Final Report

Multi-national Mission to the Tsunami Affected Areas in India

8-13 April 2005

1. Introduction

1.1 Introduction of ADRC

The Asian Disaster Reduction Center (ADRC) was established in July 1998 with a mandate to facilitate multi-national cooperation for disaster reduction in the Asian region. Along with 25 member countries, ADRC pursues activities leading to further prosperity and safe, peaceful, and comfortable lives in Asia.

ADRC also addresses issues of concern related to disaster reduction from a global perspective, in cooperation with international organizations and initiatives, such as the Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UN/ISDR), the United Nations Office for the Coordination of Humanitarian Affairs (UN/OCHA), UNESCO, the United Nations University (UNU), the United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP), World Meteorological Organization (WMO), and the World Health Organization Regional Office for the Western Pacific (WHO/WPRO).

1.2 Brief description of the survey mission

ADRC has always been keen to learn from the lessons gained from disasters in member countries and strengthen capabilities for disaster reduction of the countries in the Asian region. However it is often troublesome for the disaster affected areas to receive missions from abroad at the time of emergency. Furthermore, there are some constraints to dispatch survey teams to disaster affected areas due to political, socio-economic or cultural reasons. Considering the above, the multi-national mission provided a valuable opportunity for ADRC member countries.

In the past, ADRC organised a multi-national mission to Gujarat after the devastating earthquake occurred in 26 January 2001, as part of the cooperative project with member countries. In April 2005, after the catastrophic Tsunami which destroyed the coastal areas of the Indian Ocean countries including India on 26 December 2004, ADRC conducted a multi-national mission to the Tsunami affected area in India, in active cooperation with the Ministry of Home Affairs, Government of India, as well as other member and advisor countries.

The mission visited the severely affected districts of Kollam and Alleppey in Kerala, Kanyakumari, Nagapattinam, Cuddalore, Kancheepuram and Chennai in Tamil Nadu and Karaikal and Pondicherry divisions of the Union Territory of Pondicherry.

The objectives of the mission were: 1) to learn the lessons from the Tsunami disaster, 2) to develop a road map for mitigating future Tsunami disasters, 3) to provide knowledge and expertise for reconstruction and rehabilitation for Tsunami affected areas, and 4) to learn about changes/reforms planned to be undertaken in disaster management system following the Tsunami experience by the central and local governments.

The multi-national mission to Tsunami affected areas in India led by ADRC was conducted from 8-13 April 2005. The members of the mission were from Armenia, India, Japan, Singapore, Sri Lanka, Tajikistan and ADRC. Detailed list of the members of the mission is shown in the following section.

1.3 Profile of the members

Among the ADRC member countries, nine officers and experts from Armenia, India, Japan, Singapore, Sri Lanka and Tajikistan joined the mission. A representative from France and two from the United States of America (USA), as advisor countries, participated in the activities in Delhi.

Country	Name	Organization
Armenia	Dr. Alvaro Shavarsh ANTONYAN	President, Armenian National Survey for Seismic Protection (NSSP)
India	Mr. Amir Ali KHAN	Senior Research Officer, National Institute of Disaster Management, Ministry of Home Affairs, Govt. of India
India	Mr. Shekhar CHATURVEDI	Research Associate, National Institute of Disaster Management, Ministry of Home Affairs, Govt. of India
Japan	Dr. Michiko BAMBA	Researcher, Earthquake Disaster Mitigation Research Center (EDM), National Research Institute for Earth Science and Disaster Prevention (NIED)
Japan	Dr. Kenji MAEDA	Head of the Fourth Research Laboratory, Seismology and Volcanology Research Department, Meteorological Research Institute
Singapore	Maj. YAP Kok Boon	Division Commander, 1st Civil Defence Division, Singapore Civil Defence Force
Singapore	Cpt. GOH Boon Han	Senior Instructor, Civil Defence Academy, Singapore Civil Defence Force
Sri Lanka	Mr. Kalu Gamage WIJESIRI	Assistant Director, National Disaster Management Centre
Tajikistan	Ms. Nigina Sulaymonovna ALIEVA	Project Analyst, United Nations Disaster Risk Management Project, UNDP
France	Mr. Pierre-Andre LHOTE (Delhi only)	Attache for Science and Technology, French Embassy in India
USA	Mr. C. Balaji SINGH (Delhi only)	Project Manager, Disaster Management Unit, Office of the Social Development, US Agency for International Development (USAID)
USA	Mr. David A. HEESEN (Delhi only)	US Agency for International Development (USAID)
ADRC	Ms. Etsuko TSUNOZAKI	Senior Researcher, ADRC
ADRC	Mr. Takuzo ISHII	Senior Researcher, ADRC
ADRC	Ms. Tae WATANABE	Administrative assistant, ADRC

2. Background

2.1 Outline of the Tsunami disaster in the Indian Ocean

On 26 December 2004, the world's fifth-largest earthquake of the magnitude of 9.0 on the Richter scale occurred at 00:58 hrs GMT, off western coast of Northern Sumatra, Indonesia. The epicentre was some 10 km under the seabed and 250 km south-southwest of Banda Aceh, Indonesia. The earthquake triggered a series of powerful Tsunami reaching more than 10 meters high, and these Tsunami waves moved through neighbouring countries of the Indian Ocean at 500 km per hour wrecking coastal areas in Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka, Thailand, and even some countries in eastern Africa, Kenya, Seychelles, Somalia and Tanzania. The Tsunami washed away homes, buildings, roads and bridges, causing massive human sufferings.

The Tsunami was one of the deadliest disasters in modern history, resulting in about 300,000 people's loss of lives, one million homeless people and many hundreds of thousands losing their entire livelihoods. Various recovery efforts have been undertaken in these affected areas by donor countries, international organizations, international and local NGOs and UN agencies.

