Hazard Map Development

सत्यमेव जयते

Training of Trainers Program on

Community-based Hazard Map Development

Final Report

Prepared by

Institute for Ocean Management

Anna University, Chennai

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Contents...

Introduction

As the news on the devastating tsunami of 26 December 2004 unfolded, the world was shocked to learn that if people had known about the tsunami disaster and prompt evacuation from this dreadful natural hazard, many thousands of lives could have been saved. It was an alarm bell of the future natural calamities to all over the world. The National Disaster Management Authority [NDMA], Government of India, along with the Asian Disaster Reduction Center [ADRC], Japan supports disaster preparedness programmes through the development of the Community-based Disaster Preparedness Programme in India. The main objective of such programme/workshops is to train the trainers with adequate knowledge on disaster management to reduce vulnerability to natural hazards.

This report provides a comprehensive description of the tools and good practice on community-based disaster hazard map development. It is intended to aid the officials of the Government of India and the NGOs, who in turn would work with the local people to help reduce their vulnerability to coastal and other natural hazards. The methodology and tools developed by the ADRC consists of field visits on Town Watching, community risk and hazard map development of vulnerable areas.

Intended Users

Intended end-users are officials of the Government of India, Non-Governmental Organizations (NGOs), disaster risk management field practitioners and the academic trainers. This would aid in the:

- Enhancement of public awareness to all hazards
- Strengthening of preparedness at all levels
- Establishment of an early warning system and a mechanism for its implementation
- Redefining of the CRZ (Coastal Zone Regulation) 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
- Development of appropriate database necessary for disaster mitigation up to village level

Training of Trainers Workshop

The training of trainers program on "Community-based Hazard Map Development" was a joint effort by the ADRC, Kobe, Japan and the NDMA, with the financial support of UNESCAP. The Institute for Ocean Management, Anna University facilitated this Workshop in Chennai. The workshop was held at the Hotel Green Park, Chennai, India on 20 and 21 December 2007. Experts from both India and Japan provided background information on the various types of disasters and the current awareness initiatives prevalent in these countries.

The formal inauguration of the Training of Trainers Workshop was held on 20th December 2007 at 11:00 hrs. During the Inaugural Session, Prof. D. Viswanathan, Vice Chancellor, Anna University, Chennai, welcomed the gathering. Dr. H. Watabe of the Asian Disaster Reduction Center, Japan provided an overview of the programme. This was followed by the Presidential address of Prof. N. Vinod Chandra Menon, who in his speech highlighted the country's need for disaster preparedness and linked it to the global climate change issues.

His Excellency, The Governor of Tamil Nadu, Thiru Surjit Singh Barnala, Inaugurated this Workshop. The inaugural address of His Excellency the Governor of Tamil Nadu is appended in the Annexure. Dr. Koji Suzuki, Executive Director, ADRC, Japan highlighted the achievements of the ADRC in building resilience in affected communities and also thanked the gathering.

Workshop Objectives

The primary objective of the workshop is to raise the awareness of affected communities through different trainers (government and non-government officials, academicians, service organizations and other interested groups) on various types of natural disasters such as tsunami, storm surges, floods, earthquakes, cyclones etc. The mission is to advance and communicate knowledge on hazards mitigation and disaster preparedness. Using an all-hazards and interdisciplinary framework, the NDMA and ADRC fosters training and information-sharing to government officers, researchers, practitioners, and policy makers from around India. This workshop is a continuation of a series of ADRC's various capacity building projects conducted in Japan, Vietnam and Sri Lanka.

Some Snapshots from the inaugural function…

Prof. D. Viswanathan
Vice Chancellor
Anna University Chennai
Welcomes the gathering…

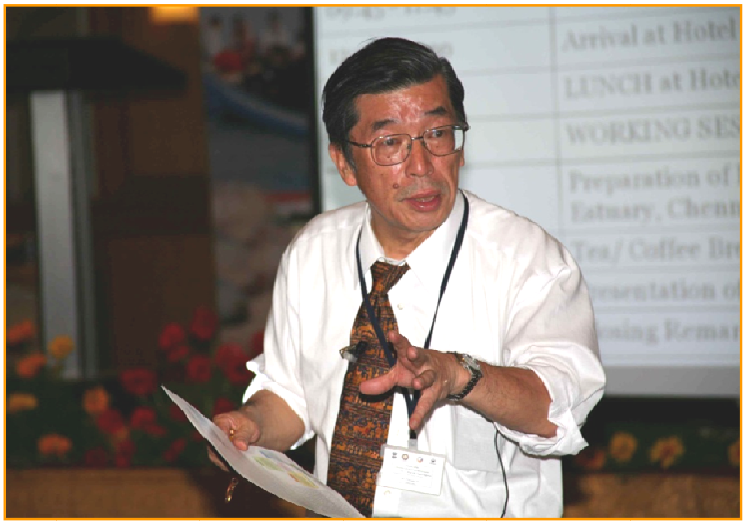
Prof. N. Vinod Chandra Menon
Hon'ble Member
National Disaster Management Authority Government of India
Presides ….

Shri. Surjit Singh Barnala
His Excellency the Governor of Tamil Nadu
Inaugurates….

Participants from the local government and other trainees with responsibility for disaster management in affected areas of Indian Ocean Tsunami of India were introduced to the basic knowledge of natural hazards and methodologies to raise awareness of the community on natural hazards. It is envisioned that the trainers would then impart the methodologies to the local community. In order to develop a hazard map, a "town-watching" program was undertaken at a specific site in Chennai City, India - the *Foreshore Estate*, which is found to be vulnerable and prone to disasters.

Interaction of Participants with Experts...

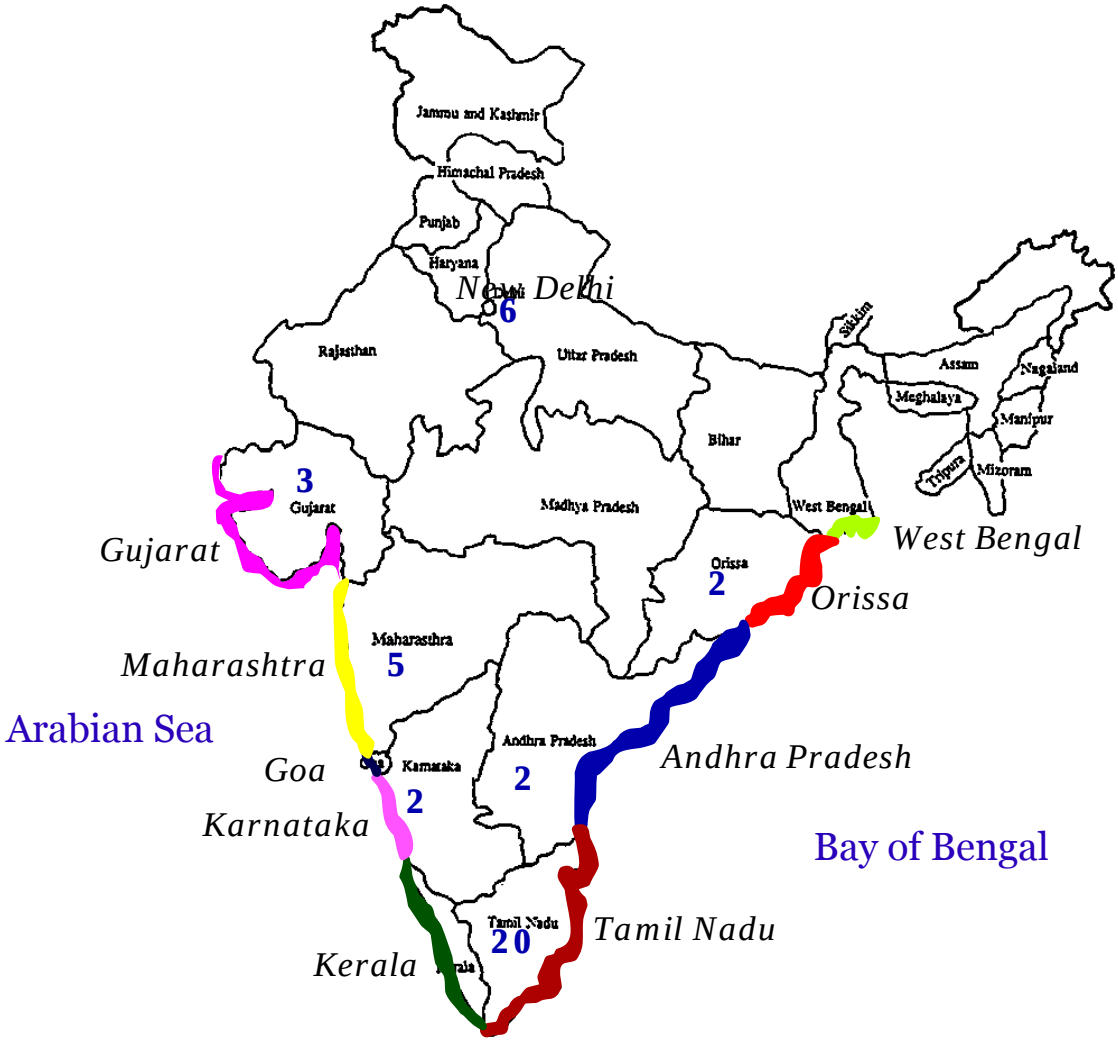
Prof. Yoshiro Ogawa explaining the Field Visit Programme....



Target Group and Beneficiaries

Target group for this workshop included the officials from the State and Central Government, NGOs, and academicians, who will directly benefit from this training programme. Indirectly, the community at large will be benefited through the trained officials after the workshop. Presented below is a map of the coastal states of India and the number of representatives from each of the coastal states.

Participants from the Coastal States of India…..



Note: The numbers in the figure indicate the participation from each coastal state and from the Government of India, New Delhi.

Outline of the Program

The 2-day workshop consisted of the introductory lectures, the Town Watching - field visit and the preparation of a hazard map for a small area of Chennai city, which was affected by the Indian Ocean Tsunami on 26 December 2004. The following is the sequence of events that was followed during the workshop.

Lectures: Description of the basic concepts of disaster management by experts from India and Japan

Field Visit: "*Town Watching*" at a site in Chennai City – Foreshore Estate

Maps: Hazard map preparation using field observations and photographs taken during the field visit

Participants:

i. Officers of the State Government related to disaster management in areas affected by the Indian Ocean Tsunami
ii. Red Cross
iii. Local NGOs
iv. National and State Disaster Management Authorities
v. Officers of the Government of India

The programme began with a series of theoretical lectures by Indian and Japanese experts on natural hazards and disaster risk management. Thereafter, Prof. Ogawa of Fuji Takoha University, Japan, introduced the methodology to develop hazard map to the participants. Community Hazard Map Development is one of the most beneficial and successful methods to learn the natural hazard risks in order to raise community risk awareness. The practical session provided the participants with opportunities to learn development hazard map through the "*Town Watching*" process. A combination of expert lectures, field visit and mapping exercises for preparedness in case of disasters was the most unique aspect of this programme. Figure 1 below provides a comprehensive view of the coastal states of mainland India and the number of participants representing each of these states.

Day 1: 20 December 2007	
Lectures on "Natural Hazards"	
09:00 - 10:00	Registration (During the Registration, Introductory Video Tapes on "Disaster Reduction Museum in Kobe" was displayed for the participants)
11:00 - 12:00	Inauguration
13:30 - 14:30	Hazards Potential and Prevention Activities in the East Coast of India by Prof. R. Ramesh, Anna University Chennai
14:30 - 15:00	Community-Participation for Build Back Better Recovery by Mr. Anil K Sinha, Programme Advisor, International Recovery Platform, Kobe, Japan
15:00 - 16:00	Lesson Learned from Japanese Disaster Experience by Prof. Ogawa of Fuji-Tokoha University
16:30 - 16.45	Procedure of "Town Watching" by Prof.Ogawa of Fuji-Tokoha University
16:45 - 17:00	Discussion and 1st Day Wrap Up

Day 2: 21 December 2007	
Field Visit and Development of Hazard Map "Town Watching" Exercise	
09:00-09:30	Review of 1st Day for the preparation of "Town Watching"
	• Grouping (Each Group Consisted of 10 participants with a Group Leader)
	• Role of Participants (Group Leader, navigator, note-taker Photographer, Presenter)
09:30 - 10:00	Transfer to the Town Watching Site (by bus)
10:00 - 12:30	Town Watching
12:30 - 13:30	Lunch
13:30 - 15:00	Development of Hazard Map by each group
15:30 - 16:45	Presentation & Discussion
16:45 - 17:00	Closing Remarks by NDMA and ADRC

Resource Materials

Since the program intends to train the trainers on the community based hazard map development, supporting tools for trainers have been developed. The actual situation of the town watching and community hazard mapping process on the workshop was recorded, and the results from group analysis have been prepared as a CD for dissemination to the stakeholders (such as local government officers related to disaster management, NGOs and local community leaders) as well as participants.

