

**“A STUDY ON STRATEGY PLANNING FOR COMMUNITY
AWARENESS ON DISASTER MANAGEMENT”**

(With particular reference to vulnerability of the community residing in the Kuppams of
Thiruvallur district.)

*Thesis submitted to Mother Teresa Women’s University for the award of
the Degree of Doctor of Philosophy (Ph.D.)*

In

MANAGEMENT

BY

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EXPHDMS512

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CERTIFICATE

It is certified that the thesis entitled, "A Study on Strategy Planning for Community Awareness on Disaster Management" (With particular reference to vulnerability of the community residing in the Kuppams of Thiruvallur district.) is a record of research work done by Latha Mazumder during the period of study under me and that the thesis has not formed the basis for the award of any degree, diploma, associate ship, fellowship or other similar title to the candidate and that the thesis represents independent work on the part of the candidate



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DECLARATION

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Dedicated to my beloved

Parents

Radha Mazumder
&
M.K.Mazumder

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ABBREVIATIONS USED IN THE RESEARCH STUDY

ACDM	ASEAN Committee on Disaster Management
ACWC	Area Cyclone Warning Centers
ACWCs	Area Cyclone Warning Centers
ADPC	ASIAN Disaster Preparedness Centre
AEEAP	ASEAN Environmental Education Action Plan
AEEMTRC	ASEAN-EC Energy Management Training and Research Centre
AEGCD	ASEAN Expert Group on Communicable Diseases
AEGDM	ASEAN Expert Group on Disaster Management
AEGFS	Adhoc Expert Group on Food Safety
AEIC	ASEAN Earthquake Information Centre
AENRIC	ASEAN Environmental and Natural Resources Information Centre
AHEWS	ASEAN Agricultural Hazards Early Warning System
CAP	Contingency Action Plan (CAP)
CCD	Charged Couple Device
CERTs	Computer Emergency Response Teams
CMV	Cloud Motion Vectors
CRC	Central Relief Commissioner (CRC)
CRF	Calamity Relief Fund
EU	European Union
FDRS	Fire Danger Rating System
FDS	Feasibility Design Stage
FGRID	Forest Genetic Resource Information Database
GIS	Geographical Information System (GIS)

HACCP	Hazard Analysis Critical Control Points
HRD	Human Resource Development
IAI	Initiative for ASEAN Integration
IAPs	Immediate Action Plans
IATEP	Inter-ASEAN Technical Exchange Programme
IMD	India Meteorological Department (IMD)
IRS	Indian Remote Sensing
MEAs	Multilateral Environment Agreements
MOU	Memorandum of Understanding
MST	Mesosphere, Stratosphere, Troposphere (MST)
NCCF	National Calamity Contingency Fund
NCMC	National Crisis Management Committee (NCMC)
NEOC	National Emergency Operations Center (NEOC)
NERIC	National Environment Resource Information Centers
PTA	Preferential Trading Arrangement
R & D	Research and Development
RCICM	Regional Training Course on Integrated Coastal Management
RCP	Research Priorities Committee
RETA	Regional Technical Assistance
SAARC	South Asia Association for Regional Cooperation
SAEI	Southeast Asian Environment Initiative
SAR	Search and Rescue
SAREX	Search and Rescue Exercise
SCMG	Sub-Committee on Meteorology and geophysics
SCMIT	Sub-Committee on Microelectronics and Information Technology
SCMS	Sub-Committee on Marine Science

SDI	Selective Dissemination of Information
SoE	State of the Environment
SPAE	Strategic Plan of Action and the Environment
SRCR	Sub-Regional Climate Review
SRFA	Sub-Regional Firefighting Arrangement
SSN	Social Safety Nets
UNCSD	United Nations Commission on Sustainable Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children Education Fund
US-AEP	United States Asian Environmental Partnership
US-EIP	United States Environmental Improvement Programme
USEPA	United States Environmental Protection Agency
VHRR	Very High Resolution Radiometer
WGEE	Working Group on Environmental Economics
WGEIPAE	Working Group on Environmental Information, Public Awareness and Education
WGEM	Working Group on Environmental Management
WHO	World Health Organization

CHAPTER I

INTRODUCTION

INTRODUCTION

NATIONAL VISION

For

Disaster Management

“To build a safer and disaster resilient India by developing a holistic, proactive, multi disaster and technology driven strategy for disaster management through collective efforts of all Government Agencies and Non Government organizations”.