2.2 Outline of the impacts of the Tsunami in India

According to the CRED-EMDAT, the Indian Ocean Tsunami devastated the areas of coastline in India, namely Tamil Nadu, Andaman and Nicobar Islands, Andrhra Pradesh, Kerala and Union Territory (UT) of Pondicherry, causing 16,389 people killed, 6,913 of injured, 647,599 of affected and US$1,022,800,000 damage. The highest human losses were in Andaman and Nicobar Islands and the state of Tamil Nadu. Relief effort in response to the Tsunami in India was 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, and 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.

3. Places of visit

3.1 National Governments

3.1.1 Ministry of Home Affairs (NDM: National Disaster Management Division)

The NDM is the central authority which coordinates and ensures the smooth flow of all relief and rehabilitation efforts for disasters. Since the Tsunami Disaster, the NDM has taken on the extra roles of coordinating for all national disasters except for drought. Their command and control capabilities have greatly expanded with the setting up of the 'state of the art' communication networks and establishing a command post within the Ministry of Home Affairs. Cooperative working relationships with various countries on information and experience sharing on disaster management have also been established. The Central Government of India has also made provisions for the NDM to obtain relief funds directly from the country's consolidated fund without having to seek approval in the Parliament which is often time consuming and thus, cutting down the lead time for crucial supplies to reach the victims who need them the most.

The NDM is also currently in the process of setting up an early warning system in the Indian Ocean to warn the countries along the coast of any impending Tsunamis and to allow the people ample time to evacuate.

3.1.2 NIDM (National Institute of Disaster Management)

The NIDM is staffed with many researchers and academics with the aim to explore and seek the optimum mode of disaster management. Their studies include lessons learnt from past disasters, analysing them and passing on to states and districts for them to build up the necessary capacity in enhancing their ability and preparedness to handle a disaster.

Prior to the Tsunami disaster, little was known about Tsunami in India and nobody was aware of the devastation that such a disaster would bring. The NIDM has gone into extensive research on the topic of Tsunami and Tsunami warning systems. India is now much better equipped and prepared for any such Tsunami in future.

3.1.3 Roles and responsibilities of NDM (Ministry of Home Affairs) and NIDM

All natural disasters (except drought which refers to the Ministry of Agriculture) are legally managed by the Ministry of Home Affairs, which in its turn coordinates the activities of various ministries and provides support to them. The Ministry of Home Affairs, being the nodal Ministry, has been coordinating the relief, response and rehabilitation measures with the affected States/ UTs, the Central Ministries/Departments providing emergency support including the Ministry of Defence and Armed Forces, other States and NGOs. The Ministry is coordinating the mobilization of resources and their dispatches and other logistics. (source: http://www.ndmindia.nic.in/Tsunami2004/mha.htm).

The National Institute of Disaster Management (NIDM), under the Ministry of Home Affairs, Government of India, is an Institute for policy advocacy and capacity building in the area of disaster management in the country. Founded in 16 October 2003, the Institute has been conducting work in such areas as disaster mitigation, preparedness, response, rehabilitation and reconstruction using a multi-disaster risk management framework adopted by the Government and other stakeholders.

3.1.4 Action and measures taken by the Government of India during and after the Tsunami

The Government of India down to the state and district levels have been caught by surprise by the Tsunami, but regardless, a quick response was mobilized to effectively address the situation. The Ministry of Home Affairs, as the main coordinating body, took lead in all activities related to response and relief through the central control room, as well as through the visits to the affected areas. The Government allocated US$ 112 million to address the immediate needs of the population, with no limit identified. Financial assistance and relief material to families affected most was provided by the Government.

On the state level, State Relief Commissioners were appointed to coordinate rescue and relief efforts through the District Collectors with active involvement of the police, fire, rescue, medical and health services, national army, air force and other related departments and bodies. The priority for the local

authorities was to meet the immediate needs of the population, such as with the provision of shelter, clean water, electricity and prevention of outbreak of infectious diseases.

The Government of India did not make any request for international assistance as it had enough capacity and resources to handle the situation nationally. For the rehabilitation and reconstruction phases a Planning Commission has been established at the Government level, which includes the UN, ADB and World Bank representatives. At this stage, the Ministry of Home Affairs is not as actively involved, as its mandate includes more immediate relief and response activities. The Planning Commission would work on the development of a comprehensive reconstruction plan of the affected infrastructure and long term rehabilitation of the affected population. The plan will be finalized and implemented by the local governments, with active involvement of the local population.

The longer-term objective of the Government of India is to develop a comprehensive Early Warning System for Tsunami (following the Japanese model of EWS), which is planned to be in place in 2 years (2007). The system will be owned and managed by the Government of India.

3.2 State and Union Territory Governments and District Administrations

3.2.1 Kerala

According to the Government of India, in Kerala 171 deaths were reported,: in Kollam district 131 deaths were reported, in Alappuzha – 35 deaths and in Ernakulam – 5 deaths were reported (source: *UN Country Team India Report, March 2005*).

3.2.1.1 Kollam

Government officials said that the third Tsunami attack brought damages to the villages. Kollam was relatively spared from the impact of the Tsunami comparing to the area on the east coast. Main infrastructure was found intact with low number of fatalities. More than 50% of the deaths among 131 deaths in this district were seen in the area that was surrounded by the sea on three sides, and there is a path to be connected with other area on only one side. Many deaths were seen in the area where there were no sea walls. Six sea walls were damaged due to the Tsunami.

Regarding the reconstruction of houses, the state provides land behind road distant from the coastlines. The land for 600 families was prepared by the State of Kerala. Financial aid to construct houses was provided by NGOs only if houses are constructed within the regulated zone distant from the coastline. Local government also prepared a plan of residential buildings for Tsunami victim's rehabilitation. It is designed to be Tsunami-proof.

