6-2. Field Survey

6-2-1. Sri Lanka

1) Background and Purpose

The massive tsunami hit Sri Lanka on December 26, 2004, causing 30,959 deaths, with 5,443 missing. It forced approximately 556,000 to evacuate. (source; UN/OCHA, February 4 2005).

The ADRC conducted a field survey immediately after the tsunami hit Indian Ocean countries. The objectives of this survey were as follows,

(1) To grasp the extent of the damage by tsunami and research the activities of relevant organizations

(2) To explore and assess the needs for future assistances.

2) Mission Period

From December 28, 2004 to January 5, 2005

3) Dispatched Members

Akihiro Teranishi (Senior Researcher of ADRC)
SriGauri Sankar (Visiting Researcher of ADRC)
Si Sira R. N. Colombage (Assistant of ADRC)

4) Survey Contents

Date	Place	Contents
28 Dec.	Departure from Japan	—
29 Dec.	National Disaster Management Center JICA Office Embassy of Japan Local NGO UNDP	Visited to relevant organizations to explain them about the purpose and itinerary of the survey as well as to collect information about damages, means of transportation and safety.
30 Dec.	Hikkaduwa Galle	Headed to Galle from Colombo. Interviewed to the local residents on the way to Galle and visited the place where a train was washed away. Visited the government office and evacuation camps to gather to information about relief situations and problems in Galle. Also, visited a fishing village to interview the residents.
31 Dec.	Colombo	Preparation for the move
1 Jan.	Trincomalee	Visited the government office.
2 Jan.	Kinnya	Surveyed the damage of yhe city. Visited a temporary clinic and evacuation comps to interview the local people.
3 Jan.	Kinnya-Colombo	
4 Jan.	National Disaster Management Center Embassy of Japan	Reported the results of the survey and discussed the future contributions.
5 Jan.	Arrival in Japan	—

5) Survey Results

(1) National Disaster Management Center

Nimal Hettiarachchi, Director of National Disaster Management Center, which is in charge of disaster relief in Sri Lanka, and other are engaged in collecting information

about disaster.

(2) Hikkaduwa

The tsunami washed out 8 cargo trains and killed 1,500 passengers. A local resident who watched the news of Sumatra earthquake on TV said that the idea of tsunami would hit Sri Lanka never came up to his mind.

(3) Galle

Many wooden houses were destroyed. One of the government officials dispatched to Galle was busy to deliver relief materials. He said that the most urgent matter was the lack of drinking water and sanitation. Schools had been turned into refugee camps operated by volunteer workers.

Fishermen asked for donations of boats and nets for their livelihood.

(4) Trincomalee

Countermeasures were discussed by relevant organizations set up by the representatives of the national government. Not only the local population but also government officials did not know even the word of "tsunami". Council members paid their attention to the tsunami brochure which the ADRC developed for Papua New Gunea.

(5) Kinya

A hospital near the sea was damaged severely and many patients became victims. The relief materials failed to reach many evacuees because only one person was running the refugee camp.

6) Issues

(1) Public awareness raising and education about the basic knowledge of disasters including tsunami

(2) Enhancement of the national and local governments' disaster management capabilities

(3) Assistance to reconstruct livelihood of victims

Fig. 6-2-1-1 Train Wreck (Galle)

Fig. 6-2-1-2 Affected Hospital (Trincomalee)

6-2-2. Thailand

1) Background and Purpose

The massive tsunami of December 26, 2004, severly affected six provinces facing the Andaman Sea in Thailand. It claimed over 5,200 dead, half of whom were from abroad. Thousands of people are still missing.

From December 30, 2004 to January 2, 2005, the ADRC conducted a survey in Thailand. In cooperation with the Department of Disaster Prevention and Mitigation, Ministry of Interior, Government of Thailand, the team visited two heavily damaged provinces; Phuket and Phangnga Province.