1.1 GENERAL INTRODUCTION

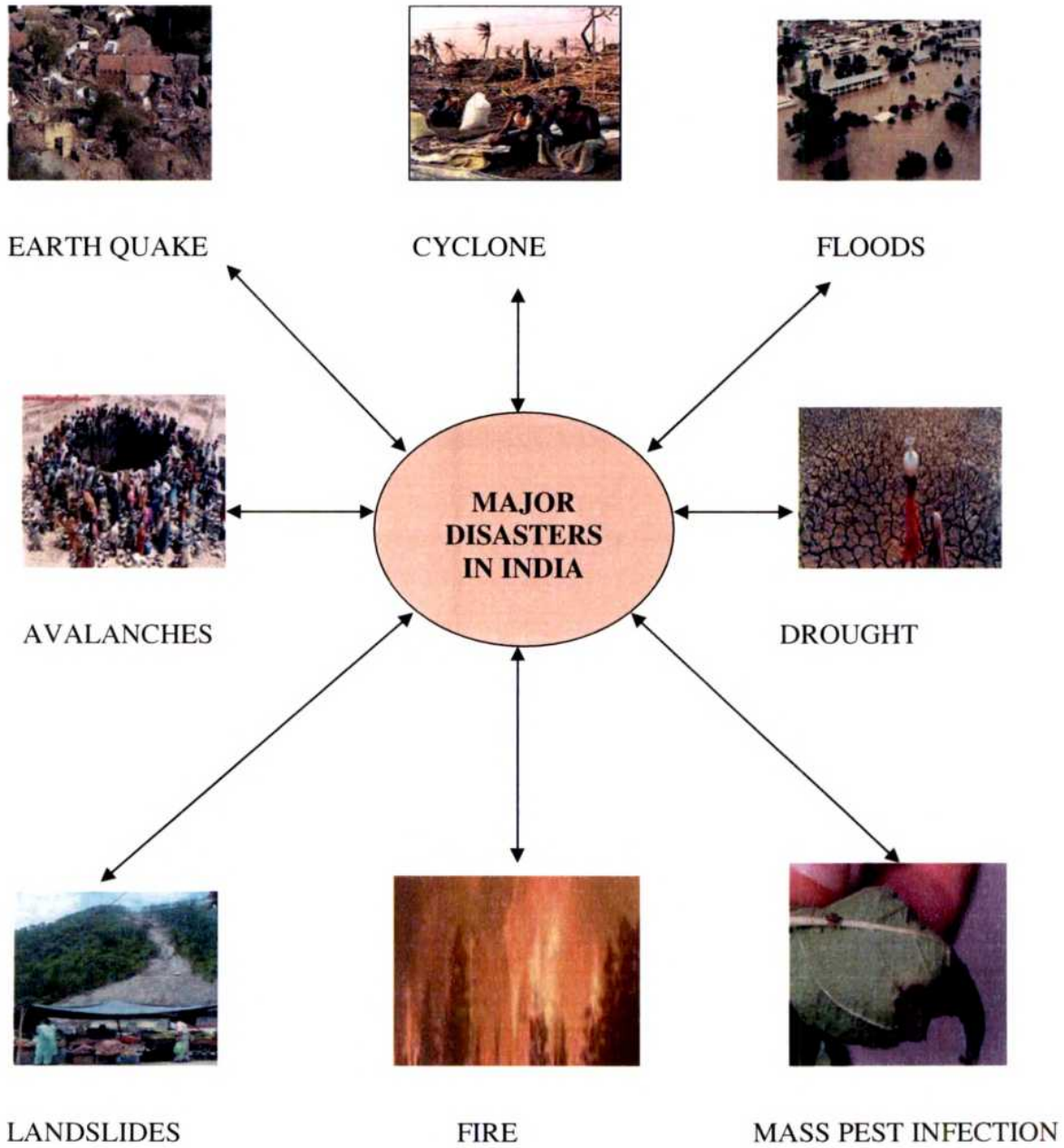
In the past several years, India has suffered major disasters ranging from earthquakes in Gujarat (**West**) to tsunami in the coastal regions of Tamil Nadu (**South**), heavy rains in the east and floods/explosions in Mumbai (**Central**) and man made disaster in the northern region. These disasters often cause severe and ongoing destruction in the form of water / fire/ storms, to human lives, cattle, buildings, cultural property, the most vulnerable being human lives and healthy living, and other material wealth. In many cases it is being observed that the most vulnerable to disasters are Women and Children in Kuppams who are either not informed or not aware of how to cope with such a disaster. On such occasions, it is essential to be prepared and list out the lessons learnt from different experiences so as to make the public aware on information on disaster preparedness and management. In severe Disaster situations, residents of the Kuppams face a sharply increased workload because decision makers or heads of the family

