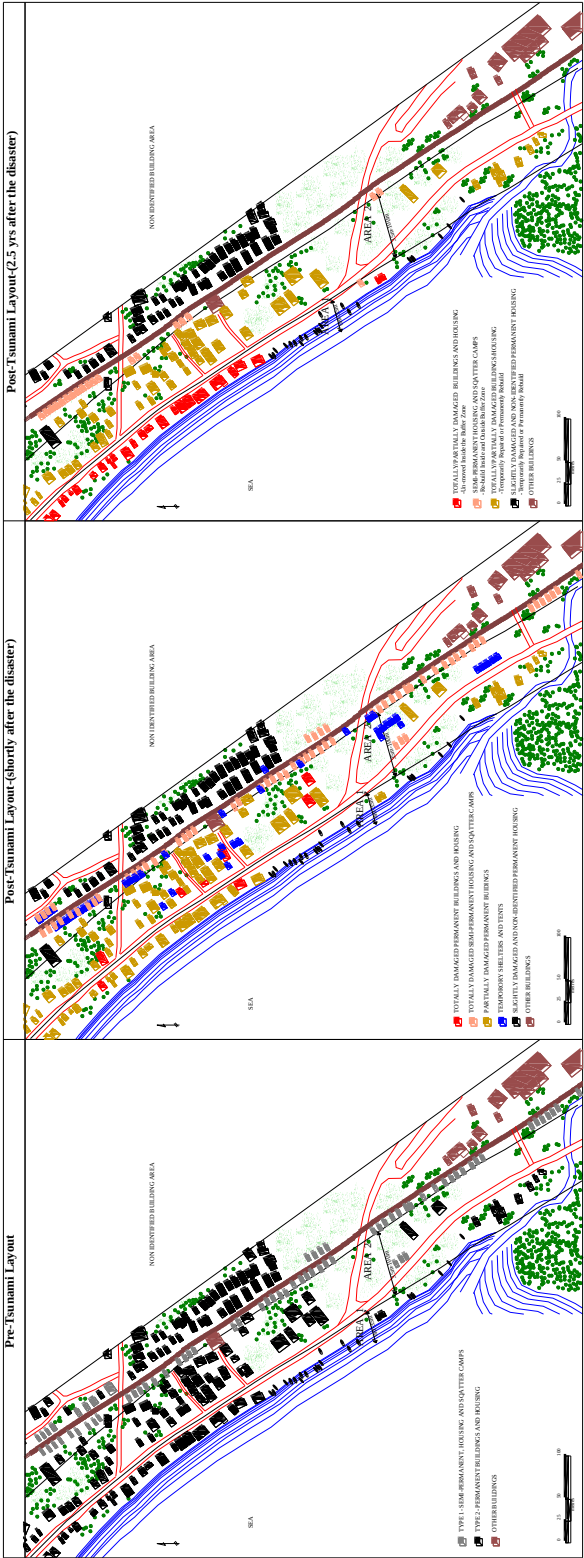


Fig.4.22: Coastal Housing Distribution and Living Environment Transformation of Dewata GN Division (by author)

It could be found problems of squatter camps mainly in the Railway Department reservations in Dewata GN division. Due to the affect of the Tsunami disaster, 26% of the community had relocated in different resettlement sites and 74% reconstructed in the original location in Areas 1 and 2 (0 – 100 m). The investigation showed that 89% of the residents that moved were residing in squatter camps. And 30% of the beneficiaries of Walahandoowa from Dewata area are the once who were living in such squatter camps.

Although many of them were employed in fishing sector had the necessity of legal housing. It could be found that some community groups among those who relocated to new permanent housing settlements had built temporary houses on their original properties and continuing their livelihood related to fishing industry which shows a reappearance of problem of squatter camps in Dewata area. And it could be identified a community group who was not beneficiary of permanent housing, had been rebuilt their original semi-permanent squatter camps in the Railway Department reservations by the grant from a NGO.

About 13% of housing and buildings still in the buffer zone and the reasons for their reluctance to move included cases where the government grant for purchasing new land and building a house or restart a business in urban areas was insufficient (LKR. 100,000 or 250,000), difficulties in finding another livelihood and unwillingness to settle in a completely different inland neighborhood. This statistic highlights the remaining problem at the present. Due to the shortage of urban land, the government and donor groups have been unable to find sufficient land to effectively relocate such affected community groups along the main road from Colombo capital.

Although many of the home/building owners living inside Area 2 (35 – 100 m), or the area within the previous buffer zone, were confused by the revision of the buffer zone but later it could be found a certain progress of the recovery processes.

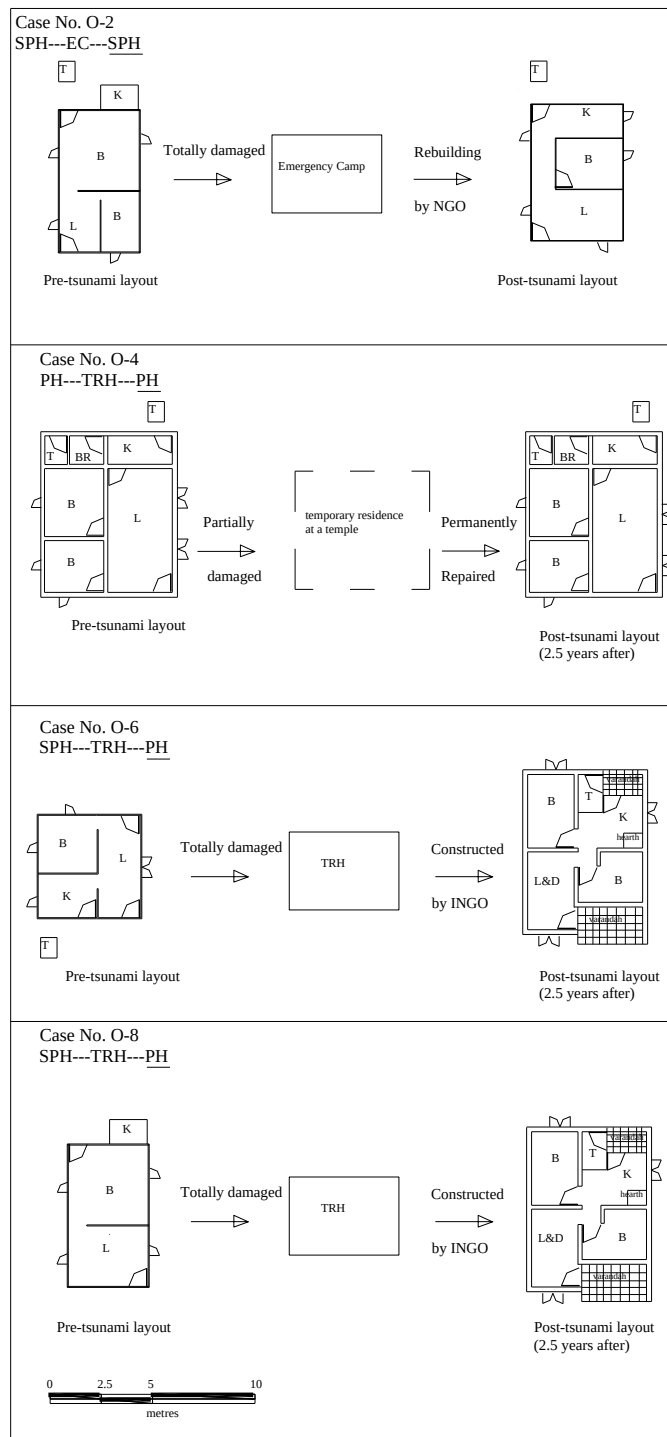
By the relocation/settlement programs it could be found a clear reduction of the squatter camps in Dewata area.