2) Mission Period

From December 30, 2004 to January 2, 2005

3) Dispatched Member

Dr. Tomohiko Hatori (Senior Researcher, Asian Disaster Reduction Center)
Akiko Nakamura (Researcher, Asian Disaster Reduction Center)

4) Survey Contents

On December 31, 2004, the team conducted the field survey in Khao Lak Village, Nam Kem Village and Takua Pa City in Phangnga Province. On January 1, 2005, the team visited several beaches (i.e. Patong Beach, Kamala Beach, Karon Beach and Surin Beach) in the Western Phuket Island. The damage situationsvaried between locations.

5) Survey Results

Known as fine resort area for foreign tourists, Khao Lak Village was greatly affected by the devastating tsunami four times. The largest wave was the third one, which was more than ten meters high. In Nam Kem Village, where many fishermen resided in low-rise houses, the tidal waves reached more than 500 meters inland from the coast. They destroyed the ground floors of the most houses, and washed away the village, claiming many lives of the local people.

No early warning was issued for evacuation and it is considered as one of the main causes for the loss of many lives. In addition, the lack of knowledge on tsunami caused heavy mortality. It is also reported that many people went into the sea to catch fishes when the sea pulled back immediately before the tidal waves came.

Considering that the affected areas in Thailand include world famous beach resorts, and that tourism is one of the major industries for the country, how to promote reconstruction and recovery successfully will be a critical issue. The team made the following three recommendations to make Thai society less prone to tsunami: 1) establishing multi-national information sharing system on earthquakes and tsunami, 2) improving information dissemination inside the country, including the one for foreign tourists, 3) raising public awareness of tsunami disaster risks and informing foreign tourists of the evacuation procedure.

Fig. 6-2-2-1 Damaged Temple on Kamala Beach (Phuket)

6-2-3. Indonesia

1) Background and Purpose

The massive tsunami hit Indonesia on December 26, 2004. The ADRC investigation team, consisting of Dr. Bambang Rudyanto, former senior researcher of the ADRC, and Mr. Masaru Arakida, senior researcher of the ADRC, went to Banda Aceh, Indonesia, one of the most severely affected areas by the huge tsunami disaster on December 26, 2004, and made some considerations on the applicability of earth observation imagery to disaster reduction.

2) Mission Period

January 7 to 11, 2005

3) Dispatched Member

Masaru Arakida (Senior Researcher, Asian Disaster Reduction Center)
Bambang Rudyanto (Associate Professor of Wako University, former Senior Researcher, Asian Disaster Reduction Center)

4) Survey Results

This survey was conducted to:

- determine the extent of the damage and analyze the current situation
- identify needs and problems

Counterpart of Indonesian government: BAKORNAS PBP

(1) BAKORNAS Operation Center （Jan. 8 2005）

- A tele-conference system was available via communication satellite.
- It was hard to collect information because no one knew the total damages.
- IBM donated and installed 200 computers for volunteer workers to input and update human and material damages.
- Image data from IKONOS and QuickBird were displayed.

(2) City of Banda Aceh（Jan. 8 2005）

- Because of rubbles, we could not reach the coastline. We went around the fish market, prison, etc., about 3-5 km inland from the sea.
- Even a building whose roof appeared undamaged on the EO image had had its ground floor severaly damaged by the tsunami.
- A GPS camcorder was used to use GIS image data.
- Color-coded images, such as ASTER images, which showed the affected areas red, were useful for the preliminary investigation before the survey.
- If the GIS allows damage estimation based on EO images, the Headquarters could have started rescue and relief operations at a much earlier stage.
- Can we estimate the height of the tsunami using images of the tsunami area and DEM data?
- Few people survived in the tsunami area.
  →The mortality rate in tsunami area was quite high.