often migrate in search of work as there is disruption and difficulties in earning daily wages in the respective location. Their health suffers. Hygiene deteriorates as the physical strain takes a toll on their already malnourished **bodies**. **They** take decisions about the welfare of children, including their **evacuation**, feeding and safe keeping in chaotic times. Education and public **information** campaigns should take account of these social and cultural responsibilities. Information on where food or other supplies can be obtained and the claims to such relief should be spelled out for the general public but should keep the vulnerability of the Kuppams residents very much in mind. Illiteracy and other factors may limit a community member's access to such information.

It too often goes unreported that residents of Kuppams usually suffer more in natural disasters, especially in the countries of the South. Preparedness and prevention program mostly ignore their vulnerability and few relief program are designed with them in mind. Since they play only a marginal role in community decision-making, they can rarely command their relief supplies or have a say in post-disaster rehabilitation. The study attempts to understand the strategic planning required for community awareness in Disaster Management.

Photograph 1.3.1

MAJOR DISASTERS IN INDIA



Photograph 1.3.2

EARTH QUAKE



India has witnessed some of the most devastating earthquakes during the last century like the one in Kangra (1905), Bihar-Nepal (1934) and in Assam (1950). In the recent past, earthquakes have caused havoc in Uttarkashi (1991), Latur (1993), Jabalpur (1997), Chamoli (1999) and in Bhuj (2001). On 26th January 2001, India experienced one of the worst earthquakes in recent times. Measuring 6.9 on the Richter scale, the earthquake caused incalculable damage not just to its epicenter, Bhuj but also to other towns of the district of Kutch and to about 500 villages out of the total of 900 villages. The reported damage to property in Gujarat was about Rs.21, 000crore and the number of human lives lost was about 14,000. Of these, more than 500 deaths were reported from Ahmadabad, situated at a distance of about 350 kms from Bhuj. Around 150 multi-storied buildings crumbled down. Cities far away from the epicenter, like Surat, too reported damage to property.

Photograph 1.3.3

DROUGHT



Drought is a temporary reduction in water or moisture availability significantly below the normal or expected amount for a specific period. This condition occurs either due to inadequacy of rainfall, or lack of irrigation facilities, under-exploitation or deficient availability for meeting the normal crop requirements in the context of the agro-climatic conditions prevailing in any particular area. This has been scientifically computed as Moisture index (M I). There is a drought in Jaisalmer (Average rainfall 200 mm) if rainfall is not sufficient to grow grass and paltry coarse-grains, whereas in Bolangir or Koraput (Orissa-rainfall above 1000 mm) there is a drought if there is not enough rainfall for bringing the paddy crop to maturity.

Photograph 1.3.4**CYCLONES**

Cyclones in India generally strike the East Coast; some of the Arabian Sea Cyclones strike the west coast of India as well mainly the Gujarat and North Maharashtra coast. Out of the storms that develop in the Bay of Bengal, over 58 percent approach or cross the east coast in October and November. India has a very long coastline of 8041 km, large parts of which are vulnerable to cyclone.