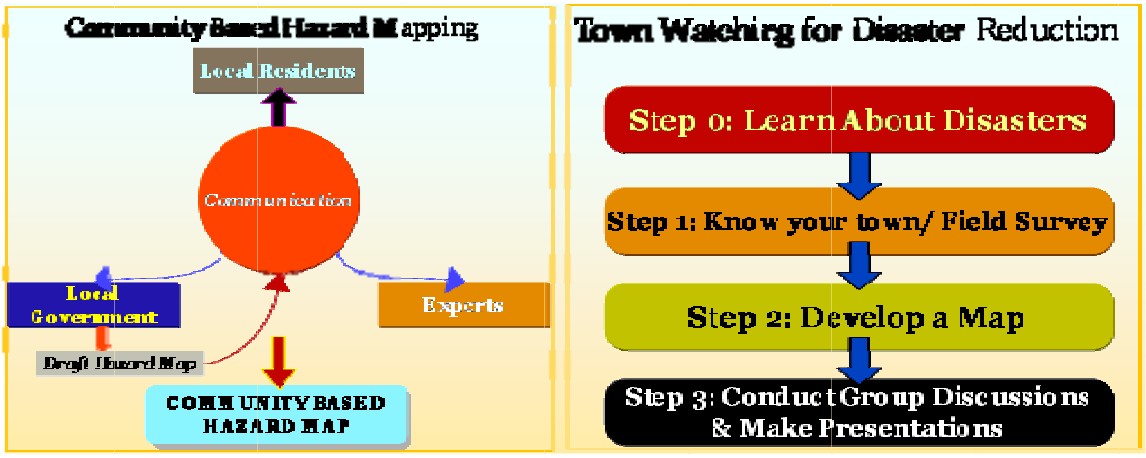
Additionally, a guidebook of the community hazard map development will also be prepared for dissemination.

Outcome of the Programme

- Enhanced understanding on the basic knowledge of natural disasters and disaster risk management
- Method of community hazard map development
- After the training, participants may be disseminate their skills to the local community to strengthen community capability on dealing with natural disasters
- About 40 trainers have been trained through this workshop
- Dissemination of the supporting tools as guidebook and DVD of the "Town Watching" methodology

Background on *"Town Watching"* for Disaster Management

Despite our efforts, the economic losses and the people affected by the natural disasters have been increasing over the recent decades. To mitigate the damages and public awareness, a simplest method was developed by ADRC in the form of "Town Watching" and preparation of *"Community Based Hazard Mapping"* in areas which are more vulnerable to disasters. Therefore, Town watching is considered as a process to prepare a community based hazard map for the disaster reduction. Many Governments distribute hazard maps for the purpose of raising public awareness about risks. A *"hazard map"* provides graphic information on potential natural hazards (seismic intensity, flood inundation depth, landslide prone areas, etc), and on evacuation matters (location of shelters, evacuation routes, potential risk areas, storage facilities for relief materials, etc.).



Source: Ogawa, 2007

Recently "Community Based Hazard Mapping" has been used in some countries as a tool for improving disaster preparedness. This approach focuses on the process of developing hazard maps and through this process, communities will gain enhanced awareness of risks, thereby bridging the *risk perception gap*. Community based hazard mapping has 3 key objectives, which are to:

a) involve local residents in developing the hazard map for their community
b) reflect the opinions of local residents in policies made by their local government, and
c) foster common understanding of risks among local residents, government officials and experts

Definitions of Hazard, Disaster, Catastrophe, Risk and Vulnerability

Hazard:

By its nature, a hazard involves something which could potentially be harmful to a person's life, health, property or to the environment. There are a number of methods of classifying a hazard, but most systems use some variation on the factors of **Likelihood** of the hazard turning in to an incident and the **Seriousness** of the incident if it were to occur. Hazards are defined as *"Phenomena that pose a threat to people, structures, or economic assets and which may cause a disaster. They could be either manmade or naturally occurring in our environment."*

Disaster:

Disaster is a sudden, calamitous event bringing great damage, loss, and destruction and devastation to life and property. The damage caused by disasters is immeasurable and varies with the geographical location, climate and the type of the earth surface/degree of vulnerability. This influences the mental, socio-economic, political and cultural state of the affected area. Generally, disaster has the following effects in the concerned areas,

1. It completely disrupts the normal day to day life
2. It negatively influences the emergency systems
3. Normal needs and processes like food, shelter, health, etc. are affected and deteriorate depending on the intensity and severity of the disaster.

It may also be termed as "a serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of the affected society to cope using its own resources."

The extent of damage in a disaster depends on:

1. The impact, intensity and characteristics of the phenomenon and
2. How people, environment and infrastructures are affected by that phenomenon

Catastrophes

The most extreme hazard events create catastrophes, or disasters, which normally arrive without warning. White and Haas (1975) define a catastrophe as any situation in which the damages to people, property or society in general are so severe that recovery and/or rehabilitation after the event is a long and difficult process.

Risk:

Risk is a measure of the expected losses due to a hazardous event of a particular magnitude occurring in a given area over a specific time period. Risk is a function of the probability of particular occurrences and the losses each would cause. The level of risk depends on:

- Nature of the Hazard
- Vulnerability of the elements which are affected
- Economic value of those elements

Vulnerability:

It is defined as *"the extent to which a community, structure, service, and/or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrain or a disaster prone area"*

Types of Disasters and Hazards

Natural hazards are usually classified based on where they occur on the Earth. Atmospheric hazards are most often weather-related events, while geologic hazards happen on or within the Earth's surface. However, it is important to understand that atmospheric hazards can trigger geologic hazards (such as a thunderstorm producing flooding), and geologic hazards can trigger atmospheric hazards (such as a volcanic eruption producing thunderstorms).

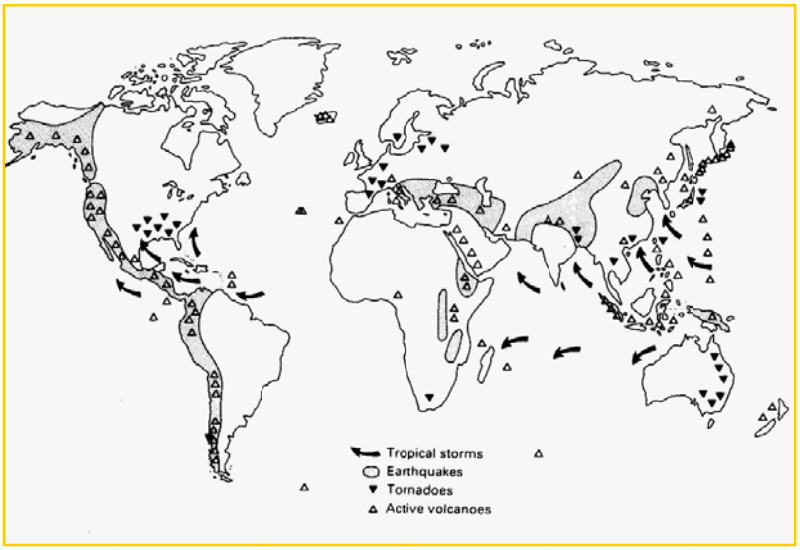
There are various ways of classifying hazards. One useful typology reflects the extent to which hazards are natural, and it recognizes three groups; natural hazards; such as earthquakes or floods, which arise from purely natural processes in the environment and would continue to exist in the absence of people quasi-natural hazards - such as smog or desertification, which arise through the interaction of natural processes and human activities technological (or man-made) hazards - such as the use of toxic chemical pesticides which can seriously pollute food chains and aquatic habitats, or the accidental release of radiation from nuclear installations (like power stations). Such hazards arise directly as a result of human activities.

There is growing anxiety over the increasing number, distribution and impact of the quasi-natural and technological hazards - like the hole in the ozone layer and atmospheric warming caused by air pollution by greenhouse gases. Such hazards are avoidable ... at a cost. For instance, acid rain - which is caused partly by the release of sulphur dioxide and nitrogen oxide gases from chimneys of coal-fired power stations - could be controlled by expansion of nuclear energy production; but that creates its own set of hazards and environmental problems.

GEOPHYSICAL	
Climatic & Meteorological	including blizzards & snow, droughts, floods, fog, frost, hailstorms, heat waves, hurricanes, lightning, tornadoes
Geological & Geomorphic	including avalanches, earthquakes, erosion, landslides, shifting sand, tsunamis, volcanic eruptions
BIOLOGICAL	
Floral	including fungal diseases (like Dutch Elm Disease), infestations (like weeds and water hyacinth), hay fever, poison ivy
Faunal	including bacterial and viral diseases (such as malaria and rabies), infestations (like rabbits and locusts), venomous animal bites

Nowhere on earth is completely safe from the threat of natural hazards. But some places are more hazardous than others (Figure 1). The danger varies from place to place, reflecting many factors (some natural, some people-made).

Figure 1: Areas at high risk from natural hazards



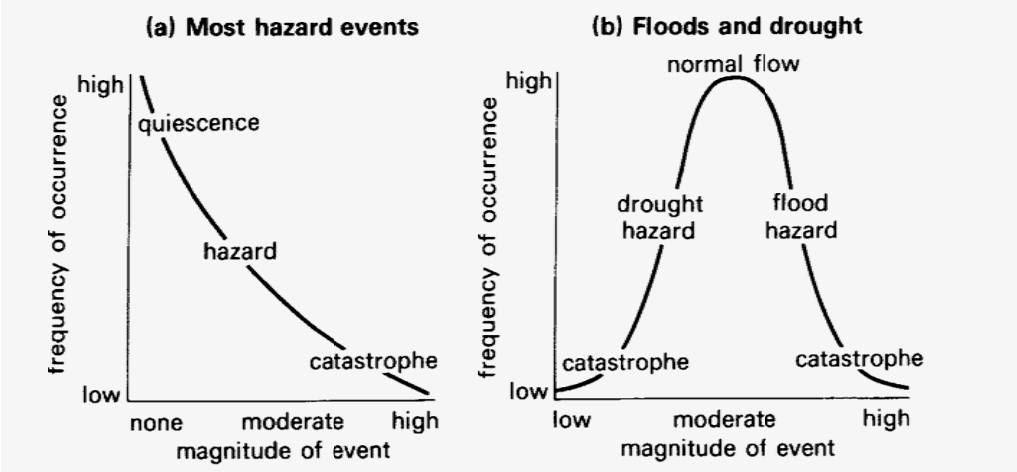
Hazard prediction; magnitude/frequency analysis

The laws of probability tell us that large events are infrequent but catastrophic, whereas most hazards are of moderate size and common occurrence. Some natural

hazards such as floods and droughts form a continuum of events, with catastrophes occurring with both extremes: normality in this case occurs frequently, and relates to moderate size events. Hazards vary in the probability distribution of events; hazard B has high frequency of relatively small events (e.g. river flooding), whereas hazard A has much larger events with similar probabilities.

The laws of probability tell us that the commonplace event is frequent and moderate in size, whereas extreme events are big but rare. Thus quite high discharges which just overtop river banks occur fairly regularly (about once in 1.5 to 2.3 years on average in many natural rivers), but severe overbank flooding or prolonged drought are less common. Thus the magnitude (size) and frequency (regularity) of events are closely inter-related for any given type of hazard (Fig. 2a and 2b).

Figure 2a and 2b: Magnitude/frequency relationships in natural hazards



a) Large events are infrequent but catastrophic, whereas most hazards are of moderate size and common occurrence.
b) Some natural hazards such as floods and droughts form a continuum of events, with catastrophes occurring with both extremes: normality in this case occurs frequently, and relates to moderate size events.

It must be stressed that magnitude, threat and impact of individual hazards are not the same thing. A hazard event might be large and cause much environmental change, but cause little damage to people or property. For example, a severe earthquake in a sparsely populated area poses less threat than a small earthquake

centred on a populated area. Even relatively small events (like a typical river flood) may have lasting and wide-ranging effects in a heavily populated area.

Classification of Natural Disasters

Wisner et al (2004) reflect a common opinion when they argue that all disasters can be seen as being man-made, their reasoning being that human actions before the strike of the hazard can prevent it developing into a disaster. All disasters are hence the result of human failure to introduce appropriate disaster management measures. Hazards are routinely divided into natural or human-made, although complex disasters, where there is no single root cause, are more common in developing countries. A specific disaster may spawn a secondary disaster that increases the impact. A classic example is an earthquake that causes a tsunami, resulting in coastal flooding as shown in the table below.

Natural disasters

A natural disaster is the consequence of when a potential natural hazard (e.g. volcanic eruption, earthquake, landslide, tsunami) becomes a physical event and this event affects humans.

Climatic	*Geological*
Floods	Earthquakes
Storm surges	Tsunamis
Windstorms	Volcanic
Wildfires	Landslides
Heat waves	Avalanches
Dust storms	
Snowstorms	

Human vulnerability, caused by the lack of planning, lack of appropriate emergency management, leads to financial, structural, and human impact. The resulting loss depends on the capacity of the population to support or resist the disaster: their resilience. This understanding is concentrated in the formulation: *"disasters occur when hazards meet vulnerability"*. A natural hazard will hence never result in a natural disaster in areas without vulnerability, e.g. strong earthquakes in uninhabited areas. The term natural has consequently been disputed because the events simply are not hazards or disasters without human involvement.

Man-made disasters

Disasters having an element of human intent, negligence, error or the ones involving the failure of a system are called man-made disasters. Man-made hazards are in turn categorized as technological or sociological.

Technological hazards are results of failure of technology, such as engineering failures, transport accidents or environmental disasters. Sociological hazards have a strong human motive, such as crime, stampedes, riots and war.

Natural Disasters in the Northern Indian Ocean

This region has had some of the world's deadliest cyclones, but there is a shortage of organized information about them.