4.2.6. Transformation of Domestic Spatial Arrangements

Table 4.8: Profile of Pre- and Post-Disaster Coastal Housing of Dewata (by author)

Pre-Settle ment (PS)	Housin g type (HT)	Re-establi shed Site (RS)	Transitional Process (TP)	FS	F A	OFA (m ²)	NFA (m ²)	DFA (m ²) NFA - OFA	OHHS person	NHHS person	OHHS (m ² /pe rson)	NHHS (m ² /pe rson)	DHHS (m ²) NHHS - OHHS	
O-1	SPH	OB	SPH—EC— <u>SPH</u>	NGO	P	30	30	00	05	05	6	6	0.0	
O-2	SPH	OB	SPH—EC— <u>SPH</u>	NGO	P	30	30	00	06	04	5	7.5	2.5	
O-3	PH	OB	PH—Other— <u>PH</u>	SLG	P	50	50	00	04	03	12.5	16.6	4.1	
O-4	PH	OB	PH—Other— <u>PH</u>	SLG	P	55	55	00	05	04	11.0	13.7	2.7	
O-5	SPH	OB	SPH—TRH— <u>PH</u>	INGO	F	30	55	25	04	03	7.5	18.3	10.8	
O-6	SPH	OB	SPH—Other— <u>PH</u>	INGO	F	25	55	30	05	04	5	13.7	8.7	
O-7	SPH	OB	SPH—TRH— <u>PH</u>	INGO	F	25	55	30	04	02	6.3	27.5	21.2	
O-8	SPH	OB	PH—TRH— <u>TH</u>	INGO	F	30	55	25	05	03	6	18.3	12.3	
O-9	SPH	OB	SPH—TRH— <u>PH</u>	INGO	F	35	55	20	04	03	8.8	18.3	9.5	
O-10	SPH	OB	SPH—TRH— <u>PH</u>	INGO	F	30	55	25	04	04	7.5	13.7	6.3	
OFA	Original Floor Area		OHHS	Original Household Occupancy					FS	Funding Source				
NFA	New Floor Area		NHHS	New Household Occupancy					FA	Funding Amount				
DFA	Difference of Floor Area		DHHS	Difference of Household Occupancy					OA	Other Assistance				
OHHS	Original Household Size		NGO	Non-Government Organization					OS	Owner Savings				
NHHS	New Household Size		INGO	International Non-Government Organizations					F	Fully				
IB	Inside Buffer zone		SLG	Sri Lanka Government					P	Partially				
OB	Outside Buffer zone		XXX	Current Residence										

Regarding the difference of floor area (DFA) of the 10 cases; 6 cases show positive values and difference of household occupancy (DHHS); 9 cases show positive values.



PH-permanent house SPH-semi-permanent house TH-temporary house
 EC-emergency camp TRH-transitional house
 L-living area B-bedroom K-kitchen
 D-dining-room BR-bathroom T-toilet

Fig.4.23: Transformation of Domestic Spatial Arrangements and Present Situation of Dewata (by author)

4.2.7. Implication on Living Space

4.2.7.1. Difference of Floor Area(m²)

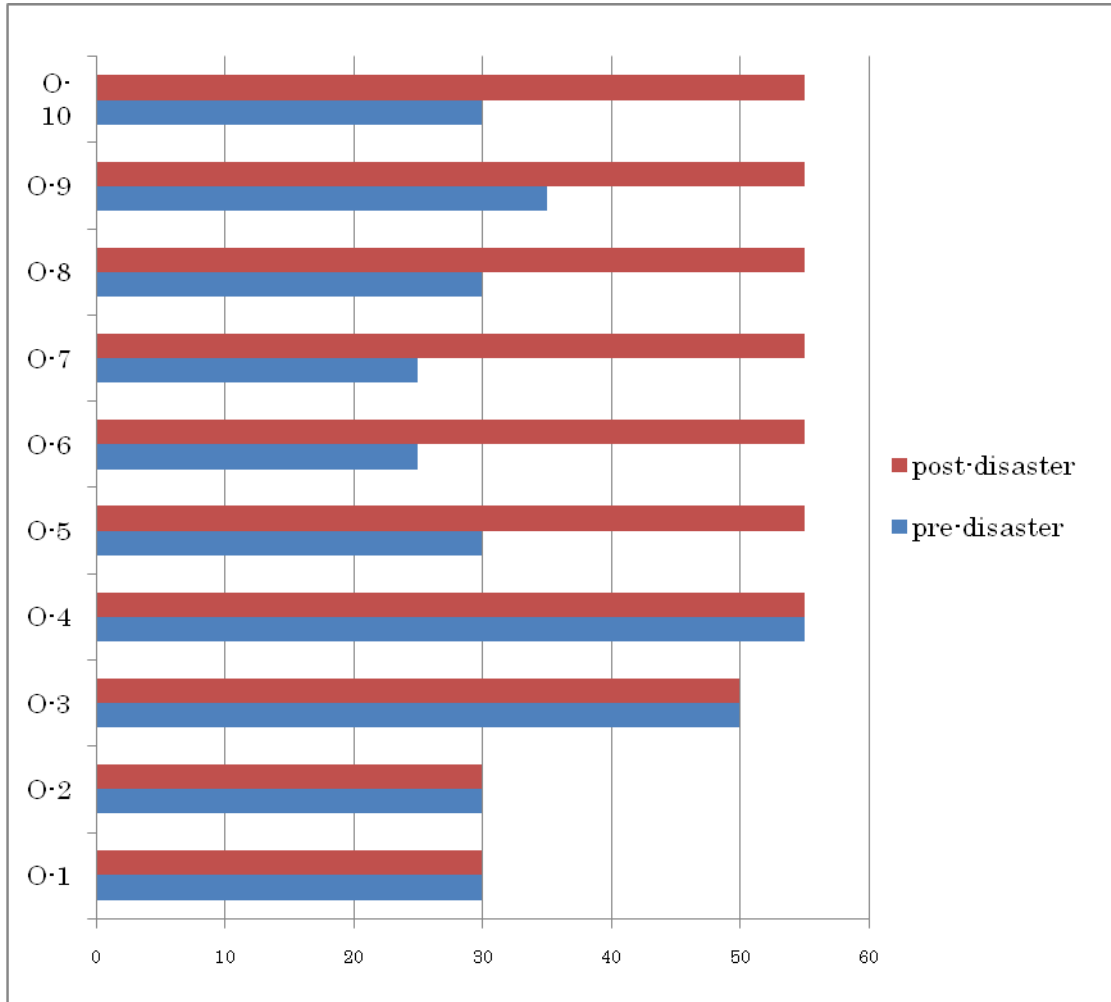


Fig.4.24: Difference of Floor Area Ratio in Pre and Post-disaster Situations of Dewata
(by author)

Regarding the difference of floor area (DFA) of the 10 cases; 0 cases show negative values, 6 case a positive value and 4 cases no differences.