Classification of Cyclonic Disturbances Table 1.1.1

S.No.	Disturbance	Wind Speed (Knots)
1.	Low	Less than 17.
2.	Depression	17-27(32-50 km/h)
3.	Deep Depression	28-33 (51-62 km/h)
4.	Cyclonic storm	34-47 (63-88 km/h)
5.	Severe cyclonic storm with a core of Hurricane winds	48-63-(89-118 km/h)

Photograph 1.3.5

FLOOD



The flood hazard is compounded by the problems of sediment deposition, drainage congestion and synchronization of river floods with sea tides in the coastal plains. The area vulnerable to floods is 40 million hectares and the average area affected by floods annually is about 8 million hectares. The average annual total damage to crops houses public utilities during the period 1953- 1995 were about Rs.9720 million. The rapid and durable recovery, which does not reproduce the original vulnerable conditions the country, receives an annual precipitation of 400 million - hectare meters.

Photograph 1.3.6

Tsunami



Tsunami (pronounced soo-nahm-ee) is a series of huge waves that happen after an undersea disturbance, such as an earthquake or volcano eruption. (**Tsunami** is from the Japanese word for harbor wave.) The waves travel in all directions from the area of disturbance, much like the ripples that happen after throwing a rock. Tsunamis also known as seismic sea waves (mistakenly called “tidal waves”), are a series of enormous waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. A tsunami can move hundreds of miles per hour in the open ocean and smash into land with waves as high as 100 feet or more.

From the area where the tsunami originates, waves travel outward in all directions. Once the wave approaches the shore, it builds in height. The topography of the coastline and the ocean floor will influence the size of the wave. There may be more than one wave and the succeeding one may be larger than the one before. That is why a small tsunami at one beach can be a giant wave a few miles away.

All tsunamis are potentially dangerous, even though they may not damage every coastline they strike. The most destructive tsunamis have occurred along the coasts of California, Oregon, Washington, Alaska, and Hawaii.

Earthquake-induced movement of the ocean floor most often generates tsunamis. If a major earthquake or landslide occurs close to shore, the first wave in a series could reach the beach in a few minutes, even before a warning is issued. Areas are at greater risk if they are less than 25 feet above sea level and within a mile of the shoreline. Drowning is the most common cause of death associated with a tsunami. Tsunami waves and the receding water are very destructive to structures in the run-up zone. Other hazards include flooding, contamination of drinking water, and fires from gas lines or ruptured tanks.

Table 1.1.2

MULTIPLE HAZARD PRONE DISTRICTS IN TAMIL NADU

S.No.	District	Wind and Cyclone	Flood	Earthquake	Area Affected
1	Chennai	Very High (VH)	Moderate (M)	Low (L)	Partially
2	Cuddalore	VH	M	L	Partially
3	Kancheepuram	VH	M	L	Partially
4	Thiruvallur	VH	M	L	Partially
5	Tiruvanamalai	VH	M	L	Partially
6	Viluppuram	VH	M	L	Partially

India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods;

about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year. The loss in terms of private, community and public assets has been astronomical. At the global level, there has been considerable concern over natural disasters. Even as substantial scientific and material progress is made, the loss of lives and property due to disasters has not decreased. In fact, the human toll and economic losses have mounted. It was in this background that the United Nations General Assembly, in 1989, declared the decade 1990-2000 as the International Decade for Natural Disaster Reduction with the objective to reduce loss of lives and property and restrict socio-economic damage through concerted international action, especially in developing countries. The super cyclone in Orissa in October 1999 and the Bhuj earthquake in Gujarat in January 2001 underscored the need to adopt a multi dimensional endeavor involving diverse scientific, engineering, financial and social processes; the need to adopt multi disciplinary and multi sectoral approach and incorporation of risk reduction in the developmental plans and strategies.