1480:	Hindu temple records say that in this year a violent storm broke a natural isthmus that previously joined Sri Lanka to India known as Adam's Bridge.
1737:	Calcutta cyclone, caused death and destruction around Calcutta, India
1864:	Calcutta cyclone, killed around 60,000 people in Calcutta, India
1970:	Bhola cyclone, killed between 300,000 to 500,000 people in East Pakistan (now Bangladesh)
1991:	Bangladesh cyclone, killed 138,000 people in the Chittagong region of Bangladesh
1999:	Orissa cyclone, killed around 10,000 people in the Orissa state of India[3]
2006:	Cyclone Mala, made landfall over Myanmar causing major damage.
2007:	Cyclone Gonu, strongest storm in the Arabian Sea and strongest cyclone to strike Arabian Peninsula; causes over $4 billion in damage (2007 USD) in Oman
2007:	Cyclone Sidr, struck Bangladesh on 15 November, has killed at least 3347 to date, though that number is expected to rise.

Table 1: Details of various types of wind systems which formed in the Bay of Bengal and affected the east coast of India during the period 1891 – 1991 (Compiled from Shrestha, 1998)

Types of disturbances	Cyclonic disturbances	Depressions / Deep depressions	Cyclonic storms	Severe cyclonic storms
Number	1009	592	268	149
Maximum Minimum	158 (Aug) 4 (Feb)	131 (Aug) 1 (Mar)	51 (Oct) 0 (Feb)	38 (Nov) 1 (Jan)
Yearly average	10	6	3	1.5
Percent of total	—	58	27	15
Wind speed (km/h)	31->118	31-61	61-88	88->118

Table 2: Wind speed, storm surges and inland penetration of saline storm waters associated with cyclones along Tamil Nadu coast (Source: Mani, 2000)

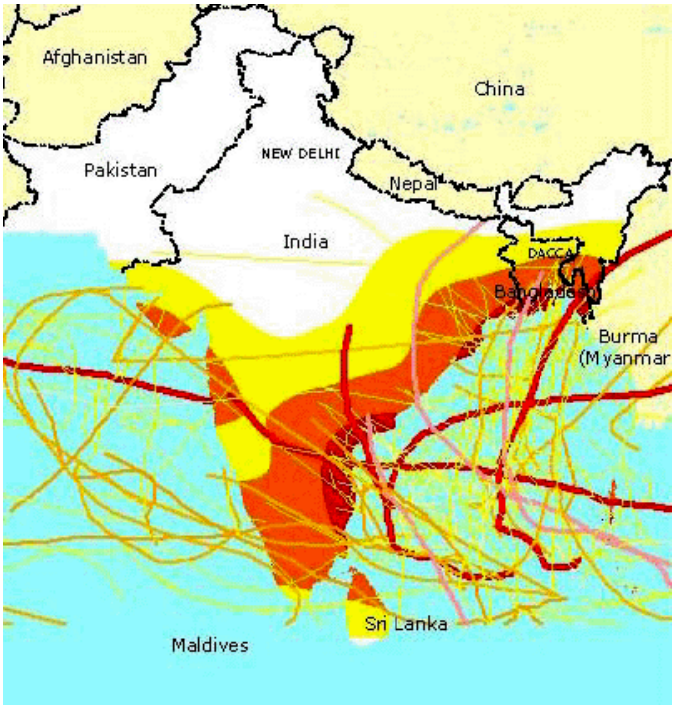
Period	Area affected	Wind speed (km/h)	Storm surge height (m)	Inland penetration (km)
November 1952	South Nagapatnam	—	3	8
December 1955	Tanjore	200	3-5	3-8
October 1963	Cuddalore	139	6	—
December 1964	Rameswaram	193	3 -5	—
December 1967	Nagapatnam	130	—	Tanjavur area
November 1978	Ramanathapuram	212	3 -5	—
November 1991	Near Karaikal	89	—	0.25
December 1993	Near Karaikal	133	3-4	2

Surge prone coasts of India

In the Indian states of Tamil Nadu and Andhra Pradesh, many villages were isolated due to heavy November rains caused by low-pressure areas in the Bay of Bengal. Flooding in Mumbai (India) in July 2006 left over 700 dead. Some areas went under 5 m of water. The worst floods in Chennai city occurred during the years 1985, 1992, 1994, 1995, 1996, 1998, 2002, 2004, 2006 etc.

Storm surge heights depend on the intensity of the cyclone, i.e., very high-pressure gradient and consequent very strong winds and the topography of seabed near the point where a cyclone crosses the coast. Sea level also rises due to astronomical high tide. Elevation of the total sea level increases when peak surge occurs at the time of high tide.

Figure 3: Map shows storm risk in India. Dark red shows high risk and light yellow are low risk categories and lines indicate the movement of cyclones



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Vulnerability to storm surges is not uniform along Indian coasts. The following segments of the east coast of India are most vulnerable to high surges

1. North Orissa, and West Bengal coasts
2. Andhra Pradesh coast between Ongole and Machilipatnam
3. Tamil Nadu coast, south of Nagapatnam

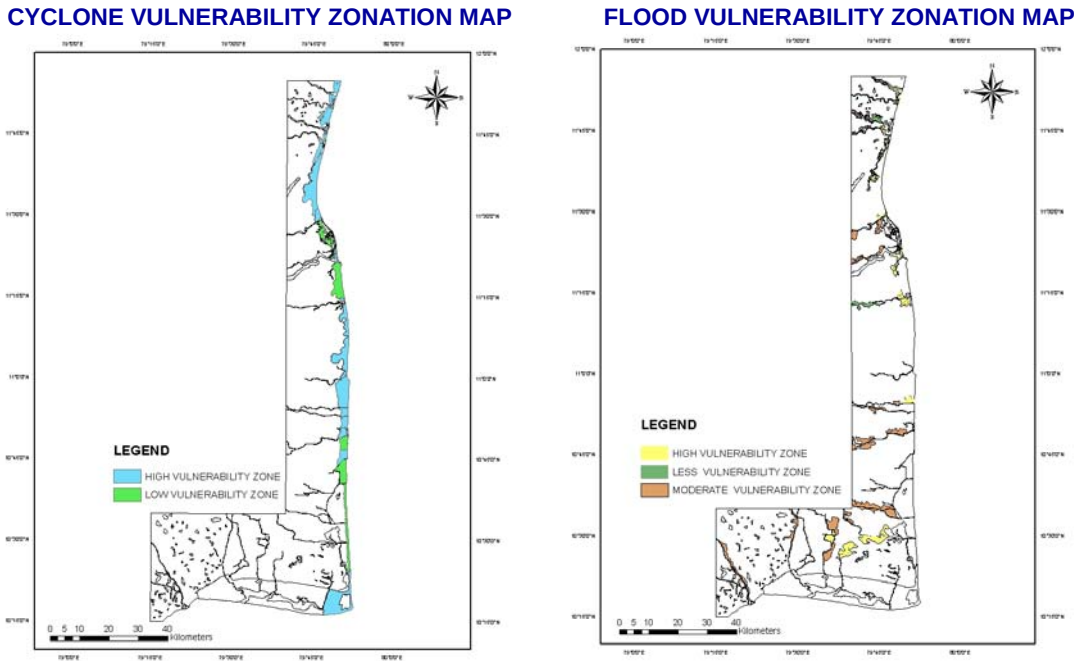
The West coast of India is less vulnerable to storm surges than the east coast of India in terms of both the height of storm surge as well as frequency of occurrence. However, the following segments are vulnerable to significant surges:

i) Maharashtra coast, north of Harnai and adjoining south Gujarat coast and the coastal belt around the Gulf of Bombay
ii) The coastal belt around the Gulf of Kutch.

The Indian sub continent has been exposed to disasters from time immemorial. The increase in the vulnerability in recent years has been serious threat to the overall

development of the country. Around 57% of the land vulnerable is to Earthquakes, 28% is vulnerable to Droughts, 12% is vulnerable to Floods and 8% of the land is vulnerable to Cyclones. Subsequently, the development process itself has been a contributing factor to this susceptibility. Coupled with lack of information and communication channels, this had been a serious impediment in the path of progress (Patnaik, 2005). Around 80 % of India's geographical area is vulnerable to cyclones, floods, landslides, drought, earthquakes as well as other localized hazards. The combination of poor socio-economic conditions and disasters has created a vicious cycle of poverty and vulnerability.

Figure 4: Cyclone and Flood Vulnerability map of Tamil Nadu (Lakshumanan, 2006)



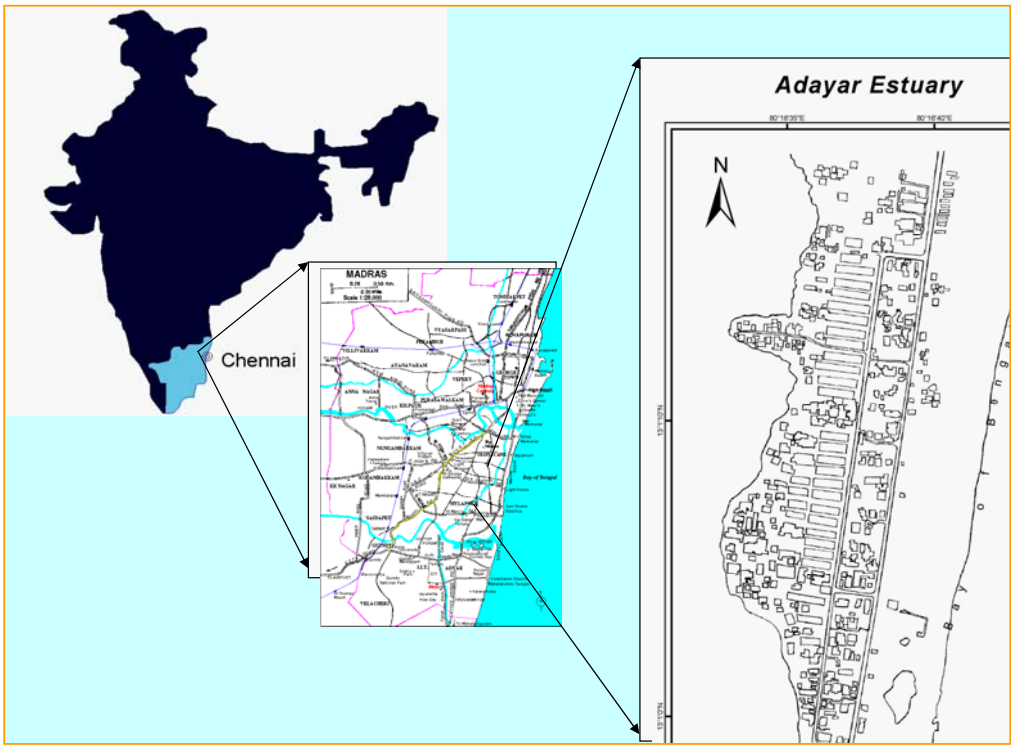
Geographical Setting of the "Town Watching" Site

Chennai City, India

Chennai, formerly known as Madras, is the capital of Tamil Nadu and is on the Coromandel Coast of the Bay of Bengal. With a population of 7.0 million, it is the fourth largest metropolitan city in India and one of the largest metropolitan areas in the world. Chennai is on the southeast coast of India in the northeast of Tamil Nadu on a flat coastal plain known as the Eastern Coastal Plains. Its average elevation is

around 6.7 meters (20 ft), and its highest point is 60 m (200 ft). Two rivers meander through Chennai, the Cooum River through the centre and the Adyar River to the south. Both rivers are heavily polluted with effluents and waste from domestic and commercial sources. The town-watch site at Chennai is located at the Foreshore Estate (see map) is a small islet at the confluence of the Adyar River with the Bay of Bengal. The Adyar River, which originates from the Chembarambakkam Lake (Chengalpattu district), is one of the rivers which passes through Chennai, South India, and joins the Bay of Bengal at the Adyar estuary. The 42 km long river contributes to the estuarine ecosystem of Chennai.

Figure 5: Town Watching Site in Chennai



Chennai lies on the thermal equator and is also coastal, which prevents extreme variation in seasonal temperature. For most of the year, the weather is hot and humid. The hottest part of the year is late May and early June, with maximum temperatures around 38 to 42°C (100-107 °F). The coolest part of the year is January, with minimum temperatures around 19 - 20 °C (66-68 °F). The average annual rainfall is about 1300 mm (51 inches). The city gets most of its seasonal

rainfall from the north-east monsoon winds, from mid-September to mid-December. Cyclones in the Bay of Bengal sometimes hit the city.

The Indian Ocean tsunami which hit the Chennai coast about 110 minutes after its generation in Sumatra had a wave run up of 1.4 m. The waves destroyed the nearby fishing hamlets at Foreshore Estate, Besant Nagar, Tiruvanmiyur, Palavakakam, Kottivakkam and other beaches in the suburbs up to Mamallappuram and Kalpakkam. Less than 100 metres from where the Marina ends, is Nochikuppam, where hundreds of fishermen's tenements are situated on the shore. A narrow sandbar on the mouth of the Adyar River prevents tidal flushing during most part of the year before the tsunami. However, this condition was reversed, after the seismic tidal waves which removed a major portion of the sandbar within a span of a few hours draining nearly all the sewage present in the river.

The Foreshore Estate (Pattinapakkam in Tamil) as seen in Fig. 1, is located at 80°16'35" E to 80°16'40" E Longitude and 13°1'00" to 13°10'00" N Latitude of Chennai, Tamil Nadu State of India. Physiographically, it is located on the Northern bank of Adyar River and estuary. Sandy beach and sand dunes are the prominent geomorphological features found in this field site and as a matter of fact, settlements are located on the sand dunes.

The Foreshore Estate is flanked by the Bay of Bengal in the East, while on the Southern and Western sides it banks the Adyar estuary, forming a peninsula-like structure. There are two prominent arterial roads running across the settlement and a variety of multistoried buildings have been built in the recent past on either side of the road. A number of lanes and by-lanes connect the main road. Apart from the well constructed buildings by the government a number of other private houses are found in the vicinity apart from clusters of small huts with thatched roofs.