4.2.7.2. Difference of Household Occupancy-DHHO (m^2/person)

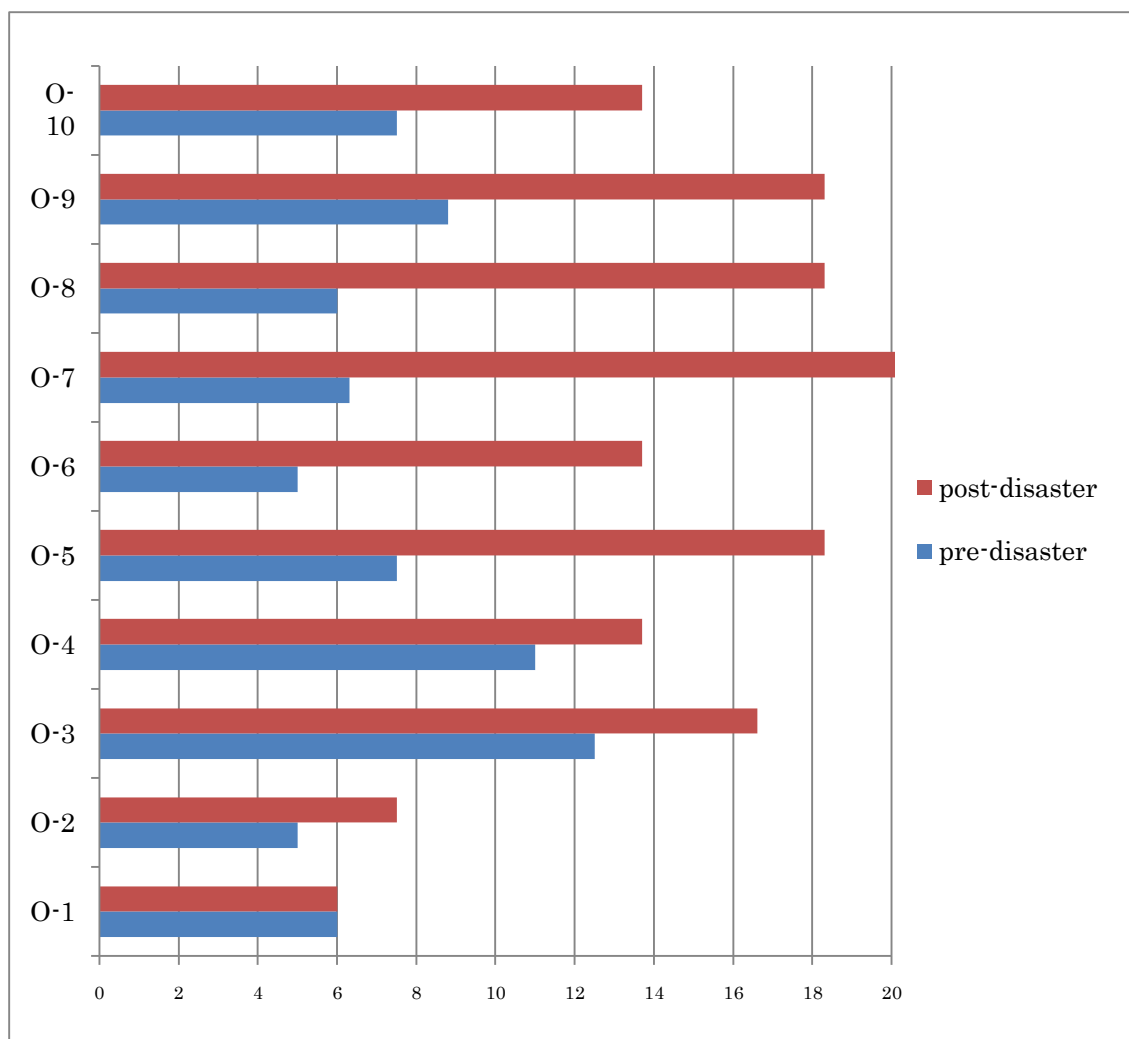


Fig.4.25: Difference of Household Occupancy Pre and Post-disaster Situations of Dewata (by author)

Regarding the difference of household occupancy (DHHO) of the 10 cases; 0 cases show negative values, 9 cases positive values and 1 case no difference.

4.2.8. Housing Relocation/Resettlement and Domestic Spatial Arrangements and Recovery

It could be found a considerable change of housing location and domestic spatial arrangements and availability of semi-permanent/squatter camps in Area between 0m-100m. About 26% of the families had moved from their original houses inside the previous buffer to the relocation sites and 23% of those (e.g. Case numbers O-5, O-6, O-7, O-8, O-9, and O-10) were squatter camps residents. About 72% of the Squatter camps had been moved to permanent housing settlements but 28% still living in narrow semi-permanent squatter camps. (e.g. Case number O-1 and O-2)