3.2.1.2 Alappad

Prior to the Tsunami, the houses stood in the limited space near the coastline in this village, therefore, this village was exposed to the Tsunami risk. Most of them were either totally or partially destroyed by the waves. However, it is assumed that damages were mitigated as this area was protected by sea walls and many palm trees. There are some houses close to the coastline remained without serious damage. Sea walls remained partially damaged or collapsed.

Temporary shelters for victims were constructed well in the area close to the coastline. The village has very limited space as it is located between the sea and backwater. Reconstructed houses will be located behind the backwater distant from the coastline.

3.2.1.3 Alappuzha (Alleppey)

Casualties are concentrated in certain areas as some of the villages of this municipality are surrounded by water and there is only one road and one bridge that connected the area with other areas. New road and bridge are planned to be constructed by the government. Well constructed temporary shelters were provided to the affected residents.

3.2.2 Tamil Nadu

In Tamil Nadu over 7,983 deaths were reported: the worst affected was Nagappathinam, where about 6,051 people died. Over 824 people died in Kanniyakumari and 612 deaths were reported in Cuddalore (sources: *UN Country Team India Report, March 2005*).

3.2.2.1 Kanniyakumari

In Kanniyakumari, damages were serious. About 10% of the total population of the district were affected (over 800 deaths were reported), and many buildings and properties to sustain livelihood of people were damaged. Many fishing boats and agricultural lands were damaged, which affects the economy of the district. One bridge recently constructed was washed away. The famous tourist spots built out at the sea were also attacked by the Tsunami. Fortunately, visitors were evacuated to the higher places and there was no human casualty although many tourists were stranded in the aftermath of the Tsunami. Helicopters were deployed for evacuation.

Rescue and relief operations were deployed by the government with the cooperation of NGO groups. Lifelines including water and electricity have been supplied or put into place at the earlier stage.

District government emphasized the importance of infrastructure and warning system. Construction of sea walls is planned in this district for future disaster mitigation.

A total number of 3,827 shelters were built in relief camps by the Government and NGOs to relocate the affected population. The relocated families were provided with food commodities, clothing, drinking water and medical supplies. The number of reported affected families is 43,804 or 187, 650 people. An orphanage was founded by the government for the children who lost their families; orphaned adolescent girls will be placed in the special care home, where they will be given vocational training for their future livelihoods.

3.2.2.2 Cuddalore

This district was also damaged seriously with more than 600 deaths and 10,000 damaged houses. Fishing boats and net, and farm lands were damaged heavily, thus, it will take a long time to recover the livelihoods of the people. The area protected by sea protection wall was not seriously damaged.

Local government officials were quick to react, and the displaced residents were housed in well constructed temporary shelters with proper sanitation and good hygiene conditions. For 20,079 affected families in this district, a relief package consisting of cash allowance, food and commodity, was distributed by the Government during February – April 2005. A large number of people have been affected indirectly, through damages to their sources of income and livelihoods, such as agricultural crops and lands. A total of 253,420 hectares of agricultural land was damaged, affecting around 3,977 farmers.

According to the government officials in the district the largest challenge during the aftermath of Tsunami was the quick mobilization of response, which involved such issues as:

- Identification of affected population of the disaster;
- Providing livelihood support within a short period of time;
- Maintaining communication with all remote villages;
- Organization of systematic relief within the villages (coordination of NGO support, relations with media, other delegations, effective man management, etc.); and
- Identification of suitable areas for temporary shelters.

One of the long-term issues that was mentioned during the discussion was the identification of areas for permanent housing, as the new areas often do not satisfy the needs of the fishermen community who need to live and work by the sea.

3.2.2.3 Nagappathinam

Nagappathinam is one of the most devastated districts in India and sustained the highest number of casualties. Authorities were quick to react and no epidemic broke out despite the large number of deaths. Victims of the Tsunami also had their basic needs catered for promptly thanks to the swift action of the local government.

Land use along the coastline is regulated. Reconstruction of houses on the land within 200m from the coastline is not allowed. Damaged houses located on the land between 200 to 500m from the coastline are subsidized the cost for repair. Totally damaged and collapsed houses will be relocated on the land beyond 500m from the coastline.

As noted by the District Collector during the discussion, preparedness to disasters can make a significant difference: not only the general population, but even the management staff of the district administration were caught unaware of Tsunami. Flexible financial support from the Government was very important in conducting relief work especially during the first several days after the disaster stroke. Coordination meetings were held with all relevant departments and units to better organize relief and response efforts.

3.2.2.4 Kanchipuram

This district is also devastated heavily. A total number of about 100,000 were reported affected; about 60,000 evacuated; 128 people killed and 28,792 relocated to 44 relief camps. Many properties for fishing were also damaged.

Rescue operation was conducted properly, such as removal of bodies, medical treatment for the injured and setting up of relief camps for victims. The government provided supplies such as water, food and so on for the relief.

The following assistance has been provided to the victims of the disaster:

- A package of Rs. 4,912.00 has been distributed to 7,093 families. It includes Rs. 2,000 for damaged houses/huts, Rs. 1,000 for provision materials, Rs. 1,000 for utensils; 60 kg of rice, 3 litres of kerosene and clothing;
- A second package of Rs. 2,912.00 has been provided to 2,289 families who lost their livelihoods. The package included: Rs. 1,000 for provision material, Rs. 1,000 for utensils; 60 kg of rice, 3 litres of kerosene and clothing;
- Besides, a sum of Rs. 100,000 each has been given to 103 legal heirs of the deceased, who were killed by the Tsunami.