Over the past couple of years, the Government of India has brought about a paradigm shift in the approach to disaster management. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process. Another corner stone of the approach is that mitigation has to be multi-disciplinary spanning across all sectors of development. The new policy also emanates from the belief that investments in mitigation are much more cost effective than expenditure on relief and rehabilitation. Disaster management occupies an important place in this country's policy framework as it is the poor and the under-privileged who is worst affected on account of calamities/disasters. The steps being taken by the

Government emanate from the approach outlined above. The approach has been translated into a National Disaster Framework [a roadmap] covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness and response and human resource development. The expected inputs, areas of intervention and agencies to be involved at the National, State and district levels have been identified and listed in the roadmap. This roadmap has been shared with all the State Governments and Union Territory Administrations. Ministries and Departments of Government of India, and the State Governments/UT Administrations have been advised to develop their respective roadmaps taking the national roadmap as a broad guideline. There is, therefore, now a common strategy underpinning the action being taken by all the participating organizations/stakeholders.

The Government of India has adopted mitigation and prevention as essential components of their development strategy. The Tenth Five Year Plan document has a detailed chapter on Disaster Management. The plan emphasizes the fact that development cannot be sustainable without mitigation being built into developmental process. Each State is supposed to prepare a plan scheme for disaster mitigation in accordance with the approach outlined in the plan. Mitigation is being institutionalized into developmental planning. Preparedness, Mitigation and preparedness measures go hand in hand for vulnerability reduction and rapid professional response to disasters. The Bhuj earthquake in January 2001 brought out several inadequacies in the system. The search and rescue teams had not been trained professionally; specialized dog squad to look for live bodies under the debris were not available; and there were no centralized resource inventory for emergency response. Although army played a pivotal role in search and rescue and also set up their hospital after the collapse of Government hospital at Bhuj, the need for fully equipped mobile hospitals with trained personnel was

felt acutely. Despite these constraints, the response was fairly well organized. However, had these constraints been taken care of before hand, the response would have been even more professional and rapid which may have reduced the loss of lives. Specialist search and rescue teams from other countries did reach Bhuj. However, precious time was lost and even with these specialist teams it was not possible to cover all severely affected areas as quickly as the Government would have desired. It was, therefore, decided that we should remove these inadequacies and be in a stage of preparedness at all times.

The Central Government is now in the process of training and equipping 96 specialist search and rescue teams, with each team consisting of 45 personnel including doctors, paramedics, structural engineers etc. Ten teams have already been trained. These teams will be located at various centers around the country for specialized response. These teams will have the latest equipment as also dog squads for locating survivors in the debris. Apart from specialist search & rescue units, it has been decided that personnel of Central Police Organizations should also be imparted training in search and rescue so that they can be requisitioned to the site of incident without loss of time. Pending arrival of the specialist teams, the battalions located near the site of incident would be deployed immediately. For this purpose, a curriculum has been drawn up and integrated into the training curriculums. The States have also been advised to set up their own specialist teams for responding to disasters. Assistance will be provided to the State Governments for training their trainers at the national institutes already designated for this purpose. The State Governments' search and rescue teams to be constituted from the State Police will be equipped to meet the requirement. For this purpose, the State Governments have been authorized to utilize 10% of the annual allocation made under the Contingency Relief Fund for purchase of equipments. Fourteen Regional Response Centers are being set up in different

parts of the country. These centers will have response teams and equipment and resources for being able to respond to any hazard/calamity in the neighboring States.

A Steering Committee has been constituted in the Ministry to oversee the Creation of capabilities for emergency response. A 200 bedded mobile hospital, fully trained and equipped is being set up by the Ministry of Health and attached to a leading Government hospital in Delhi. Three additional mobile hospitals with all medical and emergency equipments are proposed to be located in different parts of the country. These mobile hospitals will also be attached to the leading Government hospitals in the country. This will enable the mobile hospitals to extend assistance to the hospitals with which they are attached in normal time. They will be airlifted during emergencies with additional doctors/paramedics taken from the hospitals with which the mobile hospitals are attached to the site of disaster. It is proposed to purchase dedicated aircraft and helicopters with a view to reducing the response time. The issue is pending for consideration and approval of Empowered Group of Ministers on Disaster Management. Once the airlift facilities are developed for exclusive use for disaster management, it will be possible to provide airlift facilities to specialist search and rescue teams, mobile hospitals and equipments. In order to professionalism the response, it is proposed to introduce the Incident Command System in the country. This system provides for specialist incident command teams with an Incident Commander and officers trained in different aspects of incident management – logistics, operations, planning, safety, media management etc. The incident Command System has been finalized keeping in view the systems and procedures prevalent in our country by dovetailing it in the existing governmental machinery already in position. The training of trainers in the Incident Command System has already commenced at Lal Bahadur Shastri National Academy of Administration at Missour, which has