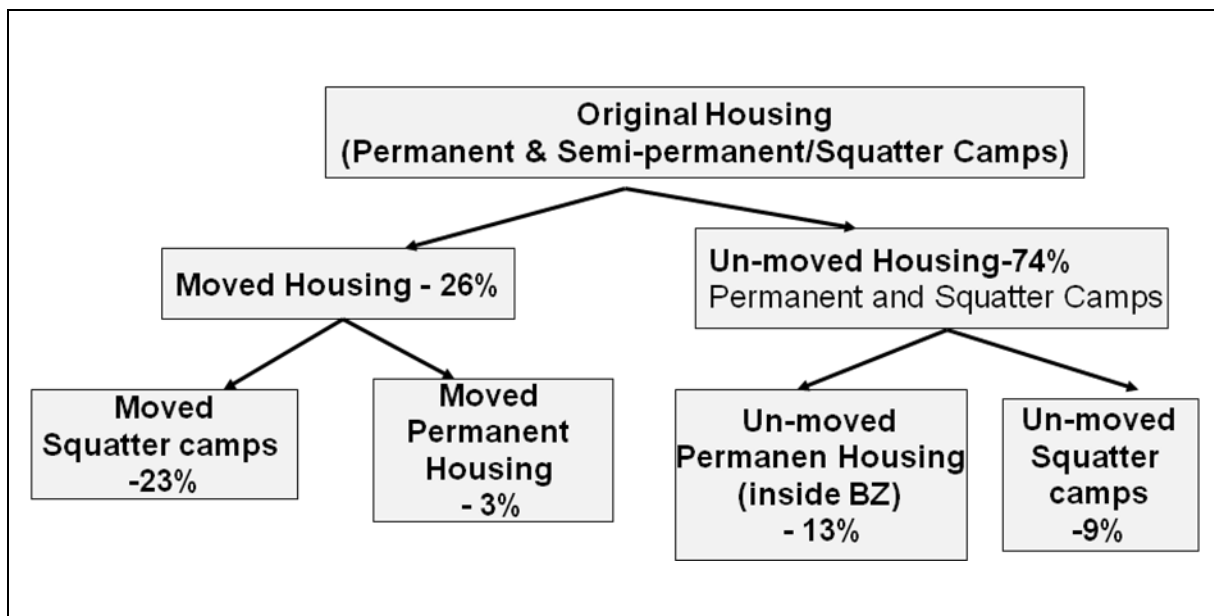


Fig.4.26: Movement of Original Housing in Dewata (by author)

With the movement from the semi-permanent housing/squatter camps to permanent houses it could be found a drastic changes in the domestic spatial arrangements and availability (e.g. Case numbers O-6 and O-8). And fewer changes could be found in reconstruction of partially damaged permanent housing. (e.g. Case Numbers O-4).

In Dewata GN division also it was not easy to determine clear transition processes as each individual case was different from each other. However it could ascertain several transition processes types, as well as problems being faced by each community group.

In case O-6 the original semi-permanent/squatter camp inside the Railway Department reservation was totally damaged by the tsunami, and the residents were asked to move to a transition house 5 - 6 km away. Due to their low income, the family, which worked in the fishing industry, had been given a new permanent house 5-6 away from the coast line (in “Walahanduwa-Salsberg” village) by an INGO. Due to their low education level and inability could not find a new livelihood which is suitable for inland living. As a result, they continue residing in both places of re-build squatter camp in the previous land and permanent house in new settlement to handle their livelihood problem. (Fig.4.23)

In case O-1, the original semi-permanent house/squatter camp which was obtained to multi family was totally damaged by the tsunami. After residing for a short period in a transition house, one of the two families moved back into a temporary house built on the original site. Since they were unable to prove ownership for separate property they could not obtain a proper grant or a permanent house in a settlement. Because of that that this affected family continue residing in the rebuild semi-permanent house/squatter camp which was given by a NGO. (Fig.4.23)

In Dewata area also cases like these have resulted in an increase in temporary houses built, which can be drag the problem of squatter camps into the future.

As for domestic spatial arrangements, it could be found a clear change in pre- and post-disaster situations. A difference of floor area (DFA) of about 60% of cases had been increased while 40% unchanged. (Table 4.8 and Fig.4.23)

Regarding the OHHO about 80% of pre-disaster cases showed values under the standard level of $10\text{m}^2/\text{person}$ has decreased to 20% by the post disaster reconstruction and resettlement programs. And a difference of household occupancy (DHHO) of about 90%, indicate positive values. (Table 4.8 and Fig.4.23)

These statics imply the increase of post disaster housing housing and community facilities available for use. And this indicates that the resettlement and relocation programs have implicated domestic spatial arrangements and availability.

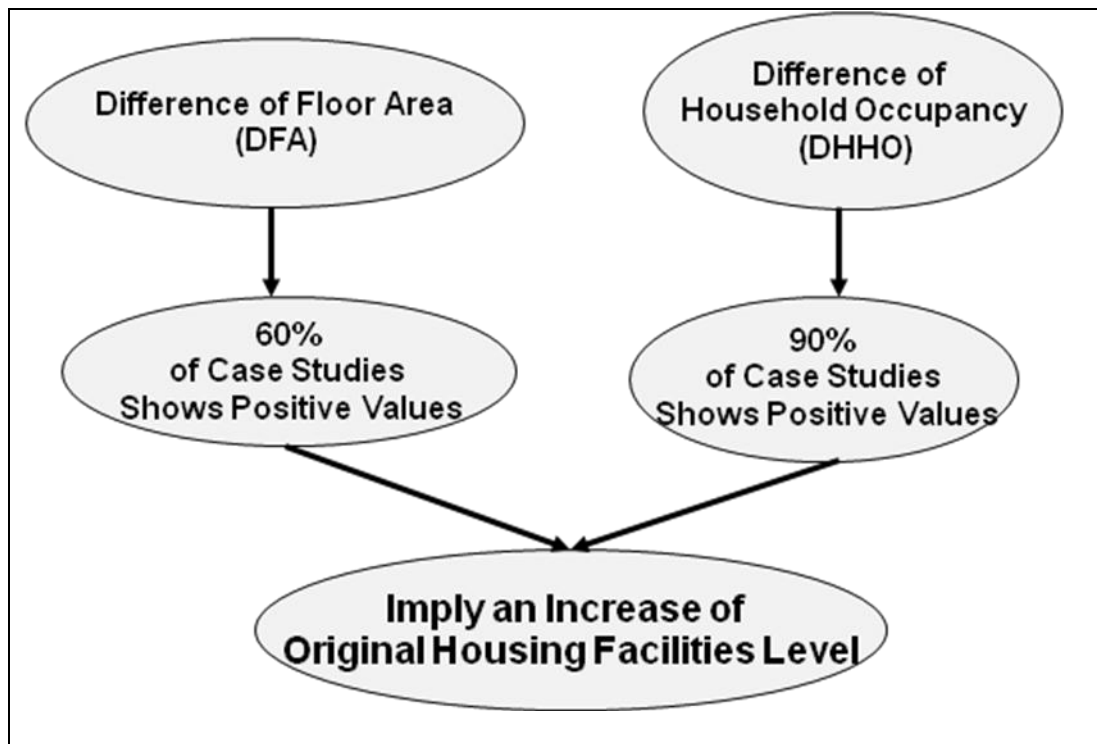


Fig.4.27: Implication on the Original Housing Facilities Level in Dewata (by author)

It could be observed certain development through the reconstruction and recovery processes of housing in Dewata GN division after 2.5 years from the tsunami. About 72% of the victims lived semi-permanent squatter camps had been moved to permanent housing settlements. And high satisfaction about their leveled up living standard could be found from the direct interviews.

As most of the relocation programs are organized based on the availability of inexpensive lands in the inland areas in southern province also, most planning authorities and developers had been unable to consider the livelihood or original communities order of the families being relocated. Although at the beginning most of the beneficiaries of permanent housing in new settlements were facing with livelihood problems mainly those who were involved in fishing industry, after 2 and half years many of them have found their own solutions to continue the original livelihood. But due to the observations and case studies it could be found that such solution are not appropriate all the time, when considering the rebuilding the squatter camps near the coast line again. This kind of cases shows the necessity of appropriate post-disaster reconstruction and planning method for suburban areas.