History of Hazards/Disasters in the Study Area

The foreshore estate experiences frequent cyclones and tsunamis that strike the coast of Chennai and it is vulnerable to flooding in Adyar River. The following are the records of the tsunamis and cyclones that struck Chennai which in-turn make the study area vulnerable.

Table 3: Tsunamis Recorded Along the Coast of Chennai

Date	Cause	Impact
31 Dec 1881	A 7.9 Richter scale earthquake beneath Car Nicobar	Entire east coast of India and Andaman & Nicobar Islands; 1m tsunami was recorded at Chennai
August 1883	Explosion of the Krakatoa Volcano in Indonesia	East coast of India was affected; 2m tsunamis were recorded at Chennai
26-Jun-1941	A 8.1 Richter scale earthquake in the Andaman archipelago.	East coast of India was affected but no estimates of height of the tsunami is available
26-Dec-2004	The earthquake occurred off northwest of Sumatra triggered tsunami	Coastal zones of Sri Lanka and east coast of India are highly affected

Table 4: Cyclones Recorded Along the Coast of Chennai

1-8 December 1972	• Crossed Tamil Nadu coast close to and north of Cuddalore at 2330 UTC on 5th December and was within 50 km WNW of Cuddalore at 0300 UTC on December 6. • People killed and 30,000 people rendered homeless in Madras due to flood. • Total loss Rs. 40 crores
28 November to 6 December 1996	• Crossed near Chennai around 2100 UTC of 6th December 1996 • The cyclone persisted for 9 days which is reported to be very long life compared to any cyclone in the Indian Ocean • Caused severe damage to life and property

In the above list cyclones which crossed at Andhra Pradesh – north of Chennai and south of Cuddalore were omitted. Such cyclones too have severe impact on the study area either through rough sea conditions or by creating a situation for flooding at Adyar River.

Procedure for "Town Watching"

Town-watching for disaster reduction is a tool whereby all stakeholders in the community work together through the process of developing a hazard map. The detailed process of the town watching is discussed. The relevant lectures (mechanism of natural hazards, historical events, causes of local vulnerabilities, countermeasures, etc.) were provided by experts, government officials who have experienced previous severe disasters, so that all participants share the same background information on local conditions in relation to disasters. Objectives, schedules of activities and expected results of the Town-watching exercise are also explained. All participants are divided into small groups and each group comprised of 10 members. Each group contains at least two members from the different discipline like NGOs, academicians, Government officials, University students, Japanese experts, etc. Each group member has been assigned a specific role: group leader, navigator, photographer, note-taker, presenter, etc.

Composition of Groups

The participants were divided into groups of 10 members. Considering the heterogeneity in languages among the participants, care was taken to include atleast one or two participants who could speak the local language (Tamil) in each of the groups. In addition, the composition of the groups also considered heterogeneity of diverse expertise such as the NGOs, academicians, Government officials, and an expert from Japan. Members of the group were assigned a specific role – including a group leader, navigator, photographer, notes-taker and finally the presenter. All members of the group participated in the field visit and also in the preparation of the hazard map for the town watching site. The following are the step-wise planning of town watching for disaster reduction.

Step I
Each group walked around the town to identify and study the positive (useful facilities, evacuation routes, etc.), and negative features (too steep slope for evacuation, etc.), relevant to disaster risk management. Group members prepared notes and took photographs of the different features. Interviews were conducted with the local community and SHGs on their experience during and post-disaster situations.

Step II
Members of all the groups create a community based hazard map, manually integrating their observations and findings on a base map of 1:4000 scale. Photographs were pasted on the map, facilitating visual understanding of the positive and negative observations. Finally, a community based hazard map was created.

Step III
Members of the group discussed the following questions addressing the various problems identified by them

- What are the potential problems?
- What could be the possible countermeasures?
- Who should be responsible for implementing the countermeasures?

Based on these questions, the group considered possible solutions for effective disaster reduction in the community. This was followed by presentations of all the groups to understand the views and ideas of the other groups.

Experience of different groups on the "Town watching"

Group I: Following were the members of Group I

Members	Affiliation
Mr. S. Lawrence	NGO
Ms. V. Anuradha	NGO
Ms. Vandana Chauhan	NGO
Dr. P. M. Soma Sundaram	Academics
Dr. Ajinder Walia	Academics

Mr. R. Abhisek Rajnathan	Government
Mr. A. K. Baria	Government
Dr. V. S. Gowri	Academics
Dr. S. Srinivasulu	Academics
Prof. Yujiro Ogawa	Japanese expert

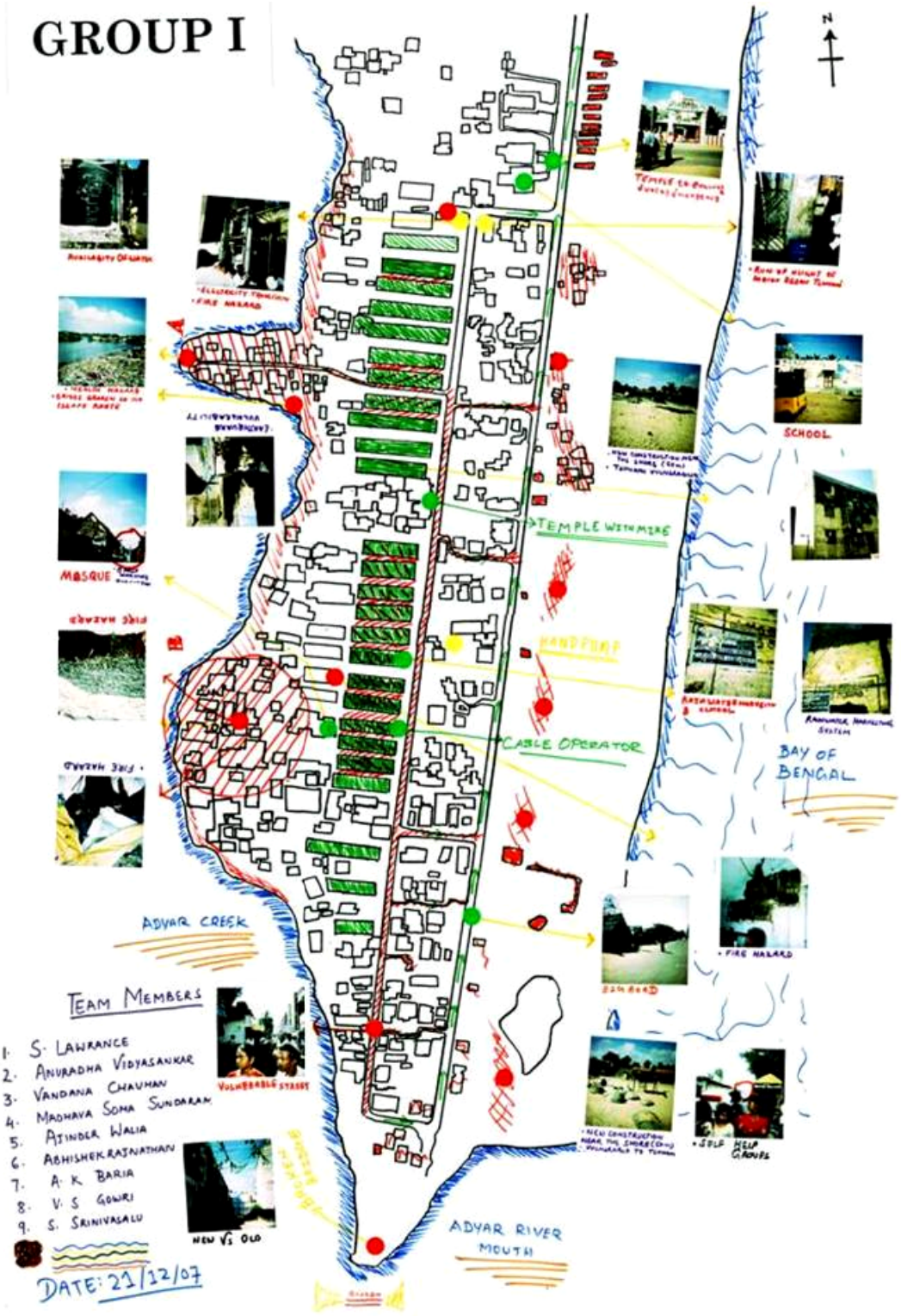
Town watching by Group I

For detailed observations - Please see map prepared by Group I

Problems and Solutions

Problems	Solutions	Agency Responsible
Surrounded by water bodies	Rising the Bunds	Local Government
Narrow lanes	Removal of encroachments	Local Government
Unsafe electrical wiring	Renovation of electrical system	Local Government
Disaster prone buildings	Disaster Resistance buildings as per Guidelines	Community, NGO, Local Government
Collapsed bridge (2) connecting Foreshore Estate and the Chennai City	Reconstruction of bridges	Local Government
Dumping of solid waste	Capacity building	NGO, Community
Thatched houses	Improvement in construction & capacity building (AWARENESS)	Government, NGO, Community
Low literacy levels, skills and economic status	Capacity Building	NGO, Local Community

Hazard Map Developed by Group I



Presentation and Group discussion:

Problems

This group has focused on the topography of the area as the major threat. Then the unsafe old buildings and narrow roads have been pointed out. The possibly main escape route i.e. the two bridges connecting the Foreshore Estate to the City has collapsed (pre-tsunami and unattended thereafter) causing hindrance to evacuation during a disaster. The group also focused on unhygienic living standards and improper solid waste disposal which may be major cause for the post disaster epidemics. The primary cause of this has been the low literacy levels of the inhabitants.

Solutions

Based on the various observations made by the group some suggestions were proposed to reduce risks during and after a disaster. The group strongly felt a greater need for the interaction and cooperation between the local government, NGOs and the local community. Geotechnical solutions such as raising the level of the bund, reconstruction of collapsed bridges and renovation of old constructions by the State government (such as the Slum Clearance Board buildings) must be taken up as priority. Awareness on sanitation including post-disaster epidemics and disaster preparedness by the NGOs and other service organizations by involving individuals of the community and the local bodies (SHGs and Panchayats) are vital.

Group II: Following were the members of Group II

Members	Affiliation
Mr. M. Sadacharavel	NGO
Mrs. Sharadha Mantrawadi	NGO
Mr. Suresh Mariaselvam	NGO
Prof. N. Chandrasekar	Academics
Mr. Abraham Lingan	Academics
Mr. M. Krishnan	Government
Mr. D. H. Kadam	Government
Mr. Narayana Kumar	Research Associate of IOM
Dr. V. Ram Mohan	Academics
Dr. Koji Suzuki	Expert from Japan

Town watching by Group II

For detailed observations - Please see map prepared by Group II

Problems and Solutions

Problems	Solutions	Responsibility
Inundation Threat (Tsunami/Flood/ Cyclone)	• Removal of settlements on the low lying vulnerable zone • Bunding the river bank • Developing bio-shields	• Slum clearance board • Revenue administration • Corporation Public Works Department
Fire	• Removal of Thatched Roof • Burning of Fire wood • Fire Station • Fire Extinguishers	• Slum clearance board • Public Works Department • NGOs and CBOs (Community Based Organizations) • Government of Tamil Nadu • Community
Pollution	• Regular Collection of Garbage • Good Sanitation • Starting Primary Heath Centers	• Corporation • Corporation • Government of Tamil Nadu
Earthquake	• Removal of Weaker buildings • Retrofitting the existing buildings • Lack of warning systems • Awareness and Education	• Slum clearance board • Slum clearance board • Government of Tamil Nadu • NGOs and CBOs (Community Based Organizations)

Hazard Map Developed by Group II

Presentation and Group discussion

Problems

Members of the Group II discussed the various problems observed during the *Town Watching* session; formulated solutions and identified the agencies responsible for executing them. The major problems identified were arranged under four different categories, viz., inundation threat due to cyclones and tsunami, fire, pollution and earthquake. The solutions have been incorporated in the map through signs and symbols.

Many of the problems related to the study area are due to its topography – with water bodies on its three sides, low-lying with limited access to the mainland. Due to its proximity to the Bay of Bengal and Adyar River, the Foreshore Estate is prone to inundation during cyclones/ flood/ tsunami. The buildings constructed over the sand dunes by the slum clearance board are very old and are vulnerable to earthquakes. Failures of the State Government in installing warning signs even after a major disaster struck this site (December 26, 2004 tsunami), is a major problem to be addressed immediately. Houses which were inundated during 2004 tsunami have not been rehabilitated yet. Socially, the emotional binding of the local community to this location, has made the State Government defer its decision of rehabilitating the affected people to safer locations farther inland. Majority of the population are dependent on fishing activities and therefore access to their fishing boats, nets etc requires proximity to the sea. In short, the people are unprepared in dealing with any type of hazard.