been designated as the nodal training institutes for this purpose. A web-enabled centralized database for the India Disaster Resource Network has been operationalized. The network will ensure quick access to resources to minimize response time in emergencies. The list of resources to be updated in the system has been finalized. It has 226 items. About 60,000 records in 481 districts throughout the country have already been uploaded since 1st September 2003 when the India Disaster Resource Network was formally inaugurated. The system will give, at the touch of the button, location of specific equipments/specialist resources as well as the Controlling authority for that resource so that it can be mobilized for response in the shortest possible time. The database will be available simultaneously at the district, state and national levels. The States are being persuaded to set up control rooms/emergency operations centers at the state and district level. Assistance for construction and purchase of equipments for control rooms is being provided. The control rooms, which will function round the clock, will be composite control rooms to look after law and order issues as well as disaster management. Equipments are also being provided for these control rooms under the disaster risk management programme. Communication is a major bottleneck in case of any major disaster particularly when the traditional network system already in force brakes down. In order to strengthen communications, it has been decided that police network

(POLNET) will also be used for disaster management. For this purpose POLNET communication facility will be extended to District Magistrates, Sub Divisional Magistrates as well as the Control Rooms. For emergency communication, mobile satellite based units which can be transported to the site of the disaster are being procured. A group was constituted to draw a comprehensive communication plan for disaster management and the report has since been received. This provides for

a dedicated communication system for disaster management with built in redundancies.

The Geographical Information System (GIS) database is an effective tool for emergency responders to access information in terms of crucial parameters for the disaster-affected areas. The crucial parameters include location of the public facilities, communication links and transportation network at national, state and district levels. The GIS database already available with different agencies of the Government is being upgraded and the gaps are proposed to be bridged. A project for this purpose is being drawn up with a view to institutionalizing the arrangements. The database will provide multi-layered maps on district wise basis. Three maps taken in conjunction with the satellite images available for a particular area will enable the district administration as well as State Governments to carry out hazard zonation and vulnerability assessment, as well as coordinate response after a disaster.

In order to further strengthen the capacity for response, the fire services proposed to be developed into multi hazard response units, as is the normal practice in several other countries. It is proposed to provide rescue tenders in addition to fire tenders to each fire unit and fill up all gaps up to sub-divisional level. Hazmat vans will be provided to State capitals and metropolitan cities. This will necessitate recruitment of additional firemen and drivers and intensive training required to be provided to enable them to function as efficient of all purpose response units. A project for development of fire service into all hazard response units has also been finalized and submitted for obtaining necessary financial approval. India has a large network of Civil Defense and Home Guards volunteers.

The existing strength is about 1.2 million. However, this organization has not so far been associated with disaster mitigation, preparedness and response functions.

It is proposed to revamp the Civil Defense organization to enable them to discharge a key responsibility in all the facets of disaster management including preparedness. A proposal in this regard has been finalized and is under consideration of the Government. Standard Operating Procedures are being laid down to ensure all the steps required to be taken for disaster management are put in place. The Standard Operating Procedure will also encompass response, besides preparedness.

CURRENT STATUS AS PER GOI:

Institutional and Policy Framework in INDIA

The institutional and policy mechanisms for carrying out response, relief and rehabilitation have been well established since Independence. These mechanisms have proved to be robust and effective insofar as response, relief and rehabilitation are concerned. At the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis. The Ministries/Departments/Organizations concerned with the primary and secondary functions relating to the management of disasters include: India Meteorological Department, Central Water Commission, Ministry of Home Affairs, Ministry of Defense, Ministry of Finance, Ministry of Rural Development, Ministry of Urban Development, Department of Communications, Ministry of Health, Ministry of Water

Resources, Ministry of Petroleum, and Department of Agriculture & Cooperation. Ministry of Power, Department of Civil Supplies, Ministry of Railways, Ministry of Information and Broadcasting, Planning Commission, Cabinet Secretariat, Department of Surface Transport, Ministry of Social Justice, Department of Women and Child Development, Ministry of Environment and Forest, Department of Food. Each Ministry/Department/Organization nominates their nodal officer to the Crisis Management Group chaired by Central Relief Commissioner. The nodal officer is responsible for preparing sectoral Action Plan/Emergency Support Function Plan for managing disasters.