CHAPTER 5- Conclusions and Considerations

5. 1. Conclusions

According to the detailed survey of two case studies and the analysis of six case studies, it could be concluded the lessons, findings, benefits and problems under Planning of Permanent Housing Settlements, Buffer-zone Regulation and Permanent Housing Construction, Design and Distribution as below.

5.1.1. Planning of Permanent Housing Settlements

Through this study it could be identified that the observed permanent housing reconstruction projects, which represent most of the other housing reconstruction projects of the country as well, have been unable to identify the former balance of the original communities, livelihood, living patterns and real necessity properly. Because of that the considerable numbers of beneficiaries are facing for physical and psychological problems within their community and their own home.

According to the analysis of six case studies, in three of those the mean value which stands for the overall satisfaction and adequate level of post disaster permanent housing lie below the 1.5 which represent inappropriate and unsatisfied situation and other 3 cases represent a certain satisfaction. According to that it can be said 50% of the case studies have been unable to satisfy the beneficiaries.

Most of the requirements such as location, livelihood facilities, kitchen, design of house, spatial arrangement lie on satisfaction level 1, which imply an inappropriate condition although the requirement has been fulfilled.

Most of the requirements such as community facilities, infrastructure facilities, bathing facilities, floor area lie on satisfaction level 2, which imply a somewhat satisfied but inadequate condition although the requirement has been fulfilled (Table 3.13).

5.1.1.1. Lessons from the Planning of Permanent Housing Settlements

- As regards Case Study 1 and Case Study 2;

Housing measures and resettlement arrangements differ markedly between urban and suburban areas. The observations revealed a wide gap between the quality and quantity of permanent housing and the progress of restoration efforts in urban areas compared to suburban areas. This implies that reconstruction plans should be considered the differences between areas and community needs.

5.1.1.2. Benefits of the Planning of Permanent Housing Settlements

- As regards Case Study 1 and 2;

One of the benefits associated with the housing reconstruction programs was that the affected inhabitants of semi-permanent/shanty/ squatter camps would receive guidance for building permanent housing; possibly the first such experience for many of these people. If successful, this instruction will help to mitigate the damage caused by future disasters and help alleviate problems associated with informal settlements along the coastline of the country.

5.1.1.3. Problems of the Planning of Permanent Housing Settlements

- As regards Case Study 1;

Insufficient grant was a main problem for the establishment of the victims of urban areas.

- As regards Case Study 2 and 3;
- Livelihood problems of the fishery community appeared due to the lottery system followed by the authorities for the distribution of permanent houses.
- And unwillingness or mental trauma to settle in a completely different inland settlement from the coastal areas was a reason for many complaints regarding the movement of the victims.
- Reconstruction of the permanent housing have been unable to done in harmony with existing regional or local patterns and quality which creates the conflicts and gap between the inhabitants and new comers.

5.1.2. Buffer-zone Regulation

5.1.2.1. Lessons from the Buffer-zone Regulation

- As regards Case Study 1;

Due to the buffer zone reduction policy, the owner driven reconstruction program seems to be slow down.

- As regards Six Case Studies;

The distance from the coastline affects the level of damage. These findings show the necessity for clear regulations pertaining to coastlines.

5.1.2.2. Benefits of the Buffer-zone Regulation

- As regards Case Study 1;

Avoid the construction of unsafe, non hygienic semi permanent squatter camps on the coast line. This helps to mitigate the future damage, preserve the coast line and alleviate the coastline shanty house problem.

5.1.2.3. Problems related to the Buffer-zone Regulation

- As regards Case Study 1;

Due to the reduction of buffer zone, the temporary houses had been increased. Such temporary structures are deferring the unsafe coastal housing and living environment related problems into the future.

- As regards Case Study 2;

Remained permanent housing and building inside the buffer zone act as barriers for the establishment of buffer zone.

5.1.3. Permanent Housing Construction, Design and Distribution

5.1.3.1. Lessons and Findings

- As regards Case Study 1 and Case Study 2;

About 94% of the totally destroyed housing in Colombo (according to case study 1) and 89% of Galle district (according to case study 2) were semi permanent/shanty/squatter camps which proves the necessity of structurally sound housing for other similar community groups in the country for the prevention from future natural disaster.

- As regards Case Study 6;

The pillar structure construction method of Totamuna homeowner driven project was the only tsunami resistance design strategy of six case studies and its represent the necessity of a proper safe house building proposal.

- As regards Case Study 2, Case Study 3 and Case Study 5;

It could be found that most of the people in the post-disaster permanent housing settlements are tempted to change the spatial arrangement of houses to satisfy their social and living environment by extending or replacing their new home.

- As regards Case Study 1 ;

The decrease in floor area and household occupancy could result in future housing quality problems in urban context.

- i. As for domestic spatial availability, it could be found a clear change in pre- and post-disaster situations. A difference of floor area (DFA) of about 57% showed negative value and 35% unchanged.
- ii. Regarding the OHHO about 65% of pre-disaster cases showed values under the standard level of $10\text{m}^2/\text{person}$ has increased up to 77% by the post disaster reconstruction and resettlement programs. And a difference of household occupancy (DHHO) of about 61%, indicate negative values.
- iii. These statics imply a decrease in the post disaster housing and community facilities available for use. These values and other observations indicate that the

many resettlement and relocation programs in urban areas have been implicated negatively on domestic spatial arrangements and availability.

- As regards Case Study 2;

The increase in floor area and household occupancy could be reduced the squatter camps and level up the future housing quality in suburban context.

- i. As for domestic spatial arrangements, it could be found a clear change in pre- and post-disaster situations. A difference of floor area (DFA) of about 60% of cases had been increased while 40% unchanged.
- ii. Regarding the OHHO about 80% of pre-disaster cases showed values under the standard level of $10\text{m}^2/\text{person}$ has decreased to 20% by the post disaster reconstruction and resettlement programs. And a difference of household occupancy (DHHO) of about 90%, indicate positive values.
- iii. These statics imply the increase of post disaster housing and community facilities available for use. These values and other observations indicate that the many resettlement and relocation programs in suburban areas have been implicated positively on domestic spatial arrangements and availability.

5.2. Considerations

5.2.1. Opportunities of Housing Reconstruction and Future Developments

The post disaster housing is not only a shelter for the homeless. It should be a home which provides an environment compatible with the life style, physical need, economy, social and cultural values and hope. Hence post disaster reconstruction projects should be done in a great effort on correct necessities according an appropriate post-disaster reconstruction plan and strategy for the well being with safety and symbiosis and a sustainable development of the regenerated community.

Further the relocation and resettlement programs are effective but both need to be undertaken in a sensitive manner as community satisfaction is important. Relocation efforts will be more effective when they preserved the local communities or at least the immediate neighborhood communities.