Fig. 6-2-3-1 Banda Aceh, Collapsed Department Store

Fig. 6-2-3-2 Banda Aceh, Medan hotel and Fish Boat

(3) Bakornas in Jakarta

- EO images from IKONOS, QuickBird, Landsat, and SPOT are available displayed in the Center.
- It was apparent that these image data were not used to develop actual countermeasures.
- Most of the HQs staff could not use EO images themselves.
- They did not know how to utilize images for their works. They need much more additional information from EO images, including the extent of the tsunami area, number of affected people, which road is available, etc.
- the headquarters staff have insufficient knowledge, skills and processing time. Therefore, quick reports, including more detailed EO image analyses, are necessary.

6-2-4. Maldives

1) Background and Purpose

The massive tsunami hit Maldives on December 26, 2004, causing 82 deaths, with 26 missing, 1,313 injured and 29,577 displaced & homeless (as of Dec. 26, 2004). Considering that the population of the country is 290,000, the impact of the tsunami was enormous for the country. There are 199 inhabited islands in the country, of which 53 islands were severely affected by this disaster. Resort islands, in particular, have been suffering serious damage to tourism, which is a major industry of the country.

The ADRC dispatched a senior researcher to Maldives as a member of a JICA mission. The mission objects were:

- To survey the current situation of the tsunami disaster in Maldives, and
- To carry out a needs assessment for Japan's future assistance.

2) Mission Period

January 26-31, 2005

3) Dispatched Member

Dr. Tetsushi Kurita (Senior Researcher, Asian Disaster Reduction Center)

4) Survey Contents

Date	Place	Description
Jan.26	Arrival to Male	—
Jan.27	Department of External Resources, Ministry of Foreign Affairs	Survey schedule check
	National Disaster Management Center	Following NDMC report -Disaster situation analysis -Future plan
	Male Island	Inspection of the seawalls which were constructed with Japan's ODA
Jan.28	Gemendhoo Island, Dhaalu Atoll	Survey of affected local island
	Vilufushi Island, Thaa Atoll	Survey of affected local island
Jan.29	Male	Report writing
Jan.30	National Disaster Management Center	Survey on damage to fisheries and agriculture
	Ministry of Finance and Treadury	Discussion on future assistance
	Ministry of Fisheries, Agriculture & Marine Resources	Survey on dmage to fisheries and agriculture
	Departure from Male	—

5) Survey Results

- Field Survey in Male Island

In the survey of Male Island, the mission inspected the seawalls which were constructed with Japan's ODA (Official Development Assistance). It is reported that the seawalls built around the island protected the City of Male from the devastating tsunami.

The mission verified the structural stability of the seawalls.

- Field Survey in Local Islands

  The field survey in Gemendhoo Island, Dhaalu Atoll and Vilufushi Island, Thaa Atoll, found that there were many collapsed fishermen's houses. These houses were vulnerable to tsunamis because residents themselves had constructed them with coral stones and burnt gypsum. On the other hand, most of public buildings (e.g. island office, mosque and school) were not affected severely because they had been constructed by contractors according to the Building Code.

  Maldives is highly prone to tidal waves since the highest elevation point of the country is 1.5 m above sea level. Based on the traces of the recent tsunami, it is estimated that 2-3 meter-high waves struck the country.

- Future Plans

  As a countermeasure against tsunamis, the Government of Maldives has started the development of the Safe Islands Programme. According to this programme, Safe Islands with coastal protection and safety zones, such as artificial high ground for emergency evacuation and public buildings for vertical evacuation, will be constructed. In the future, residents in the vulnerable islands like Gemendhoo Island will be relocated to the Safe Islands. The Government of Maldives is expecting international assistance for this programme.

Fig. 6-2-4-1 Presentation of Disaster by Minister of Planning & National Development (Second person from right)

Fig. 6-2-4-2 Sea Wall in Male

6-2-5. India

1) Background and Purpose

The massive tsunami hit India on December 26, 2004, causing devastating damage on the country. The ADRC dispatched a senior researcher to India in order to assess the damage and identify the needs of the tsunami affected areas.