Temporary shelters were provided by the government and NGOs with proper sanitation and good hygiene conditions. The government proposed to construct new houses to all affected families on the land 200m away from the coastline at a cost of Rs.1.50 lakhs per house. Houses are designed to be earthquake, cyclone and Tsunami resistant. The construction will be taken up by NGOs.

The government emphasized the importance of recovery of livelihood and plantation of mangrove along the coastline for the next step.

3.2.2.5 Chennai

According to the Chennai District Collector, as soon as the warning about the earthquake has been received, some of local population did not enter the sea and stayed at least 200 meters away from the coast, taking precautions. Unfortunately due to the low awareness about Tsunami, the majority of people did not take these warnings seriously.

The number of reported deaths in Chennai District was 158. The families of deceased were paid Rs. 10,000 of cash allowance. Monthly relief package to the affected families included: Rs. 1,000 as cash doll and other commodities as rice, kerosene, salt, sugar, tea, etc. The package was provided to 44,359 people during February – April 2005.

The economic loss is estimated $8 million. As Chennai is the largest city among the affected areas, various groups including agriculture, fishery, small business sectors and small industries are affected. 10,000 ha of the agricultural field were damaged by sea water, and it cannot be used for at least three years.

Children and young women were provided a special care including education and psycho-social support. Land use near the coastline is not allowed, but it is not restricted strictly.

Permanent houses are encouraged to be located far from the coastline, but people have started staying close to it although people were initially scared and moved away from the coastline. Although there is a regulation for the coastline land use, it is not enforced strictly.

To recover the livelihood of the victims, the harbour has been repaired and compensation for the damage on boats and nets are provided. However, the government only compensates partially and

victims need to loan money for the rest.

Lessons learnt from the disaster are raising awareness of the importance of disaster risk reduction, coordination between groups and organizations, and preparedness for disaster. Obstacles identified by the government are dealing by various groups including NGO groups and the private sector. Database of damages and geographic information needs to be developed.

3.2.3 Union Territory of Pondicherry

In the Pondicherry 591 deaths were reported and 74 were reported missing from the districts of Pondicherry and Karaikal.

3.2.3.1 Karaikal

In Karaikal, 484 deaths were reported and 66 missing (sources: *UN Country Team India Report, March 2005*). This district was also seriously devastated. A total of 60,697 people were reported affected in Karaikal District. Around 15,321 houses were damaged and 15,000 people were evacuated to 22 relief camps, and other administrative buildings. Other damages include: 790 Ha of crops, 3,500 cattle/livestock loss; overall damaged in the District is estimated to be around 270 Crores. Rescue and relief operations are considered conducted smoothly.

To prevent the outbreak of waterborne and other diseases, the affected population was provided with safe drinking water and bleaching powder; medical teams were mobilized to meet the needs of the relocated population in camps. 2,210 polio vaccines were given to children below 5 years of age; typhoid vaccination was given to 12,500 persons in affected villages. Food and non food items were provided to the affected population by the Government and NGOs. Regarding financial support, Rs. 1.00 Lakh of financial assistance was given to the kin of the deceased and another 5,000 Rs has been given for funeral expenses. Rs. 10,000 of compensation was distributed for damaged houses and properties for 4,040 families. Trained social workers of various NGOs were engaged in the process of long term counselling.

The main issue faced during the relief stage mentioned by the District Collector was difficulty in identifying beneficiaries as well as legal head of the households while assistance distribution. The District Collector emphasized the importance of establishment of bio fencing or a sea wall along the coastal line. As he noted, the experience of Tsunami showed that these types of protection do reduce the impact of disaster on livelihoods.

3.2.3.2 Pondicherry

Damages of this district were also severe.

Local officials were quick to react, and displaced residents were housed in well constructed temporary shelters with proper sanitation and good hygiene conditions. The government identified the land to relocate affected families beyond 500m from the coastline.

4. Observations

4.1 Response & Preparedness (Contingency plan)

Response and relief activities of Indian governments (national and local) were considered mostly appropriate overall. However, improvements could be made for enhanced emergency operations.

4.1.1 Response and evacuation

Due to the lack of knowledge about Tsunami disaster, response and evacuation activities were difficult. Local governments, residents, private companies were all ignorant about Tsunami risk and disaster response. In addition, no concrete evacuation or response plan was in place prior to the Tsunami disaster due to the complacency and ignorance of the people to the impending danger. More people would have been saved if prior cautions had been taken.

4.1.2 Search and rescue

Search and rescue activities seemed to be operated quickly in an organized way in some municipalities although there was no guideline or procedure to be followed. (Further research is necessary to discuss this issue.)

On the other hand, search and rescue capabilities were limited, especially at the district level. The district government had limited specialised rescue equipment and trained rescue personnel. The Central Government has began training thousands of specialized rescuers with underwater diving capabilities and are ready to be deployed at short notice to areas of disasters.

4.1.3 Awareness of Tsunami

Awareness of Tsunami was very low among government officials and residents. They had very limited or no knowledge about Tsunami before the disaster, never having heard of the term “Tsunami” until hours after the killer waves had hit the shores of India.. After the Tsunami disaster, both government officials and residents became aware of Tsunami and even scared of it.

4.1.4 Education and training

Before the Tsunami disaster, education and training programmes and systems did not seem to be fully developed in any region. The importance of education and public awareness about disasters and on what to do during a disaster can never be emphasised enough.

4.1.5 Early warning system & communication mechanism

There was no early warning system developed before the Tsunami disaster. There was also no communication mechanism to disseminate information to residents. At the earthquake on 28 March 2005, although there is no systematic operation, governments tried to warn people using telephones, mobile phones and loudspeakers.

It was observed that after the Tsunami disaster, an efficient and effective communication system was set up and information could be conveyed swiftly from the central government all the way down to the villagers.