Establishment of positive thinking is conducive for all the developments in defeated community especially from an unexpected and inexperienced natural disaster. Although it can be said the necessity of reconstruction prompted by a worst possible circumstance like Tsunami, it is clear that the reconstruction process has a high potential for significant improvements in the social, economic and environmental upgrade of Sri Lanka's coastal population. At the same time rebuilding can make a substantial contribution to long-term development in the coastal zone and in the country as a whole. Correct reconstruction methods and strategies provides the opportunity to rectify many of the mistakes that were made and were in some cases allowed or even encouraged to happen in the past and mitigate the affect of future natural disasters.

It is evident that current reconstruction methodologies are with many short comings. Therefore it would be better if the particular authorities could refresh those according to sound principles and practices. Otherwise it could be continuing the risk of unsafe living environment, weak economy and tired population who is suffering unduly.

5.2.2. Reconstruction for a Sustainable Coastal Community

Successful reconstruction requires consensus on many issues.

- According to the lack of organization of the observed reconstruction projects it could be said;
 - Undertaking the process of housing reconstruction must be driven by the goal of upgrading existing living standard, promotion of better livelihood and ensuring the future security.
- According to the lack of safety strategies of the observed reconstruction projects it could be said;
 - Should be respond to much more than Tsunami disaster through the entire reconstruction processes by taking account of the likelihood of other natural hazards such as earthquakes, floods, storms and cyclones, as well as risks of those for coastal communities.
- Considering the housing alteration done by beneficiaries of the observed reconstruction projects it could be said;
 - House reflects the identity of the Sri Lankan society not only in suburban and rural societies but also in most of the urban societies. People in the different

societies used to think that a house can reflect the position in a community and by having the similar types of typical designs, plans violates the identity, and privacy needs. These issues have been arisen in these post-disaster settlements and it affect for the existence of a sustainable community.

- Keeping a long-term perspective is important. Every step that is undertaken as part of reconstruction should not only aim to meet communities' present needs only as the human necessities are changeable.
- Many informal interviews reveals;
- The complaints regarding the housing designs could be reduced by active participation of the beneficiaries for house design projects.
- Considering the planning and construction proposals of the observed reconstruction projects it could be said;
- Cost efficiency considerations which could be avoiding the repetitions of previous poor construction practices are essential for the reconstruction processes. The housing units should be cost effective, secure, durable and easy to maintain according to best practices in housing design and construction.
- Considering the effects of the establishment and reduction of the buffer-zone it could be said;
- Strengthen of coastal zone management, development laws and related authorities will be a great help for reconstruction as the coastal line regulations

are integral part of the reconstruction processes. The weakness of the laws and authorities promote reestablishment of unsafe and illegal settlements in coast line.

- Considering the typical house building methods which had followed in the permanent housing construction, it could be said;
- Creating awareness of living with the natural environment and promotion of the reconstruction methods goes with natural environment will be useful. Such designs will help to mitigate the effect of natural disasters like earthquakes. The environment is an integral part of human lives and future security and welfare depend to a large extent on a stable and well maintained environment.
- Considering the low attention on land use planning in the coastline it could be said;
- In some cases beyond preparing for evacuation and emergency response and planning for suitable structures, by modifying the existing land use planning and development approvals it can reduce the future tsunami risk in many areas.

5.2.3. Post-disaster Permanent Housing Reconstruction Plan and Strategy

Through experience of conducting examination for six case studies and other observations, field works, informal interviews, listening to the professionals' opinions and literature survey, below mentioned housing reconstruction strategy with eight proposals for the Sri Lankan coast line have been proposed to prevention and mitigation of the damages of future earthquakes and tsunami disasters.

5.2.3.1. Part A- Reconstruction in the Coastal Areas

Proposal 1- Reconstruct with the awareness of future tsunami disasters and other natural disasters of the region.

- As regards Case Study 6;

Try to avoid or minimize the reconstruction in coastal line. For the unavoidable cases introduce a seismic resistance structure. (ex. case study 6-Thotamuna owner driven program.)

Nobody can predict about natural disasters too early. It is intellectual to design and reconstruct while considering other possible natural disaster such as earth quakes, fire, storms, cyclone, etc. of the region.

Proposal 2 – Retrofit the unaffected housing

It can be ensure the secure and mitigate the affect level in future tsunami disaster in order to retrofitting or strengthening the unaffected housing of the coast line.

5.2.3.2. Part B- Reconstruction outside the Coastal Areas

Proposal 3- Site selection should be done prior to the livelihoods

- As regards Case Study 4;

To reduce and minimize the livelihood problems the nearest lands should be distribute considering the livelihood other necessities.

Proposal 4- Preserving original local communities and immediate neighborhood at the relocation and resettlement.

- As regards Case Study 5;

Re-establish the immediate neighborhood groups together other than following lottery systems. Usual community group is best to heal the wounds after any kind of tragedy especially by a natural disaster.

Proposal 5-Arrange a new settlement in harmony with existing environment.

The new coming community group should not be peculiar or strange in the existing community to reduce the conflicts and create a peaceful society for both groups.

5.2.3.3. Part C- Reconstruction inside/outside the Coastal Areas

Proposal 6- Promote active participation of beneficiaries for house design projects.

- As regards Case Study 5;

As a defeated community group from a natural disaster is going to be settled and rebuild their life in a new house, a user friendly spatial arrangement according owner's choice will be helpful to obtain a full recovery. In most donor driven case studies many extensions (kitchen, store rooms, etc.) and interior and exterior reforms could be found at the very early stages of re-establishment processes. But in donor driven programs such problems have not risen-up.

Proposal 7- Provision of a selection/choice of house designs for beneficiaries.

- As regards Case Study 6;

People built houses according to own preferences. There is no difference in a house and a post-disaster house other than the speed of the process. As the victims have the right to live in a home according to their preference it should be provided a selection opportunity of house design for beneficiaries.

Proposal 8 – Reconstruction should be fairly deal with natural environment

- As regards Case Study 5;

The environment is an integral part of human lives and future security and welfare depend to a large extent on a stable and well maintained environment. Only this project could be found with some environment friendly ideas.