Group III: *The following were the members of Group III.*

Members	Affiliation
Col. M. Sambamurthy	NGO
Dr. Arasu Sundaram	NGO
Mr. M.V. Sailesh	NGO
Dr. R. R. Krishnamurthy	Academics
Dr. Sunil D. Santha	Academics
Dr. M. Prithviraj	Government
Mr. P. Chandran	Government
Dr. R. R. S. Pramila Devi	Research Scientist
Mr. B. Senthil Kumar	Research Associate
Dr. Hiroyuki Watabe	Expert from Japan

Town watching by Group III

For detailed observations - Please see map prepared by Group III

Problem and solution analysis

Root Causes	Dynamic Pressures	Unsafe Conditions	Hazards
• Lack of access • Power • Governance structures • Resources • Historicity • Market based fishery development	• Poverty • Unemployment • Illiteracy • Erratic climate • Competition & resource scarcity • Gender stereo-type • Building codes • Local knowledge • Real-estate bloom and tourism • Population density • Cultural chaos • Ineffective social security measures	• Dangerous work environment • Poor Infrastructure • Public health • Insecure livelihood • Poor water and sanitation • Poor housing	Tsunamis Storms Floods Fire Earthquakes Epidemics Building collapse Cyclone Electrical hazards

Presentation and group discussion

Problems

The major problem identified by the group during the town watch is: coastal flooding and poor infrastructure. Topographically, Foreshore Estate is an island, which is

Hazard Map Developed by Group III

encircled by the Adyar estuary on one side and the Bay of Bengal on the other. Therefore, the location is highly vulnerable to inundation from floods (from the land) and cyclones, tsunamis and storm surges from the Bay. The other major problems highlighted by the group include poor housing infrastructure, electrical hazards, narrow lanes and limited drinking water supply and poor sanitation facilities. Other minor problems such as lack of basic amenities (improper drainage system, lack of toilets/ education/ government schools and ration shops) makes the livelihood of the people in this area highly insecure and vulnerable.

Solutions

Inundation during a major cyclone or tsunami event could be approached by creating artificial sand dunes along the coast or raising the bunds with sea wall. Planting of coastal vegetation was also recommended by the group. Renovation of old buildings could be used as shelter during a disaster. The group also suggested capacity building among the local public in order to enhance awareness to disasters. Coordination and cooperation between the State Government and the public could build a disaster resilient community.

Group IV: Following were the members of Group IV

Members	Affiliation
Mrs. Prema Gopalan	NGO
Mr. S. M. Selwin Joseph	NGO
Mr. Sumeet Agarwal	NGO
Dr. S. Rajarathnam	Academics
Mr. Sanjay Degoankar	Academics
Dr. Antony Gnanamuthu	Government
Mr. B. R. Patel	Government
Dr. P. Nammalwar Rajan	Academics
Nirmal Rajkumar	Research Associate of IOM
Mr. Anil K. Sinha	Expert from Japan

Presentation and group discussion

Problems

The problems identified were grouped into 5 – Physical, Environment, Social, Economic and Risk & Vulnerabilities. Under physical problem the main issue taken up is housing, its location, design and maintenance. The houses were found very old, leaking and damp. Many are of Kuccha house types which are vulnerable to fire accidents. Most of the population opposes the Government's proposal for relocation, and the reason they say is that the location which Government is offering is far away from the Coast.

Town watching by Group IV

For detailed observations - Please see map prepared by Group IV

As regards the environmental problems- water logging, open drainage and garbage spread over in public places - are sited as important issues to be addressed. Social problems include multiple/ethnic groups and low awareness on civic education dominates. On the economic problems, dependence on fishing (no diversified occupation) and marketing are the major issues. Finally under risks and vulnerabilities, the old buildings constructed by the Housing Board in 1963, thatched huts with mud walls, open electric power line and the low-lying public utility buildings are some of the critical issues.

Solutions:

The members of this group had detailed discussions among and between the groups and proposed a few possible solutions for the Foreshore Estate community. For physical problems, the group suggested that the houses and streets be designed/ planned to provide an escape route in case of any emergency (e.g., during floods).

Hazard Map Developed by Group IV

Problems and Solutions

Problems / Issues	Solutions	Agency Responsible
1. Physical		
• Housing - Location, Design • Poor Maintenance- Leakage , Dampness • Kuccha Huts • Narrow Lanes, one way exit - Fire hazard possible • Relocation opposed	• Houses designed (for escape route) forecasting flooding • Cyclone shelters • Outside CRZ, Building norms • Road widening • Onsite relocation of houses, relocation linked to livelihoods	• House Owners • Government/NGOs • CMDA • Impose town planning rules
2. Environment		
• Water Logging – breeding ground • Open Drains, Open Defecation • Water – Drinking + Washing • Garbage spread / dumped	• Construction of drainage • Health centre – 3000 Population • Water Sanitation / awareness Programme	• Chennai Corporation • Local leaders + Community • NGOs
3. Social		
• Multiple, ethnic groups • Cooperation for economic survival • Women in SHGs • Civic awareness low • Low awareness on education	• Building capacity for Unity awareness • Economic diversification • Education - Vocational • Awareness Building • Utilization of existing facilities - Preparedness	• Local Leaders • NGO • Government • Government – Local Bodies • SHGs – Chennai Corporation
4. Economic		
• Dependence on fishing • Livelihoods not diversified • Women in informal sector • Marketing + Micro enterprise	• Vocational Training • On new small scale business • Micro Finance	• Government • NGOs • Local Bodies
5. Risk + Vulnerabilities		
• Housing Board – 1963 Buildings • Huts – Thatched, mud walls • Electrical/Power line • Motor Boats/Katamaran • Children and Senior Citizens • Public Utility Building	• Repair/ Reconstruction Re-locate • Remove – New Housing • Underground Cable • Safe boatyard, safety measures • Self Help Group • Raise Foundation, Raise level	• Government • Government/NGOs/ Community • Government • NGO/Government • Community

The houses must be built outside the CRZ area, with wider roads. Regarding relocation of houses, it is important that the alternative area is linked to their livelihoods, i.e., onsite relocation. The agencies responsible for planning and execution of this work must be the Government, NGOs, CMDA and the house owners. For environmental problems, construction of proper drainage, conducting water sanitation awareness programs, and building a new Health Centre have been suggested as solutions. The agencies responsible for carrying out this work are the Chennai Corporation, NGOs, local leaders and the community.

The social problems must be addressed through capacity building, economic diversification, vocational training and preparedness for utilizing the existing facilities as shelters from disasters were the solutions, as suggested by the group members. The local leaders, NGOs, Government, SHGs and Chennai Corporation will be responsible agencies in carrying out these solutions. Training in order to commence new small scale business and arranging micro-finance for the same will be the solution for economic problems. The State Government, NGOs along with the local bodies will have to take responsibilities in solving these economic problems. The possible solutions for risk and vulnerability problems include repairing/ re-location/ construction of new housing, laying underground electric cables, construction of safe boat yards, construction of public utility buildings with raised foundations and formation of Self Help Groups (SHGs). The Government, NGOs and the community will have to be collectively responsible in carrying out the above tasks.

Group V: Following were the members of Group V

Members	Affiliation
Mr. K.M. Perivelan	NGO
Mr. P. J. Thomas	NGO
Mr. Kanna Babu	NGO
Ms. K. Sunitha	Academics
Mr. Mahesh Kamble	Academics
Mr. V. Balamurugan	Government
Dr. V. Ranga Rao	Government
Mr. P. Jayasankar	Research Assistant
Mr. Ajay Kumar Ray	Research Associate
Mr. Kiyoshi Kayasimha	Expert from Japan

Town watching by Group V

Presentation and Group discussion

Problems

The major problem identified by the group is the inundation of water in the Foreshore Estate, because of its proximity to both the Adyar Estuary and the Bay of Bengal. Therefore, the Foreshore Estate is extremely prone to inundation of water from diverse types of disasters such as tsunami, storm surges, river flooding, etc. In addition to inundation, the other major problem highlighted are lack of evacuation centers, lack of early warning centers or systems (including lack of public awareness), encroachments in roads and narrow roads, dilapidated structures/ buildings. Among the other minor problems – lack of basic amenities (including the proper drainage system, toilets, education government schools and ration shops), salinization of ground water and erosion at the river mouth erosion are prevalent.

Hazard Map Developed by Group V

Problems and Solutions

Problems	Solutions	Agency Responsible
1. Water inundation (Tsunami, storm surge, river flooding, etc)	Sand dune formation, rise in bank level, evacuation, plantation, new bridges on West	State Government (PWD, TNSCB), Local community
2. Ground water	Rain water harvest and Regular maintenance	PWD, Metro Water, Local community
3. Erosion of river mouth	Construction of sea wall	PWD
4. Encroachment in roads and narrow roads	Widening of roads and rehabilitation	TNSCB, Local Community
5. Dilapidated structures	New buildings structural audit	TNSCB
6. Lack of Tele/Early warning system (Lack of awareness)	To be provided through training/capacity building	Disaster Management & Mitigation, NGO, Local Community, Education
7. Lack of evacuation centers	To be provided through training/capacity building	Disaster Management & Mitigation, NGO, Local Community, Education, TNSCB, PWD
8. Lack of basic amenities (Toilets, drainage, Government School, Rations)	To be provided through training/capacity building	State Government (PWD, Fire, Education)

Solutions

After group discussions the group came up with some conclusions for the problems indicated in the table. In order to reduce risks from inundation of sea and flood water, from calamities from the sea/ land, the group recommended the development of a natural sand dune on beach and/or rise in bank level with stones or plantation on the coast to prevent inundation of water into the Foreshore Estate area. But, when the calamities become a major disaster, people must be evacuated to proper evacuation areas/ shelters, which does not exist now. Due to encroachment on the narrow roads there may be a chance of stampede during evacuation.

During a disaster, the local residents now use the dilapidated old buildings which were built in the year 1964, and there is a chance of building collapse due to over crowding and even in the event of mild earthquakes. Though the available building has advantage of being an evacuation shelter for people, it has its own disadvantages, for which the group recommends a new building structural audit to the local government. Realizing the above situation, local residents have argued to the State

government to build a bridge over the backwaters of the Adyar River to the west of the Foreshore Estate for the immediate evacuation. Additionally, the existing roads need to be widened by the concerned Government departments such as the Public Works Department (PWD) and the TNSCB. In such cases, consulting the local community is a crucial need.

Due to lack of early warning centers and public awareness, the local community has to be sensitized and educated through proper training. For this reason, officials of the Disaster Management and Mitigation Department, NGOs and trained members of the local community need to create awareness on the impacts and preparedness for such disasters. Solution for problems such as lack of basic amenities – lack of proper drainage systems, toilets, - government schools, ration shops – the members of the group have urged the Government and the concerned state departments to act on the issues immediately. Rain water harvesting could be a solution to the problem of salinization of groundwater. Although rainwater harvesting systems are available in the area, they are dysfunctional and the group has recommended proper maintenance of these to minimize salinization. Sea wall construction has been suggested as a remedial measure against erosion at the river mouth. It was finally concluded by the group that a harmonious interaction of the local officials with the community is required to minimize risks from major disasters in the future.

Way Forward...

A multi organization task force is required to execute the community based disaster management programme in India. The National Disaster Management Authority is already in the process of develop guidelines, training manual and action plan for next years; share the action plan with all concerned and finalize it; and to develop mechanisms for monitoring and evaluation. At the end of this two day national workshop, Community Based Disaster Management Programme, participants agreed to disseminate the hazard map development initiative at the local and regional levels in order to create awareness and preparedness amongst the affected communities. Community-based disaster preparedness approaches have become increasingly important elements of vulnerability reduction and disaster management strategies. Hazard Map Development is one of the primary initiatives to reduce vulnerability in

the context of both disaster management and climate change. It presents evidence from the Indian Case Study that, in the limited forms in which they are currently employed, community based disaster preparedness and forewarning initiatives have the potential both to empower hazard and disaster management problems.

Glossary of Terms in Disaster and Hazard Management

Acceptable risk: The level of loss a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions. In engineering terms, acceptable risk is also used to assess structural and non-structural measures undertaken to reduce possible damage at a level which does not harm people and property, according to codes or "accepted practice" based, among other issues, on a known probability of hazard.

Biological hazard: Processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Examples of biological hazards: outbreaks of epidemic diseases, plant or animal contagion, insect plagues and extensive infestations.

Building codes: Ordinances and regulations controlling the design, construction, materials, alteration and occupancy of any structure to insure human safety and welfare. Building codes include both technical and functional standards.

Capacities and Vulnerabilities Analysis (CVA): CVA enables the givers of aid to learn how to give it so that it supports the efforts of people to achieve social and economic development (i.e. how to make relief interventions more developmental) but it has been used more widely in disaster preparedness and mitigation. CVA was designed for NGOs, to help them consider when and how to respond to a disaster by understanding what impact their interventions will have on capacities and vulnerabilities. The basis of the CVA framework is a simple matrix for viewing people's vulnerabilities and capacities in three broad, interrelated areas: physical/material, social/organisational and motivational/attitudinal (five other factors are added to the matrix to represent the complexity of livelihoods analysis).

Capacity and Vulnerability Assessment (CVA): CVA involves a participatory analysis of (post) disaster situations which can be applied at a range of scales from the community to the country. It is expressed in terms of capacities and vulnerabilities. It helps identify disaster management responses that would support development initiatives in the community.

Capacity: A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability.

Coping capacity: Capacity refers to the manner in which people and organisations use existing resources to achieve various beneficial ends during unusual, abnormal, and adverse conditions of a disaster event or process. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and other hazards.

Counter measures: All measures taken to counter and reduce disaster risk. They most commonly refer to engineering (structural) measures but can also include non-structural measures and tools designed and employed to avoid or limit the adverse impact of natural hazards and related environmental and technological disasters

Damage potential: The amount of property asset in a threatened area.

Damage, Needs and Capacity Assessment (DNCA): DNCA involves a participatory analysis of the disaster event focussing on the damages caused, the immediate needs and priorities of the affected community, and of the remaining capacities people use to cope with the adverse effects.