4.1.6 Activities of aid organization

Many NGOs were very keen to help out in the wake of the disaster and played important roles to support recovery of livelihood of people whose houses or properties were damaged. However, the sudden influx of the NGOs proved to be quite handful for the district officials to manage, in addition to their relief operations. Nonetheless, they were quickly being organised and aid items were delivered to where they were needed the most.

The activities of NGOs are essential for the recovery of the communities. Their activities vary from building shelters and providing goods to providing financial aids.

4.1.7 Hazard map

Hazard maps had not been developed for Tsunami in most regions because nobody had ever anticipated that they would be exposed to such a disaster.

4.1.8 Compensations, subsidies and supplies

Essential supplies and basic healthcare were made easily available to the people for their basic needs and to prevent the outbreak of any epidemics. Compensations, subsidies and supplies for the properties damaged and human casualties were provided including money, clothes and daily goods by the governments and NGOs.

4.2 Engineering Issues

4.2.1 Design and structure of buildings

Many houses and buildings built near the coastlines did not adhere to the requirements of the building authority in India and not of the design for Tsunami-proof. As building regulations were not strictly enforced in the rural parts of India, it resulted in many houses being built in a haphazard manner and also not structurally strong.

4.2.2 Infrastructure (including structural mitigation measures)

There were extensive damages of roads and bridges. Many small villages were only served by a single road or a single bridge and the destruction of such infrastructure by the Tsunami meant that these villages were essentially cut off from the rest of India. The Indian army was mobilised to reconstruct temporary bridges and roads in the shortest time possible to facilitate the flow of aid to the people in those areas.

Many public buildings including schools were also damaged. Sea walls proved to be effective to mitigate damages on houses and buildings although many sea walls were damaged.

4.2.3 Lifeline

There were damages to electricity and water supplies in most of the affected areas. Electricity was restored in early stage in most districts. Water was supplied by tank cars or restored in early stage in most districts.

4.3 Rehabilitation & Reconstruction

4.3.1 Livelihood restoration (fishery, agriculture, etc.)

State and district officials were assigned to look into and solve the problems faced by the people in various industries. Main industry of Tsunami victims are fishery and agriculture. As many fishing boats were damaged, it is now difficult for them to make their living by themselves. It will be necessary to provide assistance to repair or purchase fishing boats and nets for the rehabilitation of livelihood of fisherman and a scheme was developed. Agricultural land and livestock were also damaged. Agricultural land can not be used for at least three years due to the sea water. Alternative source of income needs to be found for victims who were engaged in agriculture.

4.3.2 Temporary / intermediate shelters and housing

Temporary shelters were constructed very quickly by both the governments and NGO's for a large number of the affected people. As temporary shelters were built by different organizations rapidly, there is no uniform design and quality control. Prior to the construction of such shelters, schools and other government buildings were used as temporary shelters.

4.3.3 Relocation & reconstruction of permanent housing

The Indian government took the opportunity to enforce and ensure the compliance of building codes and introduced a scheme to provide houses to the people who were willing to stay 200m away from the sea. Government launched a policy that permanent houses within 200m from the coastlines will principally be relocated to safer places. Damaged houses reconstructed on the land acquired by the governments beyond 200m from the coastlines are provided subsidy by NGOs or governments.

4.3.4 Health and mental care

Great emphasis was placed on health and mental care. A large number of doctors were despatched to the affected areas to treat the injured, help maintain the basic level of hygiene and prevent the outbreak of any epidemics. Counsellors were also brought in to talk to the distraught and help them manage the emotional trauma of losing loved ones and coping with the aftermath of such a massive disaster.

As most of the affected people fall in poverty class, they cannot afford to pay heal care fees by themselves. They depend on health care services provided by NGO groups.

4.3.5 Vulnerable people (women, children, elderly people)

Women, children and elderly people suffered from the disaster, and many casualties were found among those vulnerable people. Vulnerable groups were identified by the government and special care was rendered to them so that they will not be left out in the cold or exploited by the unscrupulous in the wake of the disaster.

4.4 Comprehensive approach to disaster risk reduction

4.4.1 Risk and vulnerability assessment

No risk and vulnerability assessment on Tsunami was carried out prior to the Tsunami. For earthquake, cyclone and flood, result of risk and vulnerability assessment was conducted but the result has not been effectively used for disaster management planning. Identifying and helping the high risk and vulnerable groups helps reduce the adverse effects of disasters.

4.4.2 Information management

There was no organized system to collect, classify, and disseminate information at local government level. An effective information sharing and communication system would help ensure that critical information is transferred to and understood at all levels

4.4.3 Development plan (including land use planning and management)

Not many local governments had a master plan or comprehensive development plan for development planning. A few municipalities developed a land use plan and development plan although they are not comprehensive.

In most local governments, land use within 200m from the coastlines was restricted only after the Tsunami disaster. Land use regulation partly responds to the national coastal law that require the regulation of land use within 500m from coastlines.

A master plan for development should be drawn up to set aside eco belts along the coast for shielding purposes and designating proper areas for residential and agricultural use that would reduce the damage caused by any similar disasters in future.

4.4.4 Enforcement of standards and regulations

Regulation on use of land was not enforced strictly either although most of the district governments restricted the use of land near the coastlines after the Tsunami disaster.

The authorities should play a more proactive role in enforcing the building codes and taking action against defaulters. Construction process of earthquake, cyclone and tsunami proof design houses should be monitored.

4.4.5 Community empowerment

NGOs play important roles to empower communities resilient to disasters. Efforts of the governments to develop plans or programmes to raise awareness of people towards disaster or provide information and technology need to be improved. It is worthwhile to note that the communities themselves rallied and formed self-help groups and vigilantes to better prepare themselves for future disasters.