2) Mission Period

March 2-4, 2005

3) Dispatched Member

Ms. Etsuko Tsunozaki, Senior Researcher of ADRC

4) Supported by

Ministry of Home Affairs (Government of India), State Relief Commissioner of Tamil Nadu, Collector of Cuddalore, Relief Commissioner of Pondicherry

5) Survey Contents

From March 2 to 4, 2005, a senior researcher of the ADRC visited the tsunami-affected areas in the State of Tamil Nadu and the UT of Pondicherry. India lost thousands of lives and suffered extensive damage to livelihood and economy in the States of Tamil Nadu, Kerala and Andhra Pradesh, and the Union Territory (UT) of Pondicherry as well as on the Andaman and Nicobar Islands. The number of casualties exceeded 10,000 and more than 5,000 people were still missing (as of March 31 2005).

Relief efforts in response to the tsunami in India were coordinated efficiently by the Ministry of Home Affairs as the nodal agency at the national level; by the Relief Commissioners at the state and UT levels, by the Collectors at the district level. It should be noted that not only the governments carried out relief activities, but also, UN agencies, community members, individuals and local NGOs as well as the private sector responded to the needs of the affected communities. At present, short to medium-term recovery and reconstruction activities, such as reconstruction of public facilities, repair of infrastructure, replacement of boats, mental health care and so on, are being carried out, coordinated among all the stakeholders. The challenges are still enormous for all the affected communities to recover entirely, and a long-term recovery plan is currently being developed to that end.

Fig. 6-2-5-1 Ruined fisherman's hut in Pondicherry

Fig. 6-2-5-2 Temporary shelters constructed by the state of Tamil Nadu

6-2-6. Field Survey on Awareness of Tsunami Risk

At the initiative of UNESCO/IOC, various plans/activities are currently under discussion for improving disaster management systems including development of a Tsunami Early Warning System in the countries surrounding the Indian Ocean. Raising public awareness for disaster reduction is the key for the successful implementation of such plans/activities. The ADRC conducted a field survey on tsunami risk awareness in Sri Lanka to identify the current situation and characteristics of community's capacity to respond to natural disasters for the purpose of proposing appropriate methods to designate potential high risk areas for tsunami, and develop strategies for disseminating tsunami knowledge and raising public awareness regarding tsunami disasters.

1) Survey Contents

- Questionnaire survey on tsunami risk awareness among the general public (Expected number of respondents: 1,000)
- Questionnaire survey on tsunami risk awareness among school children (Expected number of respondents: 1,000)
- Interview survey on natural disaster management with government officials (Expected number of respondents: 50-100)
- Field survey on the damage by the tsunami in the target area
- Proposal for effective methods to deliver risk information to the general public and activities for raising public awareness for disaster reduction in Sri Lanka.

2) Target Area

Galle District, Sri Lanka

3) Period of Field Survey

March 1-14, 2005 (March 1-12, 2005 survey in Galle district)

4) Result of the survey (Preliminary report as of 22 March, 2005)

(1) Questionnaire survey among the general public

A local survey team consisting of 23 members conducted a questionnaire survey among the residents in the target area, selected by simple random sampling, and received 1,324 responses.

Table 6-3-2-1 Ratios of the number of sample (by division)

DS division	Ratio of number of respondents(%)(tentative figure)	Total number of households (survey of 2001)
Benthota	10.2	11,801
Balapitiya	14.9	15,570
Ambalangoda	13.5	18,328
Hikkaduwa	22.1	23,838
Galle four Gravets	22.2	19,931
Habaraduwa	17.1	14,215