Damage, Needs and Capacity Assessment (DNCA): DNCA involves a participatory analysis of the disaster event focussing on the damages caused, the immediate needs and priorities of the affected community, and of the remaining capacities people use to cope with the adverse effects.

Damage: The amount of destroyed or damaged property asset, the injury of people and environment as a consequence of an occurred hazard.

Disaster Risk Assessment (DRA): DRA is the process of determining the nature, scope and magnitude of negative effects of hazards both within an anticipated time period and at numerous spatial scales.

Disaster: A hazard might lead to a disaster. A disaster by itself is an impact of a hazard on a community or area – usually defined as an event that overwhelms that capacity to cope with.

Early warning: The provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response. Early warning systems include a chain of concerns, namely: understanding and mapping the hazard; monitoring and forecasting impending events; processing and disseminating understandable warnings to political authorities and the population, and undertaking appropriate and timely actions in response to the warnings.

Emergency management: The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation. Emergency management involves plans, structures and arrangements established to engage the normal endeavours of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as disaster management.

Exposure: The economic value or the set of units related to each of the hazards for a given area. The exposed value is a function of the type of hazard.

Forecast: Definite statement or statistical estimate of the occurrence of a future event (UNESCO, WMO).

Gendered Community Risk Assessment: Gendered Community Risk Assessment extends the disaster risk assessment as the research methods build on the ideas, feelings and observations of women.

Geological hazard: Natural earth processes or phenomena that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Geological hazard includes internal earth processes or tectonic origin, such as earthquakes, geological fault activity, tsunamis, volcanic activity and emissions as well as external processes such as mass movements: landslides, rockslides, rock falls or avalanches, surfaces collapses, expansive soils and debris or mud flows.

Geological hazard maps: Geological hazard maps are maps that include geological information of an area that allows one to identify, assess and characterize the various areas that are vulnerable to geological hazards.

Hazard and Vulnerability Assessment (HVA): HVA enables the identification of the physical hazard that is acting to generate impacts. Analysis which has made use of concepts such as impact chains or grids has proven useful for this.

Hazard typology: The hazard typology clusters hazards that are somehow interrelated to each other. It is a basis for the development of the typology of regions.

Hazard: A property or situation that in particular circumstances could lead to harm. More specific, a hazard is a potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity and probability.

Land-use planning: Land-use Planning creates policies at the local/municipal level that guide how the land (inside the administrative borders of a municipality) and its resources will be used. The main instrument of land-use planning is zoning or zoning ordinances, respectively. Land-use planning is situated below the regional planning level.

Losses: The amount of realized damages as a consequence of an occurred hazard.

Mitigation or disaster mitigation: A proactive strategy to gear immediate actions to long-term goals and objectives.

Participatory Capacity and Vulnerability Assessment (PCVA): PCVA is an enabling process whereby communities can analyze their disaster experiences and take action to address their vulnerabilities.

Participatory GIS (PGIS): PGIS is a spatial decision making tool attempting to utilize GIS technology in the context of the needs and capabilities of communities that are involved with and affected by development projects and programmes.

Preparedness: Readiness for short term activities, such as evacuation and temporary property protection, undertaken when a disaster warning is received.

Public awareness: The processes of informing the general population, increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster.

Reaction: While mitigation is characterized by long-term actions, reaction aims at short-term actions in case of an occurring disaster. Reaction comprises preparedness, response and recovery.

Recovery: This constitutes the last step of post disaster actions, such as rebuilding or retrofitting of damaged structures.

Regional plan: The spatial plan of an administrative area (superior to the municipal level); is part of the official (national of federal) planning system; makes statements and/or determinations referring to the spatial and/or physical structure and development of a region (spatial distribution of land use: infrastructure, settlement, nature conservation areas etc.); has impacts on the subordinate levels of planning hierarchy (local level, e.g. municipal land use plans etc.); textual and cartographic determinations and information normally refer to the scale 1:50 000 to 1:100 000.

Regional Planning: Regional planning is the task of settling the spatial or physical structure and development by drawing up regional plans as an integrated part of the formalised planning system of a state. Thereby regional planning is required to specify aims of spatial planning which are drawn up for an upper, state, or federal state wide level. The regional level represents the vital link between the state-wide perspective for development and the concrete decisions on the land use taken at local level within the land-use planning of the municipalities.

Resilience / resilient: The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Response: The term of ”response” contains three different meanings: 1) as an element within the DPSIR chain, 2) in a general meaning as a spatial planning answer as proposed in the tender and 3) as a narrower term which describes specific reactions immediately after a disaster has occurred. Response in the broader sense means the sum of long-term actions (mitigation in terms of planning responses) and short-term actions (reaction) to prevent disasters or mitigate their impacts. In this case it is linked to the Response chain link of the DPSIR chain. In a narrower sense, response is a part of short-term actions (reaction) when a disaster occurs. Then, response means short-term emergency aid and assistance, such as search-and-rescue operations, during or following the disaster.

Retrofitting/ upgrading: Reinforcement of structures to become more resistant and resilient to the forces of natural hazards.

Risk analysis: Risk analysis is the mathematical calculation including the analysis of a hazard (frequency, magnitude) and its consequences (damage potential).

Risk assessment: Risk assessment consists of risk estimation and risk evaluation.

Risk estimation: Risk estimation is concerned with the outcome or consequences of an intention taking account of the probability of occurrence.

Risk evaluation: Risk evaluation is concerned with determining the significance of the estimated risks for those affected: it therefore includes the element of risk perception.

Risk mapping: Risk mapping is the process of mapping elements/areas at risk and differentiating between low, medium and high risk areas. This activity is best conducted by

involving community members and allowing them to lead the exercise. This exercise may also include mapping resources/infrastructure and describing the state in which these are in.

Risk perception: Risk perception is the overall view of risk held by a person or group and includes feeling, judgement and group culture.

Risk reduction: Risk reduction may be defined as the "consequence of adjustment policies which intensify efforts to lower the potential for loss from future environmentally extreme events." (Mileti, et al. 1981; Nigg and Mileti. 2002). Such adjustment policies may refer to a broad range of guidelines, legislation and plans that help to minimize damage potential (i.e. exposure to a hazard or maximizing coping capacity of a region or community by, e.g. guaranteeing resources and preparing adequate plans for pre-disaster mitigation and post-disaster response measures). Risk reduction involves both policy/regulatory issues and planning practices. In other words, risk reduction – as defined above – is the result of what has earlier been defined as risk management related response (prevention orientated mitigation, non-structural mitigation, structural mitigation, and reaction).

Risk: A combination of the probability or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence. More specific, a risk is defined as the probability of harmful consequences, or expected loss (of lives, people injured, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human induced hazards.

Sectoral planning: 'Sector' in terms of 'sectoral planning' means the spatial planning under consideration of only one planning criteria (e.g. traffic, environmental heritage, etc.). Sectoral approaches are (in the ideal case) weighted and combined in the context of comprehensive development planning. Sectoral as well as comprehensive planning can take place on different administrative levels.

Sensitivity/highly sensitive areas: In general, sensitivity describes how a system responds to permanent influences. In the context of the ESPON 1.3.1 Hazards project, the highly sensitive areas are defined as those areas that are most sensitive towards the entirety of all hazards. In terms of the chosen methodology the highly sensitive areas are represented by risk intensities of 8, 9 and 10 (red, brown and black colours in the colour scheme of the synthetic risk map).

Spatial typology: This is a general term that describes the result of a clustering process that is based on relevant spatial data. Consequently, the typology of regions is a spatial typology.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs (Brundtland Commission, 1987).

Technological hazards: Danger originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Some examples: industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, industrial or technological accidents (explosions, fires, spills).

Timeline: A timeline is a tool that narrates the disaster history and significant events that happened in the community. One column gives the year and the other column lists down the events that took place. Timeline is a widely used participatory tool that aids understanding of a community's history. It gives a quick impression of the community, how it is moving forward and/or what legacies persist in the community. It generates information of the major events (e.g, earthquake, epidemic, landslide, flood, new school building, electricity, new road built, new technology etc) which have impact upon the society.

Transect walk: Transect walk involves walking in the community along a predetermined path, taking notes and asking questions as one goes.

Typology of regions: The typology of regions clusters areas in Europe, which are threatened by similar hazards. This typology does not consider the aspect of vulnerability and it is therefore a hazard based typology instead of a risk based typology. In the typology of regions, interactions between certain hazards are taken into consideration.

Typology of risk: A risk typology clusters risks into groups by the characteristics of probability (and certainty of assessment), extent of damage (and certainty of assessment), ubiquity, persistancy, irreversibility, delay effect and mobilisation potential. The typology of risk distinguishes the risk types of Cyclops, Damocles, Pythia, Pandora, Cassandra and Medusa.

Typology: At its simplest level, a typology involves the clustering of a large number of items (variety of descriptions) into smaller groups by virtue of their shared characteristics.

Vulnerability: Vulnerability is the degree of fragility of a person, a group, a community or an area towards defined hazards. In a broader sense, vulnerability is defined as a set of conditions and processes resulting from physical, social, economical and environmental factors, which increase the susceptibility of a community to the impact of hazards. Vulnerability is determined by the potential of a community to react and withstand a disaster, e.g. its emergency facilities and disaster organisation structure (coping capacity).

Zoning: Zoning is the local governments' tool that regulates land-use, promotes orderly growth, and protects existing property owners by ensuring a convenient, attractive and functional community. Zoning is the way the local governments control the physical development of land and the kinds of uses to which each individual property may be put.

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ANNEXURE-I

Inaugural Address

His Excellency
SHRI SURJIT SINGH BARNALA
Hon'ble Governor of Tamil Nadu

Prof. Vinod Chandra Menon, Member, National Disaster Management Authority, Government of India;

Dr Koji Suzuki, Executive Director, Asian Disaster Reduction Center (ADRC), Kobe, Japan;

Dr D Viswanathan, Vice Chancellor, Anna University;

Distinguished participants, government officials, academics, representatives of Non Governmental Organisations;

Ladies and Gentlemen;

Opening Remarks

I am very pleased to be here with you this morning at the Inaugural session of this two day Training of Trainers Program on "Community Based Hazard Map Development for Areas Affected by the Indian Ocean Tsunami" organized by the National Disaster Management Authority, Government of India, in collaboration with the Asian Disaster Reduction Centre (ADRC), Kobe, Japan and the Institute of Ocean Management at Anna University. I am really delighted to see that Chennai has been selected as the venue for this Training of Trainers Program, especially since participants from several states and Government of India are attending this program. I am also happy to hear that this Training Program is being led by senior resource persons from Japan, with the financial support of UN ESCAP, to impart the skills of a participatory and experiential pedagogic tool called "Town Watching" to the participants of this program to develop community based hazard maps in the tsunami affected areas. I understand that this tool has been successfully used in several countries like Japan, Malaysia, Thailand, Indonesia, Philippines, Vietnam and Sri Lanka. I am also very pleased to note that Prof. Ogawa of Fuji-Tokoha

University, Japan who has designed, developed and disseminated this tool is leading the Training of Trainers Program here in Chennai.

Disaster Management in Japan

I am sure that all of us would agree that Japan is probably the most advanced nation in the world in the field of tsunami early warning, tsunami preparedness, tsunami mitigation and post-tsunami emergency response as they have been facing hundreds of tsunamis every year. I have been told that because of the high seismic risk and vulnerability in Japan, the advanced Early Warning Systems are able to immediately stop the Bullet Train, shut down electricity in the earthquake-affected areas to prevent gas pipe fires due to short circuit and alert drivers on National Highways through FM Radios to minimize the loss of lives in the event of a high intensity earthquake. I am sure that the participants of this Training Programme would benefit immensely from their interactions with the learned resource persons from Japan and would find this a valuable and useful exercise as the theoretical sessions are followed by participatory and experiential exercises in a tsunami-prone area in the Chennai City by teams of participants, which will be presented before all of you and reviewed by the resource persons.

The Indian Ocean Tsunami happened on 26th December 2004, barely within two months of my assumption of office (for the second time) as the Governor of Tamil Nadu on 3rd November 2004. For almost everyone in the country, even the word Tsunami was unknown till that day. Now we know that Tsunami is a Japanese term that consists of two Japanese words: Tsu meaning “harbour” and Nami meaning “high waves”. I still recall very vividly the panic caused by the Tsunami on 26th December 2004 and the lightning calls from around the country and the devastated districts in Tamil Nadu. A quiet Sunday morning suddenly turned into a rollercoaster of events unfolding as the pictures of the destruction started coming up on the television screens.

Why this Training Program?

During 8th to 13th April, 2005, a Multinational Mission led by ADRC had visited Cuddalore, Kancheepuram, Kanyakumari, Nagapattinam and Chennai in Tamil

Nadu, Kollam and Alleppey districts in Kerala and Karaikal and Pondicherry Divisions of the Union Territory of Pondicherry. While this Multinational Mission led by ADRC appreciated the tremendous challenges in coordination by the Government of India and the State Governments in providing immediate relief to the people affected by the tsunami who had to be provided with temporary shelters and the outpouring of compassion by the general public and the civil society organisations, they also emphasised the need for creating greater public awareness on disaster risk and vulnerability faced by the coastal communities and for strengthening the disaster preparedness at all levels.

The Multinational Mission led by ADRC also specifically urged for pursuing sustainable efforts to build the capacity for disaster mitigation at all levels. I am really glad that this Training of Trainers Programme addresses the need for creating greater awareness among first responder agencies like the academics, professionals, government officials and representatives of NGOs to equip themselves with the tools and techniques for risk assessment and vulnerability analysis for the coastal communities. I am sure that these tools and techniques will be extremely valuable to assess the implications of climate change, global warming and sea level rise facing the coastal communities.