4.5 Experiences in the wake of Tsunami warning on 28 March 2005 due to M8.2 earthquake

The experience of Tsunami of December 2004 has definitely raised the awareness of the population as well as the government officials involved in disaster management about this particular disaster. As soon as an earthquake warning has been received from Delhi on 28 March 2005, all the villages in the coastal line were informed about the warning and massive evacuation of people started although the system has not been well developed. The local population took the warning seriously and readily evacuated from their houses swiftly and in an orderly manner. Government officials were also quick to open up schools and public buildings as evacuation sites.

5. Recommendations of the Mission

Based on the interactions with Government officials and observations of the affected areas, the following major recommendations can be drawn:

5.1 Response & Preparedness (Contingency plan)

5.1.1 Response and evacuation

A comprehensive contingency plan, with local, state, national and international resource allocation, must be put in place and proper communication with the villagers established in order to achieve a smooth and swift evacuation in times of emergencies Shelters or places for the evacuation should be planned in advance and training needs to be conducted. The management of logistics, human resources and information should be improved by developing a system and guidelines for efficient and effective emergency operations.

5.1.2 Search and rescue

Preparation is necessary for search and rescue operation including training of experts and preparation of instruments.

The response time for search and rescue is the most critical factor and the survival rates dwindle as time passes from the time of incident. It is crucial to get the rescuers to the disaster site in the soonest possible time so as to increase the chances to save survivors.

5.1.3 Awareness of Tsunami

Public education and awareness are of utmost importance. Education of the masses on the procedures to take when faced with an emergency helps to greatly reduce fatalities.

After the 2004 off Sumatra earthquake almost all residents who suffered any kind of damage know the word ‘Tsunami’ and have learned that there might be a possibility of being attacked by destructive tidal waves after a large earthquake. The majority of people living along coastal area are well aware of Tsunami at present, and the fact that the evacuation against the 2005 March earthquake off Sumatra was successfully and smoothly conducted proves the awareness of Tsunami among residents. So the first stage of awareness of Tsunami is achieved through the actual experience of Tsunami. What is important

in the next stage is to keep the awareness of Tsunami through long years beyond generations that may be more difficult to achieve than the first stage. To keep the knowledge of Tsunami continuous efforts of education and training are crucial.

5.1.4 Education and training

Education and training for Tsunami disaster are necessary for government officials and residents. Proper education and training of the public will help them to be aware of what to do in times of emergency. Wide range of educational materials including video films, posters, booklets, visual signs etc. should be published and installed in coastal areas and islands at most risk.

5.1.5 Early warning system & communication mechanism

Taking into consideration the regional features of South Asian countries of Indian Ocean basin and the level of seismic and tsunami hazard, a comprehensive and people-centred Regional Early Warning System should be created and operated.

It is very important to develop a mechanism to collect and disseminate the detailed and accurate information about the size (height) and arrival time of Tsunami. False alarm or Tsunami attack without alarm make people distrust the Tsunami warning system which results in the inappropriate reaction of people even if they receive a warning. Tsunami height at each location differs depending on many factors, for example, Tsunami source estimation, wave length of Tsunami, bathymetric conditions, direction of Tsunami propagation, and so on. Once the warning system is constructed, it is necessary to check the reliability of the system. One of the methods to check the warning system is to compare the actual data and predicted values.

The Tsunami data of the 2004 Sumatra event observed at various locations are very valuable because they can be a key to check the Tsunami warning system that will be constructed in the near future. Therefore, to make a database of observed Tsunami, for example, the Tsunami height at many positions, maximum run-up locations, velocity of Tsunami water, arrival time of Tsunami, the first motion of Tsunami, etc. is crucial. It is also important to share the data internationally among the scientists or engineers in order to improve the warning system. Such a database is valuable also for making the hazard map.

Considering the fact that Tsunami is triggered by large scale submarine earthquakes, and some of Armenian NSSP (National Survey for Seismic Protection) seismological stations are incorporated into IRIS and CTBTO global observation networks and register any earthquake on the Earth with high accuracy in real time, it was suggested to use the NSSP stations for Early Warning System of Indian Ocean basin countries.

5.1.6 Activities of aid organization

With many aid organizations coming forward, the challenge is to coordinate their efforts to ensure minimal wastage and maximum aid received by the affected.

5.1.7 Hazard map

Hazard map needs to be developed, to be distributed to public and to be used in disaster management planning. However, it will need the national and international efforts to develop Tsunami hazard maps.

High risk areas should be properly identified on these hazard maps and particular attention should be paid to the building controls in these areas. Up-to-date Geographical Information Systems (GIS) technology is necessary to develop accurate hazard maps.

In Japan, Tsunami hazard maps are made by national government. The resolution of the maps are not so fine, but enough to overview the attack area of Tsunami. The maps are made for every local coastline and consist of several set of maps corresponding to Tsunami height that will be informed in the Tsunami warning issued by JMA (Japan Meteorological Agency). They are useful for residents to be aware of the possibility of Tsunami attack and make an evacuation plan. Therefore it is highly recommended to make Tsunami hazard maps for all countries where have possibility of being attacked by large Tsunamis.

Urban development should be based on hazard and risk maps, and special Tsunami related building codes, and housing would be made of reliable building materials.

5.1.8 Compensations, subsidies and supplies

Proper records of the population should be kept to facilitate compensations, subsidies and supplies to those genuinely affected by the disaster and to avoid aid lending into wrong hands.

5.2 Engineering Issues

5.2.1 Design and structure of buildings

Earthquake, cyclone and Tsunami proof design of the buildings should be developed. It will be important that buildings are constructed following the details of the design plan. (There is a need for further study to investigate the quality of building construction of India)

Not much damage was observed beyond 500 meters away from the ocean. It was also reported that houses made of bricks and concrete with firm foundation proved to be resistant to the damage. This means that building codes regulations and coastal zone regulations should be enforced.