Fig. 6-3-2-1 Interview to the affected people living in the

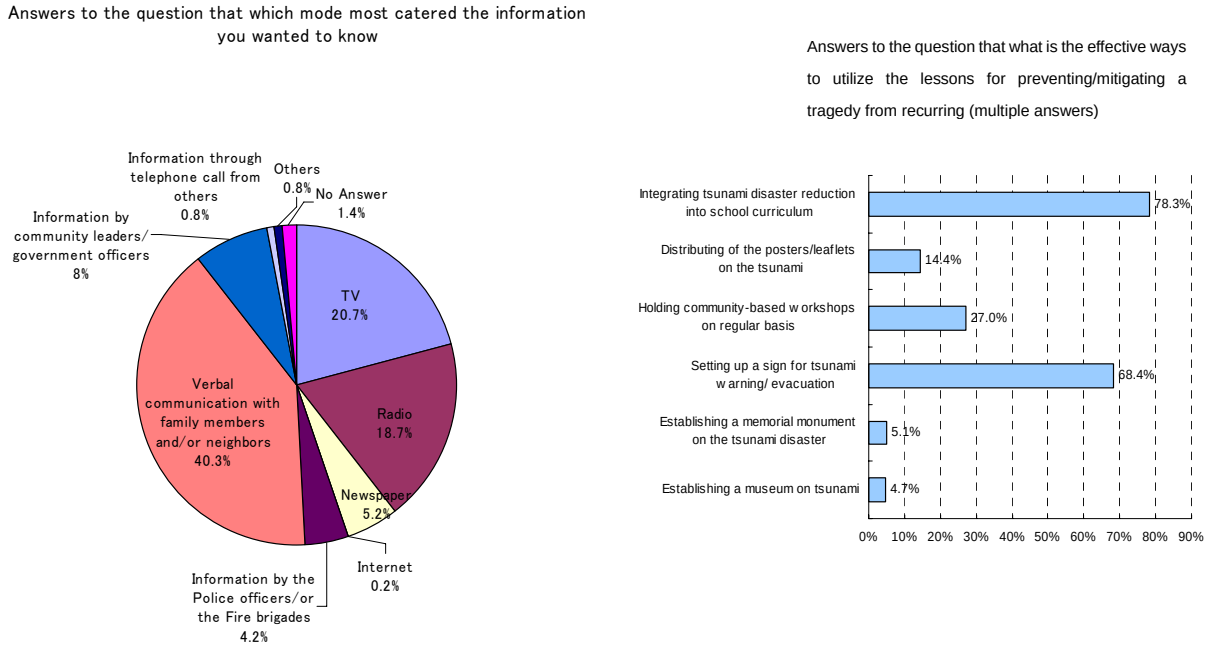

Fig. 6-3-2-2 Result of the questionnaire survey among residents (extract)

The collected answers to the 19 questions clearly show the current status of the capabilities for disaster management of the residents in the target area. As the two graphs above show, promotion of disaster reduction education at schools would contribute to public awareness raising.

(2) Questionnaire survey among school children

The survey covered mainly fifth-grade school children (aged 10) at the schools selected with the regional demographic differences taken into consideration. The ADRC survey team visited the schools, and asked the principals for cooperation for the questionnaire survey.

Table 6-3-2-2 Numbers of collected answers (by school)

Name of School	DS division	Number of sample		Remarks
		School Children	Teachers	
Shariputra Maha Vidyalaya	Habaraduwa	51	2	
Uswatunhasana Maha Vidyalaya	Galle	28	1	Muslim
Sudharma Maha Vidyalaya	Galle	66	1	
Southlands College	Galle	285	9	Girls school
C.W.W. Kannangara Maha Vidyalaya	Galle	16	1	
Gintota Maha Vidyalaya	Galle	134	4	
Alloyseus College	Galle	270	5	Boys school
Rohana Maha Vidyalaya	Habaraduwa	60	5	Grade 6
Mahamaya Balika Vidyalaya	Hikkaduwa	18	1	Girls school
Peraliya Jinaratana Vidyalaya	Hikkaduwa	25	2	
Siddharta Madya Maha Vidyalaya	Balapitiya	55	2	Randombe Kanishta Vidyalaya (united)
Hegalle Maha Vidyalaya	Balapitiya	77	2	
Martin Wickramasinghe Kanishta Vidyalaya	Habaraduwa	27	1	
Total		1,112	36	