New Dimensions of Disaster Management in India

I am very happy to see that India was one of the first countries among the 13 countries affected by the Indian Ocean Tsunami to immediately review our preparedness to face natural disasters and man-made disasters and take the decision to strengthen the institutional mechanisms for disaster management in India. The Disaster Management Act, 2005 was passed unanimously by both the Houses of Parliament in 2005 and the Bill received the assent of the President of India on 23rd December 2005. Even while the Bill was being debated in the Parliament, the Government of India set up the National Disaster Management Authority (NDMA) chaired by the Hon'ble Prime Minister of India on 28th September 2005. The Disaster Management Act, 2005 has the provision of setting up the State Disaster Management Authorities at the State Levels headed by the respective Chief Ministers of States as well as District Disaster Management Authorities at the district level

headed by the respective District Collectors and co-chaired by the elected representatives of the respective districts. The Act also provides for setting up the Disaster Response Fund and the Disaster Mitigation Fund at the National, State and District levels. I am also happy to inform you that one of the eight battalions of the National Disaster Response Force specially constituted for Disaster Management is located at Arconam in Tamil Nadu and they are also trained and equipped to address the emergency response requirements to all types of disasters, including Chemical, Biological, Radiological and Nuclear (CBRN) Emergencies. The NDMA has been working on a variety of activities for professionalizing the transition from the hitherto post-disaster relief-centric regime to strengthening the pre-disaster preparedness, mitigation and emergency response capabilities in the country. I understand that they have already released the National Disaster Management Guidelines for the Management of Earthquakes, Chemical (Industrial) Disasters and Medical Preparedness and Mass Casualty Management and several other Guidelines on Management of Floods, Cyclones, Tsunami, Landslides, Psycho Social and Trauma Care, Community Based Disaster Preparedness, Chemical, Biological, Radiological and Nuclear Emergencies, etc. are in the final stages of preparation.

Concluding Remarks

I must compliment the National Disaster Management Authority, Asian Disaster Reduction Centre, Kobe and the Institute of Ocean Management at Anna University for organising this Training of Trainers Program at Chennai. I am grateful to you for inviting me to inaugurate this Program. I hope all of you will find your stay in Chennai comfortable and find this Training Program useful, instructive and valuable. I would urge you to interact with the officers of the Government of Tamil Nadu and learn from them the progress of the post-tsunami reconstruction and recovery efforts.

I am happy to announce that the Training of Trainers Programme is formally inaugurated.

Thank You! Jai Hind!

Annexure II

Presidential Address by

Prof. N. Vinod Chandra Menon
Hon'ble Member NDMA

Prof. N. Vinod Chandra Menon, Member, National Disaster Management Authority (NDMA), Government of India welcomed His Excellency Shri Surjit Singh Barnala, the Hon'ble Governor of Tamil Nadu, Dr Koji Suzuki, Executive Director, ADRC, Kobe, Japan and Dr D Vishwanathan, Distinguished Vice Chancellor of Anna University to the Inaugural Session of the NDMA-ADRC Workshop on Preparation of Community Based Town Watching Maps at Chennai. He expressed his appreciation that a large number of representatives of International Humanitarian Organizations and Civil Society Organizations, Senior Government Officials, and Representatives of the Media were participating in the Workshop. The successful use of popular participatory hazard risk and vulnerability assessment tools such as "Town Watching" in several countries to create awareness on disaster risk and vulnerability among stakeholders and thus to reduce risk at the level of local communities was also highly appreciated.

The UN ISDR has estimated that the number of people at risk has been growing by 70 to 80 million per year and more than 90% of the vulnerable population is in the developing world. In his introduction to the Secretary General's Annual Report on the Work of the Organization of the United Nations in 1999, Kofi Annan commented:

- More effective prevention strategies would save not only tens of billions of dollars, but also save tens of thousands of lives
- Funds currently spent on intervention and relief could be devoted to enhancing equitable and sustainable development. This will reduce the risks of friction amongst various countries
- Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in distant future
- Moreover, the benefits are not visible; they are the disasters that did NOT happen.

In India, the National Disaster Management Authority was set up as a statutory body through the Disaster Management Act, 2005 to provide the enabling environment for the institutional mechanisms for mainstreaming the paradigm shift from the hitherto post-disaster relief-centric regime to improved pre-disaster preparedness, mitigation, disaster risk reduction and strengthened emergency response capabilities. In close cooperation with the Planning Commission, the NDMA has addressed the strategy for mainstreaming disaster risk reduction in developmental planning while formulating the Eleventh Five Year Plan.

Prof. Menon cited several areas of concern in the Indian context including the activation of an early warning system, integrating the scientific, technological and administrative agencies for effective management of disasters, and assessing and mitigating the vulnerability of critical infrastructure to disaster events. Climate Change adaptation is emerging as one of the most serious challenges before policy makers and development practitioners. Pro-active, people-friendly climate change adaptation strategies strongly rooted within the local grassroots reality of the coastal communities and their concerns for safety of lives, livelihoods and security needs is the urgent need of the hour, shifting the emphasis from technological imperatives proposed by the protagonists of the dominant paradigm of reducing the carbon emission targets.

On the eve of the third anniversary marking the tsunami devastation, he said that we are deeply aware that 400 million people constitute our coastal communities and their lives, livelihoods and security depends on our humane understanding, insights and application of mind.

In essence, this will call for people-friendly development with a human face and more humane climate change adaptation strategies. Prof. Menon expressed his hope that this will receive the priority and attention it deserves at every level. He concluded by thanking the organizers and ADRC for bringing all the stakeholders together, thereby providing a valuable opportunity for every participant to share their thoughts on community based hazard map development and learn the art of Town watching to better comprehend disaster risk and vulnerability for addressing the priority needs.

Annexure III

WELCOME ADDRESS

By

Prof. D. Viswanathan
Vice-Chancellor, Anna University, Chennai

Your Excellency the Governor of Tamil Nadu;
Honourable Prof. Vinod Chandra Menon, Member, National Disaster Management Authority, Government of India;
Dr Koji Suzuki, Executive Director, Asian Disaster Reduction Center Japan;
Dr Watabe also from the ADRC
Distinguished Participants, Colleagues and Staff and students of Anna University
Media
Ladies and Gentlemen…

I am deeply honored and highly privileged to welcome our Chief Guest His Excellency Thiru Surjit Singh Barnala, The Governor of Tamil Nadu for his gracious presence in this programme of immense National and International Significance.

We are all extremely honored Your Excellency that despite the tremendous demands upon your time, your commitment to this Community Based Hazard Map Development Programme has been as unstinting and motivating as they could possibly be.

Ladies and Gentlemen, His Excellency the Governor has made major contributions to the society, the most significant of which has been his very emotional contact and communication with the people throughout India.

As all of us are aware, His Excellency, The Governor, has been extremely concerned in the rehabilitation of the people affected by the Indian Ocean Tsunami of December 2004.

His Excellency's emphasis on a multi hazard strategy for disaster prevention and mitigation will be a source of inspiration and guidance to all of us at this hour of need. I once again wish to express my very sincere and hearty welcome to His Excellency and we are proud to have you Sir, with us today.

It is our great privilege to welcome Honorable Prof. Menon, Member, National Disaster Management Authority, Government of India, for spearheading the National initiative on disaster management. Honorable Prof. Menon is also leading a multi diverse group of Scientists and policy makers in developing a National Policy document for several natural disasters including the tsunami.

Under the Chairmanship of His Excellency the Prime Minister of India, Prof. Menon and his colleagues are preparing every individual in this great nation in building resilience and preparedness against natural hazards. I once again welcome you Sir for this meeting and for being a source of great inspiration in the conduct of this event.

India and Japan have much in common, especially the commonality in facing and managing disasters. Throughout history the Japanese have been affected by intense natural disasters and so has the rest of Asia. As the Executive Director of the Asian Disaster Reduction Center, Dr. Koji Suzuki and his team have been actively involved in training the trainers in the affected countries of Asia for a common good. It is a great pleasure to know that your expertise is being shared with us in India, which is of immense importance to this country. It is my honor to welcome you to India and to Chennai.

Dr. Watabe, I understand, has been the force behind this programme and his untiring efforts and meticulous preparation for this programme is highly commendable. It is my pleasure to welcome you on this occasion.

I am very happy that the Institute for Ocean Management, Anna University has this unique privilege of collaborating with both the NDMA and ADRC to develop mapping strategies of hydro-meteorological hazards. I assure you that with a strong commitment to disaster risk reduction, Anna University will develop the necessary

academic and research commitment and join hands with the NDMA to make this a priority in Anna University's Curriculum.

I am very grateful to all the distinguished representatives from the ADRC, NDMA, and the National Institute of Disaster Management, Officials of the Government of India and the Government of Tamil Nadu and other State Governments for their presence here today.

I am also very happy to welcome all distinguished participants and guests from various governmental, intergovernmental and nongovernmental organizations, united in the common interest and goal of promoting management of natural disasters in the Asian region. Over the next two days our distinguished experts gathered here are expected to engage in preparing the hazard map for this region.

I extend my warm welcome to all of you to Chennai and wish you great success for a valuable contribution to this programme.

I welcome the Media and thank you for the constant support and encouragement to programme of such national and international importance and value.

I once again welcome one and all....

Jai Hind!!

Annexure IV

Address during Inaugural Session

Dr. KOJI SUZUKI
Executive Director
Asia Disaster Reduction Center, Japan

Excellency, Honorable guests, distinguished participants, ladies and gentlemen,

I am feeling much honored to organize the trainers training program on community based hazard map development for affected areas by Indian Ocean Tsunami in such a beautiful city, Chennai with His Excellency, the Governor of Tamil Nadu, Thiru Surjit Singh Barnala in presence.

This program is excellently and beautifully prepared and organized with the full commitment and support of National Disaster Management Authority of India with the strong leadership of His Excellency of Professor N. Vinod Chandra Menon who is the Honorable Member of National Disaster Management Authority.

And we received the substantial and technical support from Professor Dr. Viswanathan, Vice Chancellor, Anna University, Chennai.

Please allow me to take this opportunity to extend my sincerely gratitude to Dr. Anil Sinha who is one of my best friends in Kobe, UNDP officer and the head of the Secretariat of the International Recovery Platform, United Nations in Kobe for his generous support to prepare this program.

Asian Disaster Reduction Center has been established in 1998 in Kobe after the Great Hansin Awaji Earthquake, ADRC has been received with financial and technical support from the 25 member countries in Asia. Government of India has been the member of ADRC from the establishment. ADRC has been committed itself in enhancing the capacity of disaster risk reduction of the countries in Asia.

We had a devastating Tsunami Disaster on 26th of December 2004. This program was originally planned and developed by Asian Disaster Reduction Center based on

the report of multi-national mission to Tsunami affected areas including Chennai in April 2005. Asian Disaster Reduction Center led the mission and made substantial contribution to compile the report with recommendation.

It is said in the report that in order to make the community more resilient to disaster, the community based disaster risk reduction including raising public awareness is very effective. To make the community more resilient to disasters, public support by the government alone is not enough. Individual involvement in disaster risk reduction and mutual help in the community are also critical for that.

In this context the participants are expected to learn the town watching method developed by Dr.Ogawa and Asian Disaster Reduction Center. This method is quite effective to raise the public awareness of the community on various types of natural hazards such as tsunami, storm surge, flood, earthquake, cyclone etc.

In the program, participants of the local government officers with responsibility for disaster management will learn the basic knowledge of natural hazards and methodology to raise public awareness of the community on natural hazard. After the program, the participants having a skill to develop hazard map could provide with their skill to other local officer, NGOs and their community leaders.

Finally on behalf of the organizers I would like to extend our sincere gratitude to the financial support from UN/ESCAP for this program.

Thank you very much for your attention.

Annexure V

Address during Inaugural Session

Dr. HIROYUKI WATABE
Asia Disaster Reduction Center, Japan

Excellency,

Honorable,

Distinguished Participants,

First of all, I would like to sincerely express my profound gratitude to the National Disaster Management Authority of Government of India, in particular Honorable Prof. Vinod Chandra Menon, the Member of NDMA, for his generous support as co organizer of the workshop on the "Trainers' Training Program on the Community based Hazard Map Development" with the financial support from UN/ESCAP.

And also I would convey my sincerely appreciation to the Anna University, in particular, Prof.Dr.D.Viswanathan,Vice Chancellor and Prof Dr. Ramesh for the excellent support on the logistics and other details. And I would also sincerely express my gratitude to His Excellency, Thiru Surjit Singh Barnala, the Governor of Tamil Nadu for being kind to spare so much of his valuable time to be with all of us this morning .

Later, Mr. Koji Suzuki of Executive Director of the Asian Disaster Reduction Center, would explain on our activity and the aim of the programme of the workshop in detail.

The 2 days workshop will be designed to train the trainers on the community based hazard map development. The hazard map is a well known tool to enhance the community's awareness to the natural disasters in Japan. We, ADRC disseminate the procedure of the development of the map for our 26 member countries in Asia.

As you know, there are two types of hazard maps, one is developed by the scientifically based knowledge, another one is the community based hazard map that is developed by the community in a participatory manner, it is a non scientific, but very practical for the community.

In this workshop, we would share our knowledge of the procedure of community based hazard map development with the participants.

I would briefly explain the 2days program. We already have provided you the agenda of the workshop in your bag. Please look through it.