National Crisis Management Committee (NCMC): Cabinet Secretary, who is the highest executive officer, heads the NCMC. Secretaries of all the concerned Ministries /Departments as well as organizations are the members of the Committee. The NCMC gives direction to the Crisis Management Group as deemed necessary. The Secretary, Ministry of Home Affairs is responsible for ensuring that all developments are brought to the notice of the NCMC promptly. The NCMC can give directions to any Ministry/Department/Organization for specific action needed for meeting the crisis situation.

Crisis Management Group: The Central Relief Commissioner in the Ministry of Home Affairs is the Chairman of the CMG, consisting of senior officers (called nodal officers) from various concerned Ministries. The CMG's functions are to review every year contingency plans formulated by various Ministries/Departments/Organizations in their respective sectors, measures required for dealing with natural disasters, coordinate the activities of the Central Ministries and the State Governments in relation to disaster preparedness and relief and to obtain information from the nodal officers on measures relating to above. The CMG, in the event of a natural disaster, meets frequently to review the relief operations and extend all possible assistance required by the affected States

to overcome the situation effectively. The Resident Commissioner of the affected State is also associated with such meetings.

Control Room (Emergency Operation Room): An Emergency

Operations Center (Control Room) exists in the nodal Ministry of Home Affairs, which functions round the clock, to assist the Central Relief Commissioner in the discharge of his duties. The activities of the Control Room include collection and transmission of information concerning natural calamity and relief, keeping close contact with governments of the affected States, interaction with other Central Ministries/Departments/Organizations in connection with relief, maintaining records containing all relevant information relating to action points and contact points in Central Ministries etc., keeping up-to-date details of all concerned officers at the Central and State levels.

Contingency Action Plan: The Government of India formulates a National Contingency Action Plan (CAP) for dealing with contingencies arising in the wake of natural disasters and it had been periodically updated. It facilitates the launching of relief operations without delay. The CAP identifies the initiatives to be taken by various Central Ministries/Departments in the wake of natural calamities, sets down the procedure and determines the focal points in the administrative machinery.

State Relief Manuals: Each State Government has relief manuals/codes, which identify that role of each officer in the State for managing the natural disasters. These are reviewed and updated periodically based on the experience of managing the disasters and the need of the State.

Funding mechanisms: The policy and the funding mechanism for provision of relief assistance to those affected by natural calamities are clearly laid down. The Finance Commission appointed by the Government of India every five years reviews these. The Finance Commission makes recommendation regarding the

division of tax and non-tax revenues between the Central and the State Governments and also regarding policy for provision of relief assistance and their share of expenditure thereon.

A Calamity Relief Fund

(CRF) has been set up in each State as per the recommendations of the Eleventh Finance Commission. The Finance Commission has fixed the size of the Calamity Relief Fund after taking into account the expenditure on relief and rehabilitation over the past 10 years. The Government of India contributes 75% of the corpus of the Calamity Relief Fund in each State. 25% is contributed to by the State. Relief assistance to those affected by natural calamities is granted from the CRF. Overall a national committee lays down norms for relief assistance with representatives of States as members. Different States can have State specific norms to be recommended by State level committee under the Chief Secretary. Where the calamity is of such proportion that the funds available in the CRF will not be sufficient for provision of relief, the State seeks assistance from the **National Calamity Contingency Fund (NCCF)** - a fund created at the Central Government level. When such requests are received, a team from the Central Government assesses the requirements and thereafter a High Level Committee chaired by the Deputy Prime Minister clears the assessed requirements. In brief, the institutional arrangements for response and relief are well established and have proved to be robust and effective.