Fig. 6-3-2-3 Children filling in the survey sheets (Habaraduwa)

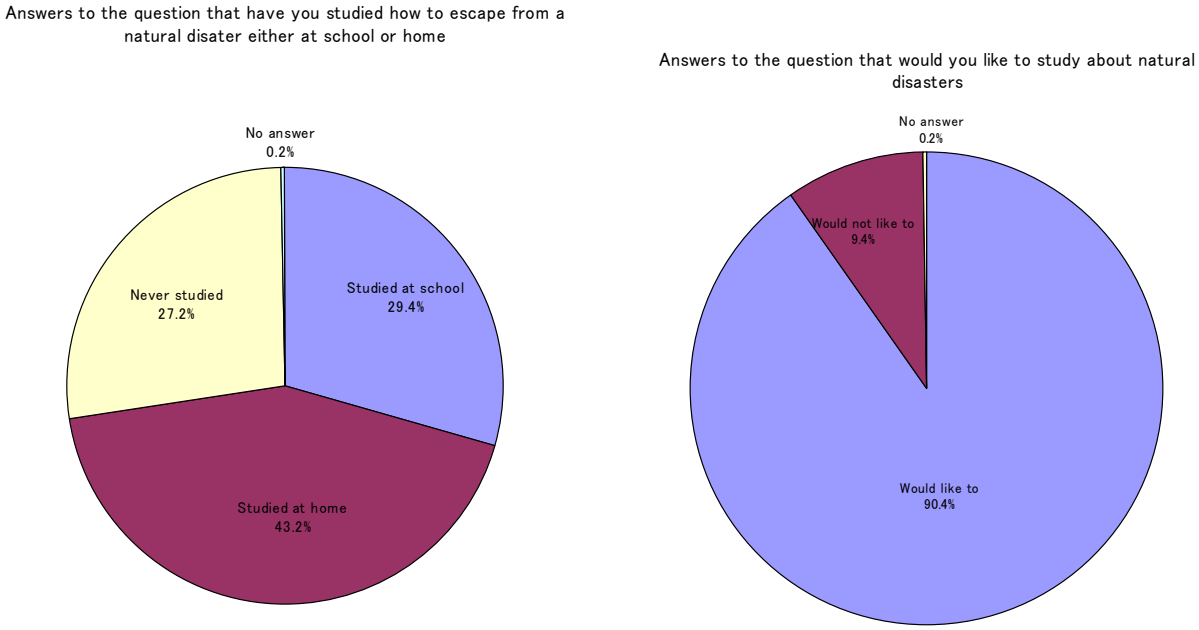

Fig. 6-3-2-4 Result of the questionnaire survey among school children (extract)

The collected answers to the 12 questions clearly show the current status of the capabilities of school children for disaster reduction in the target area. The two graphs above clearly show the lack of school education for disaster reduction. It should be required to develop a school curriculum taking the importance of studies for disaster reduction into consideration.

(3) Questionnaire and interview survey among government officials

- Questionnaire survey

  The ADRC survey team visited each organization, and asked the head of the organization for cooperation to conduct the questionnaire survey in his/her organization.

Table 6-3-2-3 Collected numbers of the survey sheets (by organization)

Organization		Name of the head of the section	Number of respondents
NDMC		Mr. Hettiarachchi	18
Administrative District of Galle	Planning	Ms. Piyadasa	9
	Education	Ms. Dahanayake	12
	Health	Ms. Gamage	15
	Police	Mr. Silva	8
	Navy	Mr. Somapala	16
DS division office	Ambalangoda	Mr. Ravindra	5
	Balapitiya	Mr. Ariyaratne	4
	Benthota	Mr. Jayalal	6
	Galle four Gravets	Mr. Gunawardena	7
	Habaraduwa	Mr. Samarasekara	5
	Hikkaduwa	Ms. Piyaratne	5
Total			110