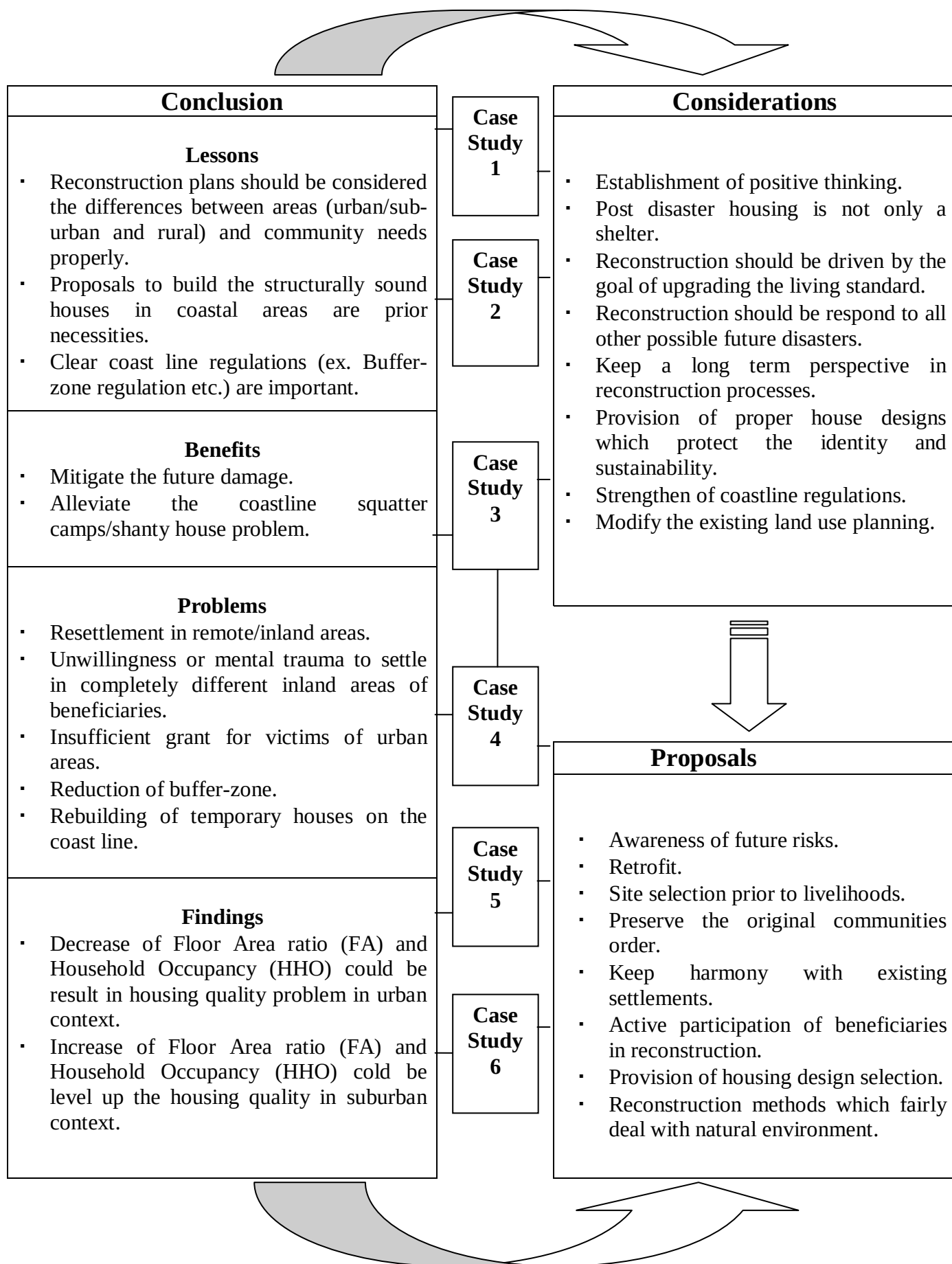


Fig.5.1: Summary of Conclusion, Considerations and Proposals of the Study.

SUMMARY

Coastal housing in Sri Lanka currently faces a variety of problems related to living environment, including quality and quantity habitability issues and administrative problems in the form of vague government regulations regarding housing construction on the nation's coastline. These problems vary according to the urban or rural areas of the country. Most low income communities are located along the urban coastline due to the livelihood opportunities associated with such areas and the relative ease with which they can sustain themselves using the available resources such as fisheries, tourism and opportunities related to the provision of service labor, etc. About 70% of all such coastal housing is structurally unsound and susceptible to collapse during disasters. Even though government authorities have historically ignored these factors during housing planning, proper consideration is essential for developing reliable housing designs and proper living environments.

In such a situation two thirds of the entire Sri Lankan coastal population was affected by the Sumatra earthquake and tsunami on 26th of December 2004. And two percent of entire housing were totally or partially damaged and that made the necessity of a quick reconstruction processes in the housing sector of Sri Lanka. Most low income communities those who were residing in the coastline squatter camps, which had not taken account to the government housing stock also severely affected by tsunami and became the problem worst.

Such circumstances made a sudden necessity of a mass housing supply for the country. Although such a mass housing reconstruction program was a big challenge to Government of Sri Lanka and other development authorities through the continued aids a quick start of permanent housing reconstruction was possible. As Sri Lanka remains a densely populated country, land pressure is particularly intense in the Coastal Zone. The government and the other authorities happened to start rebuilding on the principle of minimum land use as unused land is at a premium in the coastal zone since rebuilding was the priority.

Several housing reconstruction programs were implemented by the Sri Lankan government with many financial supports to obtain a full recovery for the affected living environments. Simultaneously, buffer-zone (set-back zone) which directs two programs for permanent housing known as home-owner driven housing reconstruction program and donor-built housing resettlement program to repair or rebuild damaged houses were also introduced. Later it could be found many shortcomings in most of those post-disaster reconstruction programs. As most of the reconstruction programs had been missed the order of original community, environmental contexts and livelihood facilities. It is evident such unplanned prompt reconstruction proposals drag the housing and living environment related problems in to future which makes the current housing problems more severe.

Because of that this research had been conducted in the opinion of reconstruction can make not only the rebuild the damaged housing but also a substantial contribution to long-term development in the coastal zone in the country as a whole and correct reconstruction methods and strategies provides the opportunity to rectify many of the mistakes that were made and mitigate the affect of future natural disasters.

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The study clarifies the pre-disaster and post-disaster local living environment organizations and domestic spatial arrangements and availability. Implications of resettlement and relocation on changes to domestic spatial arrangements and availability as well as community adaptations to the changing living environment were also investigated through the study. The study introduces different post-disaster housing reconstruction approaches of urban and suburban areas and analyzes and discusses about the advantages and short comings of those. Finally propose some proposals which could be helpful to develop an appropriate post disaster housing reconstruction strategy for the Sri Lankan coast line.

A chronological study method has been used for this research to clearly observe and clarify the existed conditions, transformation and development progresses of each stage of selected coastal living environments. Furthermore in this study the pre and post disaster coastal living environments and domestic spatial arrangements and their transformations due to the post disaster reconstruction processes have been studied in detail. To select the case studies, several observations had been conducted in the western and southern coastal areas. Those selected villages were fully or partially fishers' villages and selected as case studies due to the clear evident of community problems. This is a descriptive and explorative field work study by using six different case studies in Western and Southern coast line which occurred a marked damaged from tsunami by being highest populated provinces of the country. Two of the six fieldwork surveys conducted in the selected fields in Colombo (urban) and Galle (urban and suburban) districts were used for detailed study and to produce layout maps of each stage a.) Pre-tsunami b.) Post-tsunami-shortly after the disaster c.) Post-tsunami-2.5 years after the disaster, which could be helpful to investigate real situation of the affected areas.