5.2.2 Infrastructure (including structural mitigation measures)

Construction of sea walls in all the coastlines will be expensive. However, there were evidences of the effectiveness of sea walls to mitigate damages. It will be suggested to construct sea walls where houses are densely built. Greenbelt, such as plantation of mangrove trees should be also considered together with sea walls. Coastal area should be protected by the sea wall or bio fencing, which proved to reduce the impact of Tsunami.

Key access roads and other infrastructure should be made more disaster resistant to avoid entire communities from being crippled and cut off from the rest of India in the event of such disasters.

5.2.3 Lifeline

Restoration of lifeline was operated in early stage.

5.3 Rehabilitation & Reconstruction

Rehabilitation and reconstruction process provides a good opportunity to build disaster resilient community.

5.3.1 Livelihood restoration (Fishery, Agriculture, Industry, etc.)

In rehabilitation and reconstruction of livelihood of victims, sources of income have to be re-established quickly. Damaged fishing boats and nets needs to be repaired or replaced for the rehabilitation of fishery. If the budget is available, governments and NGO groups can provide subsidy for them. If the financial aid for each individual is difficult, subsidy for fishing boats fisherman can share is suggested for the early rehabilitation. One alternative is to provide appliances, such as fishing boats, to the community, not to individuals, to share them in the community. For agricultural land damages, governments need to provide alternative income source until agricultural land are restored.

5.3.2 Temporary / intermediate shelters and housing

Although quality of temporary shelters varies, enough quantity of temporary shelters was provided.

5.3.3 Relocation & reconstruction of permanent housing

It will be effective mitigation countermeasure for Tsunami or cyclone, if governments can successfully relocate houses 500m beyond coastlines. It will depend on how much governments can support reconstruction of housing financially.

5.3.4 Health and mental care

The emotional needs of the victims must be given top priority.

5.3.5 Vulnerable people (women, children, elderly people)

This vulnerable group of people have to be given extra attention as they are incapable of taking care of themselves and are also at risk of falling prey to opportunists who may exploit them and cause them even more sufferings.

5.4 Comprehensive approach to disaster risk reduction

5.4.1 Risk and vulnerability assessment

Risk assessment of the community towards disasters is important for disaster management planning to prepare for and mitigate disaster. National government should support providing the guideline for risk and vulnerability assessment method that local government can manage.

In addition, an accurate risk and vulnerability assessment will help ensure that resources are adequate and efficiently committed to areas where they are needed the most.

Following the Armenian NSSP example it is essential to organize the special multi-disciplinary regional Task Force Team comprised of experienced specialists. Such a team would assess the risk level and make recommendations on forthcoming activities in case of disaster hazard. It is evident that the

major earthquake (M= 9.0) would, with high probability, trigger the devastating Tsunami, and Task Force Team would warn about Tsunami and provide Tsunami counter-measures to avoid the tragic consequences.

5.4.2 Information management

An effective information management will help ensure that crucial information is being transmitted to the stakeholders in a timely fashion.

Development of information management system is recommended. It is important to plan the mechanism how to collect data, organize data and disseminate information. Computer database is an alternative for organizing data although emergency electricity should be prepared to use the computer system under the emergency like power cut.

5.4.3 Development plan (including land use planning and management)

It is highly recommend developing a land use plan based on risk assessment. Use of land should be managed based on land use plan that determines the city design and location of infrastructure and housing development. Land use planning can mitigate disasters in the long term.

5.4.4 Enforcement of standards and regulations

Strict enforcement of standards and regulations has to be carried out regularly to ensure that building codes are being strictly adhered to.

Monitoring is important for the strict enforcement of standards and regulations.

5.4.5 Community empowerment

Due to the rareness of Tsunami event in the region and lack of Tsunami hazard and related risk assessment, the population and, in some cases the local authorities were not expecting Tsunami disaster. However, local authorities provided swift and responsible measures and arranged the temporary shelters and relevant drinking water, food and sanitation for affected people. We were impressed by the vitality of affected people and relentless hope and belief that they are not alone in their hardship, and local authorities did their most to help them. Their hope is empowered by rapid humanitarian assistance of international community.

The followings should be considered for community empowerment;

1. Enhancement of pubic awareness to all hazards at all levels;
2. Strengthening of preparedness at all levels (mock drills, training for the staff, etc.);
3. Establishment of an early warning system and a mechanism for its implementation;
4. Communication system which provides immediate information exchange daily and in times of disaster should be in place (down to the village level);
5. Developing eco-fencing along the coastline and other types of protection;
6. Sustainable efforts to build the capacity for disaster mitigation at all levels;

7. To develop a mechanism for proper identification of beneficiaries and distribution of relief after a disaster;
8. To develop and maintain a common contingency plan on the district level, which would help identify response capacities within each entity active in the area (government and NGOs) and to be utilized at times of disaster;
9. Disaster preparedness and response plans should be in place down to community level (should include evacuation plan, shared duties of community members, etc.);

6. Conclusion

All the members of the delegation brought home many invaluable lessons learnt from the Indian government in the management of disasters. The multi-national mission also provided the opportunity for the members of the delegation from ADRC member countries to interact and learn about the disaster management systems in their respective countries.

A comprehensive, exercised response plan coupled with well established links amongst the central government, local authorities and communities would help minimise the impact of disaster and restore life back to normalcy in the shortest possible time.