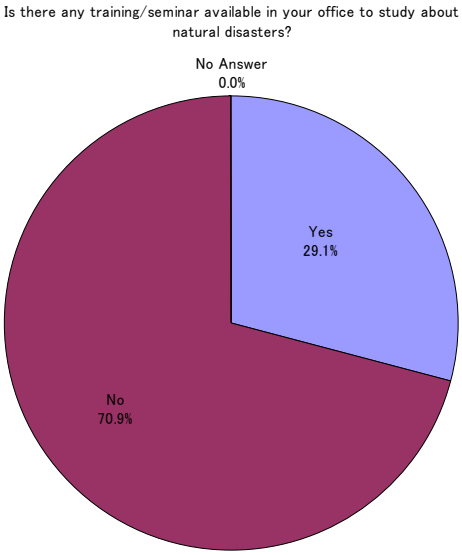

Fig. 6-3-2-5 Result of the questionnaire survey among government officials (extract)

- Interview survey

In addition to the questionnaire survey, the ADRC team conducted an interview survey with the heads of the target organizations.

Table 6-3-2-4 List of the interview survey

Organization		Heads	
		Title	Name
NDMC		Director	Mr. Hettiarachchi
Administrative District of Galle		District Secretary	Mr. Hewavitharana
	Planning	Director	Ms. Piyadasa
	Education	Director	Ms. Dahanayake
	Health	Deputy Secretary	Ms. Gamage
		Deputy Provincial Director	Mr. Gunawardena
	Police	Senior Superintendent	Mr. Silva
	Navy	Commander	Mr. Somapala
DS division office	Ambalangoda	Divisional Secretary	Mr. Ravindra
	Balapitiya	Divisional Secretary	Mr. Ariyaratne
	Benthota	Divisional Secretary	Mr. Jayalal
	Galle four Gravets	Divisional Secretary	Mr. Gunawardena
	Habaraduwa	Divisional Secretary	Mr. Samarasekara
	Hikkaduwa	Divisional Secretary	Ms. Piyaratne

The result of the interview survey revealed the main problems in many of the organizations; lack of coordination among the government organizations; and inadequate capabilities of officers who have to deal directly with residents matters. Besides, many told about the urgent necessity of a tsunami early warning system.

(4) Field survey on the damage by the tsunami in the target areas

Table. 6-3-2-5 Damage statuses in the target areas in Galle district (as of March 1, 2005)

No.	DS division	Dead/ Missing (people)	Injured (people)	Affected (people)	Evacuee (people)	Property Damage		Number of Camps
						Totally	Half	
1	Galle	916	-	31,510	28,442	1,061	2,619	0
2	Habaraduwa	274	90	17,066	14,782	1,284	579	2
3	Hikkaduwa	1,342	-	59,973	59,973	3,164	2,236	14
4	Ambalangoda	59	132	4,343	2,906	348	176	3
5	Balapitiya	196	84	16,000	15,490	1,167	1,996	5
6	Benthota	18	-	1,000	333	8	74	-
Total		2,805	306	129,892	121,926	7,032	7,680	24

Fig. 6-3-2-6 Damaged house near the coast (Hikkaduwa)

Fig. 6-3-2-7 Tent set up on the discharged sediment (Hikkaduwa)

The situation of the area was now shifting from the emergency relief phase to the recovery phase. It was observed that construction of the temporary houses and permanent houses had started. Disposal of a massive amount of debris was considered as one of the big issues to be quickly solved.

5） Conclusion

The successful development of a Tsunami Early Warning System in the areas surrounding the Indian Ocean requires considerations on how to ensure effective delivery of risk information, and to educate the population as to what action to take in case of warning. The survey result will be of great help for the consideration in Sri Lanka. The result will also be applied to the future study for other areas and countries.