Findings reveals that; 1.) Through the post disaster housing reconstruction programs inhabitants of shanty areas would receive guidance for building permanent housing; possibly the first such experience for many and it will help to mitigate the future damages and alleviate problems associated with shanty/squatter settlements along the coastline. 2.) Most of the permanent housing reconstruction projects have been unable to identify the former balance of the original communities, importance of usual living patterns and livelihood, and satisfy the beneficiaries in the new settlements. In many cases reconstruction of the permanent housing have been unable to done in harmony with existing regional or local patterns and quality which creates the conflicts and gap between the inhabitants and new comers. Furthermore, according to the analysis of six case studies, it can be said 50% of the case studies have been unable to satisfy the beneficiaries and provide the adequate requirements. 3.) Necessity of structurally sound housing for other community groups in squatter settlements in the country for the prevention from future natural disaster. According to the observations about 94% of the totally destroyed housing in Colombo and 89% of Galle districts case studies were semi permanent/shanty/squatter camps. 4.) The decrease in floor area and household occupancy of post disaster housing could result in future housing quality problems. 5.) Reduction of buffer zone regulation clearly affects the progress of reconstruction programs and deferring coastal housing and living environment related problems into the future. 6.) There is a wide gap between the quality and quantity of

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permanent housing and the progress of restoration efforts in urban areas compared to suburban areas.

Could be proposed; 1.) The process of housing reconstruction must be driven by the goal of upgrading existing living standard, promotion of better livelihood and ensuring the future security. 2.) The concept of post disaster reconstruction methods should be deal with community based disaster prevention and the main facts to be considered are original community and living environment organization, neighborhood groups and livelihood 3.) Reconstruction programs should be response not only to future tsunami disasters as well as other possible natural disasters through the entire processes 4.) Re-establishment or strengthen of coastal zone management, development laws and related authorities will be a backup for reconstruction process. 5.) Reconstruction programs should be considered the difference of housing measures and resettlement arrangements in between urban and suburban areas or redevelopment plans should consider the differences between areas and community needs.

The next proposals could be help full to develop an appropriate post disaster coastal housing reconstruction strategy for Sri Lanka.

- Proposal 1 - Reconstruct with the awareness of future tsunami disasters and other natural disasters of the region
- Proposal 2 - Retrofit the unaffected housing.
- Proposal 3 - Site selection should be done prior to the livelihoods.
- Proposal 4 - Preserving original local communities and immediate neighborhood at the relocation and resettlement.
- Proposal 5 - Arrange a new settlement in harmony with existing environment.
- Proposal 6 - Promote active participation of beneficiaries for house design projects.
- Proposal 7 - Provision of a selection/choice of house designs for beneficiaries.
- Proposal 8 - Reconstruction should be fairly deal with natural environment.

Finally it could be concluded that, post disaster housing are not only a shelter for the homeless. It should be a home which provides an environmental compatible with the life style, physical need, economy, social and cultural values and hope. Hence post disaster reconstruction projects should be done in a great effort on correct necessities according an appropriate post-disaster reconstruction plan and strategy for the well being with safety and symbiosis and a sustainable development of the regenerated community.

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GN DIVISION - DS DIVISION-

House No. - Name of Household-.....

Family Members	Household (HH)		Younger Children below 18 yrs (YC)	Elder Children above 18 yrs (EC)	Elder Parents (EP)	Other members (O)	Total No. of Family Members
	Single (HHS)	Married (HHM)					
Previous No							
Current No							

Member	Previous livelihood	Distance to previous work place(m/km)	Current livelihood	Distance to current work place(m/km)
Household (HH)				
Wife (W)				
Elder Children (EC)				
Other (O)				

- 1.) GS Division..... GN Division..... Address-.....
- 2.) Distance from the sea- a) 0-35m b) 35-100m
- 3.) Type of house-a) Type 1- Temporary b) Type 2- Semi-permanent c)Type3- Permanent
- 4.) Services- a) Electricity- Individual/ Common b)Water- Individual/ Common
c)Bath- Individual/ Common d) Toilet- Individual/ Common
- 5.) Land area- perches
- 6.) Floor Area-.....m²
- 7.) Had a legal deed- a) Yes b)No
- 8.) Living period- yrs months
- 9.) How was your previous living environment comparing to your current situation?
a) It was good b) It wasn't much good c) It was bad

- 1.) Original House(OH)----Transitional House(TH)----Permanent House(PH)-OB
- 2.) Original House(OH)----Transitional House(TH)----Permanent House(PH)-RS
- 3.) Original House(OH)----Transitional House(TH)----Original House(OH)-OB
- 4.) Original House(OH)----Transitional House(TH)----Original House(OH)-IB
- 5.) Original House(OH)----other----Original House(OH)-OB
- 6.) Original House(OH)----other----Original House(OH)-IB

E. Current Residence

- 1.) GS Division..... GN Division..... Address.....
- 2.) Distance from the sea- a) 0-35m b) 35-100m c) 100-500m d) 500m-1km
e)1km-4km f)more than 5km
- 3.) Type of house-
 - a) Original House- fully damaged-rebuild outside the buffer zone
 - b) Original House-partially damaged-rebuild outside the buffer zone
 - c) Original House- fully damaged-rebuild inside the buffer zone
 - d) Original House- partially damaged-rebuild inside the buffer zone
 - e)Transitional House
 - f) Permanent House-Relocated site
 - g)other
- 4.)Services- a) Electricity- Individual/ Common b)Water- Individual/ Common
c)Bath- Individual/ Common d) Toilet- Individual/ Common
- 5.)Land area- perches
- 6.)Floor Area-.....m²
- 7.)Have a legal deed- a) Yes b)No
- 8.)Living period- yrs months
- 9.)How is your current living environment comparing to your previous/original situation?
 - a) It is good b) It isn't much good c) It is bad
- 10.)Are you satisfy with your current;
 - House a) satisfy b) some what satisfy c) not satisfy (reason.....)
 - Common facilities a) satisfy b) some what satisfy c) not satisfy (reason.....)
 - Livelihood facilities a) satisfy b) some what satisfy c) not satisfy (reason.....)
 - Living environment a) satisfy b) some what satisfy c) not satisfy (reason.....)

F. Funds for Permanent House Building

1. Amount of fund a) Fully b) Partially
2. Source
- a) SLG- Sri Lanka Government
- b) INGO- International Non-government Organizations
- c) NGO- Non-government Organizations
- d) OA- Other assistance
- e) OS- Owners' Savings

H.. Problems

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Questionnaire to Residents

1. Family Structure (sex, age, school, year, occupation)
2. Human damage of your family members and housing damage
3. Housing layout
4. Original location of your house before disaster
5. Occupation for income (including wife and other family members) in pre and post disaster
6. Access to new occupation sites (How long? On foot, bus, vehicle, other, reside near occupation site)
7. Access to public services, facilities (including hospital, school, shopping complex, public administration, bus stop)
8. Lifeline (water supply, electricity, gas, sewerage)
9. Communication with neighbors, in neighborhood.
10. Current problem into the future
11. Considerations in future disaster, at the reconstruction your house or movement to the resettlement site
12. Any request to Government and donors