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Annex I

Preliminary Report by the Multi-national Mission to Tsunami Affected Areas in India (8-13 April 2005)

Report Format

- Introduction
    - Places visited
    - Methodology
- Objectives
- Observations
- Recommendations
- Acknowledgement
- Members of the Mission

Introduction

The Multi-national Mission to tsunami affected areas in India led by the Asian Disaster Reduction Center (ADRC) based in Kobe, Japan was conducted from April 8-13, 2005. The members of the Mission were from Armenia, India, Japan, Singapore, Sri Lanka, Tajikistan and ADRC. Representatives from France and USA joined the Mission in the activities in New Delhi. Detailed list of the members of the Mission is attached in annexure I.

The Mission visited the severely affected districts of Kollam and Alleppey in Kerala, Kanyakumari, Nagapattinam, Cuddalore, Kancheepuram and Chennai in Tamil Nadu and Karaikal and Pondicherry divisions of Union Territory of Pondicherry. Detailed tour programme of the Mission is attached at annexure II.

The methodology adopted by the Mission during the visit include to meet the officials at

- National level
    - NDM division, Ministry of Home Affairs
    - NIDM
- State and UT level
    - Relief Commissioners
    - OSD (Relief & Rehabilitation)
    - Other officials
- District level
    - District Collectors and other district level officials
    - Sub-division and block level officials

After meeting the officials, the Mission visited the severely affected villages and interacted with the affected communities. Preliminary discussions with officials on tsunami experience in their district prior to visiting the affected areas were very useful in providing insight about the affected communities, activities on response and relief operations, etc.

Objectives

Mission had the following objectives:

1. to learn the lessons from Tsunami disaster
2. to develop a road map for mitigating the disaster
3. to provide knowledge and expertise for reconstruction and rehabilitation for disaster affected areas, and
4. to learn about changes/reforms planned to be undertaken by the local and central governments in disaster management system following the tsunami experience.

Observations

After visiting the tsunami affected areas, the Mission has following observations.

Lack of:

- awareness at all levels about disasters and disaster management in general, tsunami in particular
- preparedness at all levels about disasters and disaster management in general, tsunami in particular
- early warning system for tsunami
- implementation of norms and regulations (including Coastal Zone Regulation (CRZ) norms, building codes and byelaws)
- hazard, vulnerability and risk assessment for disaster management
- appropriate database for disaster mitigation
- holistic approach towards disaster mitigation and management
- sufficient plantation along the coast
- proper mechanism to identify the beneficiaries

Positive observations regarding the activities carried out by all the stakeholders (governments, NGOs, communities, corporate sector, etc.):

- Good response afterwards after initial confusion
- Coordinated efforts involving all the stakeholders
- Enhanced awareness was observed in response to the tsunami warning on 28 March 2005 (due to Sumatra earthquake)
- Tsunami disaster is considered to be an opportunity for improving disaster risk management

Recommendations (drawn by the Mission as well as the relief commissioners and district collectors)

Mission recommends the following

- Enhancement of pubic awareness to all hazards
- Strengthening of preparedness at all levels
- Establishment of an early warning system and a mechanism for its implementation
- Communication system, which enables immediate information exchange daily and in times of disaster, should be in place.
- Redefining of the CRZ norms with practical approach
- Structural measures to be taken up which may withstand the tsunami
- Developing eco-fencing along the coastline
- Sustainable efforts to build the capacity for disaster mitigation at all levels
- To develop a mechanism for proper identification and distribution of relief after a disaster
- To develop and maintain a contingency plan at the district level, which would help identify response capacities within each entity active in the area (government and NGOs) and to be utilized at times of disaster
- Development of appropriate database necessary for disaster mitigation up to village level
- Incorporation of comprehensive disaster risk management in the local development plan

Acknowledgement

The Mission is grateful to:

- Government of India
- State & UT Governments
- District Administration
- ADRC Member Countries and Advisor Countries

13/04/05/Delhi/ADRC

Annex II

Schedule

Multi-national mission to tsunami affected areas of India

Tamil Nadu, Pondicherry, Kerala and Chennai

8 - 13 April 2005

Date	Day	Departure /Stay	Time	Arrival/Visits	Time	Accommodation	Transportation
7 Apr	Thu		PM	Arrival at Delhi		Delhi (The Park)	
8 Apr	Fri	Delhi	AM	Visit to Ministry of Home Affairs (MoHA) and National Institute for Disaster Management (NIDM)			Transfer by coach
			PM	Visit to UNDP		Delhi (The Park)	
9 Apr	Sat	Leave Delhi (JET Airways 9W336)	08:00	Arrival at Trivandrum	12:40		Hotel→Airport (Delhi) Transfer by coach
		Kerala	PM	Visit to tsunami affected villages in Kerala		Trivandrum	Transfer by coach
10 Apr	Sun	Kerala	AM	Visit to tsunami affected villages in Kerala			Transfer by coach
			PM	Visit to tsunami affected villages in Kanniyakumari		Trivandrum	
		Leave Trivandrum (Indian Airlines IC968)	03:30	Arrival at Tiruchirapalli	04:20	Tiruchchirappalli	Airport (Tiruchirapalli) → Hotel Transfer by coach
11 Apr	Mon	Tamil Nadu	AM	Visit to tsunami affected villages in Nagappattinam			Transfer by coach

			PM	Visit to tsunami affected villages in Cuddalore, Pondicherry		Pondicherry	
12 Apr	Tue	Tamil Nadu	AM	Visit to tsunami affected villages on the way to Chennai			Transfer by coach
			PM	Visit to tsunami affected villages in Chennai		Chennai	
		Leave Chennai (Indian Airlines IC802)	20:00	Arrival at Delhi	22:30	Delhi	Airport (Delhi)→Hotel Transfer by coach
13 Apr	Wed	Delhi	AM	Report to MoHA			Hotel→MoHA Transfer by coach
			PM	Free			
				Departure from Delhi			