On the 1st day of the programme, after the inaugural session, there are three lectures in the afternoon. The first lecture will be presented by Prof. Ramesh of Anna University on the "Natural Hazard and Disaster Risk Management in the East Coast of India". The second one will be presented by Mr.Anil Sinha of Program Advisor of International Recovery Platform in Kobe, Japan, on the "Build back better recovery". The third speaker is Prof.Ogawa of Fujitokoha University, former Executive Director of ADRC. The title is "Lesson Learnt from Past Japanese Disaster Experience" and "the procedure of community based hazard map development". After the lecture, the reception will be hosted by ADRC in this evening.

On the 2nd Day of the programme, the participants will be divided into 5 groups, and we will depart here for town watching to "Foreshore Estate" in Chennai, which was affected by the Indian Ocean Tsunami in 2004. At the site, we will survey the site to understand their hazard and the problem for the disaster, before noon returning to the venue, the community based hazard map will be developed by the participants based on the observations from the town watching. After the discussion on the problem of the site within the each group, the presentation will be made by each group to the participants.

Through the 2days workshop, the participants will learn the procedure of the development of the map, and the participants will recognize it as a useful communication tool to understand the risk.

At this time, we select the tsunami affected site in Chennai for the map development; however, the methodology will be applicable to the other hazards such as Cyclone, Earthquake, Landslide, flood etc, and also applicable to the other locations in India.

We are convinced that the community based hazard map will be a useful tool for raising the community risk awareness in India as well as Japan, and we hope the participants will be a great trainer of the community risk awareness using the map.

I thank you once again for your participation and attention.

Annexure VI

List of Participants of the Training of Trainers Programme on *Community Based Hazard Map Development*			
S. Nr.	*Name*	*Designation*	*Organization/ Address*
1	Prof. N. Vinod Chandra Menon	Hon'ble Member	National Disaster Management Authority, Government of India, Centaur Hotel, New Delhi 110 037
2	Mr. K. Vijaya Kumaran	PS to Member	PS to Member, National Disaster Management Authority, Government of India, New Delhi
3	Dr. Koji Suzuki	Executive Director	Asian Disaster Reduction Center, Kobe, Japan
4	Dr. Hiroyuki Watabe	Researcher	Asian Disaster Reduction Center, Kobe, Japan
5	Mr. Kiyoshi Kayashima	Researcher	International Recovery Platform, Japan
6	Prof. Yujiro Ogawa	Professor	College of Environment and Disaster Research, Fuji Tokoha University, Ohbuchi 325, Fuji City 417-0801, Japan
7	Prof. R. Ramesh	Professor and Director	Institute for Ocean Management, Anna University, Chennai 600 025
8	Dr. Purvaja Ramachandran	Visiting Faculty	Institute for Ocean Management, Anna University, Chennai 600 025
9	Dr. M. Prithviraj	Director and Scientist F	Earth System Sciences, Department of Science and Technology, Government of India, New Mehrauli Road, New Delhi 110 016
10	Dr. Arasu Sundaram	Faculty Member, Disaster Management Cell	Anna Institute of Management, KANCHI No. 36, P.S. Kumarasamy Raja Salai, Greenways Road, Chennai 600 028
11	Col. M. Sambamurthy, S.M.	Director	SARITSA Foundation, 20, 11th Cross Street, Shastri Nagar, Adyar, Chennai 600 020
12	Mr. M.V. Sailesh	Faculty, Disaster Management	AP-Academy of Rural Development, Rajendra Nagar, Hyderabad 30
13	Dr. R.R. Krishnamurthy	Senior lecturer	Department of Applied Geology, University of Madras, Chennai

S. Nr.	Name	Designation	Organization/ Address
14	Mr. P. Chandran	Network Coordinator	Disaster Watch, A/28, S.F.H.S 1st Floor, Circular Road, Jai Maruti Nagar, Nandini Layout, Bangalore 560 096
15	Dr. Sunil D. Santha	Assistant Professor	Jamshedji Tata Centre for Disaster management, Tata Institute of Social Sciences, P.O. Box 8313, Deonar, Mumbai 400 088, Maharashtra
16	Mr. V. Balamurugan	Environment Consultant	Revenue Administration, Government of Tamil Nadu, Chennai
17	Dr. V. Ranga Rao	Scientist D	ICMAM-PD, Ministry of Earth Sciences, Chennai
18	Mr. P.J. Thomas	Field Officer	CASA , No. 4, Church Road, Vepery, Chennai 600 007
19	Mr. Kanna Babu	State Programme Coordinator (Disaster Management)	United Nations Team for Recovery Support, O/O AMR-APARD, Rajendra Nagar, Hyderabad 500 030
20	Ms. K. Sunitha	PhD Student	Centre for Disaster Management and Mitigation, Anna University, Chennai
21	Mr. Mahesh Kamble	Assistant Professor	Jamshedji Tata Centre for Disaster Management, Tata Institute of Social Sciences, P.O. Box 8313, Deonar, Mumbai 400 088, Maharashtra
22	Mr. S. Lawrence		Indian Red Cross Society, Trichy
23	Dr. P. Madhava Soma Sundaram	Head	Department of Criminology and Criminal Justice, Manonmaniam Sundaranar University, Tirunelveli 627 012
24	Mr. A.K. Baria	Deputy Collector (Disaster) Government of Gujarat	Block No. 11/7, New Sachivariya, Gandhi Nagar, Gujarat
25	Dr. Ajinder Walia	Assistant Professor	National Institute of Disaster Management, Ministry of Human Affairs, Government of India
26	Ms. Vandana Chauhan		All India Disaster Mitigation Institute, 411 Sakar Five, Near Natraj Cinema, Ashram Road, Ahmedabad 380 009, Gujarat
27	Dr. S. Srinivasalu	Assistant Professor	Department of Geology, Anna University Chennai
28	Mr. R. Abisekaraj Nathan	Divisional Engineer	Highways Department, Government of Tamil Nadu, India, Tirunelveli
29	Ms. V. Anuradha	Civil Society Coordination Associate	Tamil Nadu Tsunami Resource Centre, 54/1 Josier Street, Nungambakkam, Chennai 600 034
30	Mr. B.R. Patel	State Project Officer	UNDP-DRM Programme, GSDMA Premises, 5th Floor, Block 11, Udhyog Bhavan, Gandhinagar 382 011 Gujarat

S. Nr.	Name	Designation	Organization/ Address
31	Mr. Sanjay Degaonkar	Under Secretary	Relief and Rehabilitation, Revenue Department, Government of Maharashtra, Mantralaya, Mumbai
32	Dr. P. Nammalwar Rajan	Scientist	Institute for Ocean Management, Anna University, Chennai 600 025
33	Dr. Antony Gnanamuthu	DM Delegate	Orissa Disaster Mitigation Programme II, German Red Cross, Red Cross Bhawan, Bhubaneshwar, Orissa 751 022
34	Dr. S. Rajarathnam	Professor and Director (i/c)	Centre for Disaster Management and Mitigation, Anna University, Chennai 600 025
35	Mr. S.M. Selwin Joseph	Field Officer	CASA , No. 4, Church Road, Vepery, Chennai 600 007
36	Mr. Sumeet Agarwal	Deputy Coordinator (PMU)	SEEDS India, New Delhi
37	Mr. Anil K. Sinha	Programme Adviser	International Recovery Platform, UNDP, Hitomiraikan 5F, 1-5-2 Wakinohamakaigan-dori, Chuo-ku, Kobe, 651 0073, Japan
38	Mrs. Prema Gopalan	Director	Swayam Shikshan Prayog, 5th Floor, Bhardawadi Hospital, Bhardawadi Road, Andheri West, Mumbai 400 058
39	Mr. S. Franklin Joseph	Director - HEA	World Vision India, 16 VOC Main Road, Kodambakkam Chennai 600024
40	Prof. N. Chandrasekar	Dean-Research	Manonmaniam Sundaranar University, Tirunelveli
41	Mr. M. Sadacharavel	Zonal Director (i/c)	Nehru Yuva Kendra Sangathan, Ministry of Youth Affairs and Sports, Government of India, Plot Nr. 22, Chari Avenue, Anna Salai, Palavakkam, Chennai 600 041
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News Clippings:

11th plan will address preparation to face disaster and relief

22 Dec. 2007

Special Correspondent

The number of people at risk from disasters is growing

CHENNAI: Issues of preparing for disasters and post-disaster relief will be addressed in the 11th Plan, Vinod Chandra Menon, member, National Disaster Management Authority, said on Thursday.

Stressing the importance of preparation, he said the package, to be incorporated into the Plan, would combine sound theories with practical tools, and would involve community participation. Tackling climate change, a serious issue for policymakers, would involve adopting more people-friendly emission reduction strategies rooted in communities.

According to U.N. estimates, the number of people at risk from disasters was growing by seven-eight crore every year, and 90 per cent of them were in the developing world. Which was why it was important to build a culture of prevention, Prof. Menon said. However, it would not be easy to build such a culture as the benefits were not tangible. There were only disasters that did not happen and cause damage, so it would be difficult to convince people. He also outlined the course that the disaster management movement took since the 1990s, when the United Nations General Assembly declared the period as the "International Decade for National Disaster Prevention." Some of the goals were to increase public awareness of disasters, reduce risks and keep the community in a state of preparedness.

Prof. Menon was speaking at the inaugural function of a training programme on the community-based hazard map development, organised by the NDMA, the Asian Disaster Reduction Centre and Anna University.

Building the culture of prevention and strategic thinking, disaster reduction through preparedness, quick response and effective coordination at all levels were necessary, according to Governor Surjit Singh Barnala. Preparedness had to be activated right from the top to the grass roots of all disaster-prone areas.

The Centre had made laudable efforts at constituting the National Disaster Management Authority even before the Disaster Management Act, 2005, was passed. Setting up of State Disaster Management Authorities under the leadership of the Chief Minister and the district authorities led by Collectors would pave the way for effective planning in disaster mitigation.

Koji Suzuki, executive Director, ADRC, Japan, said individual involvement and mutual help at times of disaster was crucial. He also spoke about the Town Watch method to develop community-based hazard maps, the brainchild of Yujiro Ogawa of ADRC. Hiroyuki Wattage of ADRC provided an overview of the programme.

D. Viswanathan, Vice-Chancellor, Anna University, said he hoped the sessions would benefit the community in evolving hazard maps.

The Hindu: dated 22 December 2007
Chennai, INDIA

Guidelines to tackle tsunamis soon

Stress on involving communities in preparing hazard maps

Ramya Kannan

22 Dec. 2007

CHENNAI: The National Disaster Management Guidelines to tackle tsunamis will be out in the next two to three months, N.Vinod Chandra Menon, member, National Disaster Management Authority, said on Thursday.

- National Disaster Management Authority working on them
- Integrated coastal zone management being worked out

Speaking to *The Hindu* on the sidelines of a training programme to prepare a community-based hazard map, Prof. Menon said the NDMA was working on the guidelines, which would be released soon. This plan would include components on creating public awareness, evaluating risk and vulnerability, involving the community in planning evacuation and post-disaster management. Additionally, it would address associated issues such as extreme weather conditions and the impact of climate change.

While the tsunami package is exclusive in the broad list of disasters covered by the guidelines, it would have an overarching focus on handling the situation after any kind of disaster – natural or man-made such as nuclear attacks and use of bio-weaponry. Most of the guidelines have common ground, Prof. Menon said, and serve as a composite body of strategies to help the nation bounce back to normality after any calamity. The involvement of communities in preparing hazard maps, escape routes and evacuation plans is stressed in all plans.

Key areas

One of the key areas of intervention proposed by the tsunami plan is preparedness, up to the last mile. The task is to ensure that the loss of life is minimised. The plan will, therefore, suggest some structural and non-structural mitigation strategies, including developing mangrove forests and shelter bed plantations, cautioning against the craze to build seawalls. Meanwhile, the Tsunami Early Warning Systems are also being strengthened. Sophisticated warning systems are in place at the Indian National Centre for Ocean Information Services that use "bottom pressure recorders and satellites to predict the occurrence of a tsunami. The success of this set-up was apparent in September after the Sumatra earthquake when the Centre rightly predicted that there would be no tsunami.

The public awareness component would also incorporate the new controversies about the coastal zone. An integrated coastal zone management will be worked out, to look at different coastal areas and the behaviour of the sea in these areas.

The Authority is also suggesting that reconstruction of homes should not be in situ, especially in tsunami-hit areas as quick relocation would not be possible.

Another important aspect that the guidelines deal with is the necessity of having structures that are not life threatening. For instance, the Authority has mandated that all new constructions, public or private, should comply with quake-resistant controls since September this year. They have gone ahead and linked this with housing loans.

The Ministry of Finance is issuing guidelines to banks to desist from giving loans for buildings that do not incorporate these regulations in their plans.

Prof. Menon added that there will also be a new emphasis on capacity building for engineers, architects, engineering college faculty, contractors and masons.

In collaboration with the Indian Institutes of Technology, the National Institutes of Technology, the Indian Institutes for Architecture, industrial training institutes, engineering colleges and polytechnics, the NDMA would impart the principles of building quake-resistant structures for these target groups.

The idea is to mainstream disaster management plans into all development plans.

All ministries should have a disaster management component integrated into their working, Prof. Menon said. There were penalties for non-compliance, he added, and zero tolerance for loss of life.

"We (the NMDA) have the authority to ensure and enforce compliance. There are penal provisions, being worked out, we will not hesitate to use wherever violations are reported," he said.

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