In the federal set up of India, the basic responsibility for undertaking Rescue, relief and rehabilitation measures in the event of a disaster is that of the State Government concerned. At the State level, Departments of Relief & Rehabilitation handle response, relief and rehabilitation. The State Crisis Management Committee set up under the Chairmanship of Chief Secretary who is the highest executive functionary in the State. All the concerned Departments and

organizations of the State and Central Government Departments located in the State are represented in this Committee. This Committee reviews the action taken for response and relief and gives guidelines/directions as necessary. A control room is established under the Relief Commissioner. The control room is in constant touch with the climate monitoring/forecasting agencies and monitors the action being taken by various agencies in performing their responsibilities. The district level is the key level for disaster management and relief activities. The Collector/ Deputy Commissioner is the Chief administrator in the district. He is the focal point in the preparation of district plans and in directing, supervising and monitoring calamities for relief. A District Level Coordination and Relief Committee is constituted and is headed by the Collector as Chairman with participation of all other related government and non governmental agencies and departments in addition to the elected representatives. The Collector is required to maintain close liaison with the district and the State Governments as well as the nearest units of Armed Forces/Central police organizations and other relevant Central Government organizations like Ministries of Communications, Water Resources, Drinking Water, and Surface Transport, who could supplement the efforts of the district administration in the rescue and relief operations. The Collector/Deputy Commissioner coordinates the efforts of the Government and non-governmental organizations for response and relief. The District Magistrate/Collector and Coordination Committee under him review preparedness measures prior to a impending hazard and coordinate response when the hazard strikes. As all the Departments of the State Government and district level report to the Collector, there is an effective coordination mechanism ensuring holistic response.

New institutional mechanisms: As has been made clear above, the existing mechanisms had based on post-disaster relief and rehabilitation and they have

proved to be robust and effective mechanisms in addressing these requirements. The changed policy/approach, however, mandates a priority to full disaster aspects of mitigation; prevention and preparedness and new institutional and policy mechanisms are being put in place to address the policy change.

It is proposed to constitute a National Emergency Management Authority at the National level. The High Powered Committee on Disaster Management which was set up in August, 1999 and submitted its Report in October, 2001, had inter alias recommended that a separate Department of Disaster Management be set up in the Government of India. It was, however, felt that conventional Ministries/Departments have the drawback of not being flexible enough especially in terms of the sanction procedures. The organization at the Apex level will have to be multi-disciplinary with experts covering a large number of branches. The National Emergency Management Authority has, therefore, been proposed as a combined Secretariat/Directorate structure – a structure that will be an integral part of the Government and, therefore, will work with the full authority of the Government while, at the same time, retaining the flexibility of a field organization. The National Emergency Management Authority will be headed by an officer of the rank of Secretary/Special Secretary to the Government in the Ministry of Home Affairs with Special Secretaries/Additional Secretaries from the Ministries/Departments of Health, Water Resources, Environment & Forests, Agriculture, Railways, Atomic Energy, Defense, Chemicals, Science & Technology, Telecommunications, Urban Employment and Poverty Alleviation, Rural Development and India Meteorological Department as Members of the Authority.

The Authority would meet as often as required and review the status of warning systems, mitigation measures and disaster preparedness. When a disaster strikes, the Authority will coordinate disaster management activities.

The Authority will be responsible for:-

- i) Coordinating/mandating Government's policies for disaster Reduction /mitigation
- ii) Ensuring adequate preparedness at all levels in order to meet disasters.
- iii) Coordinating response to a disaster when it strikes.
- iv) Coordination of post disaster relief and rehabilitation.

The National Emergency Management Authority will have a core permanent Secretariat with three divisions – one for Disaster Prevention, Mitigation & Rehabilitation, the other for Preparedness and the third for Human Resource Development. At the State level, as indicated, disaster management was being handled by the Departments of Relief & rehabilitation. As the name suggests, the focus was almost entirely on post-calamity relief. The Government of India is working with the State Governments to convert the Departments of Relief & Rehabilitation into Departments of Disaster Management with an enhanced area of responsibility to include mitigation and preparedness apart from their present responsibilities of relief and rehabilitation. The changeover has already happened in eight State Governments/Union Territory Administrations. The change is under process in other States. The States have also been asked to set up Disaster Management Authorities under the Chief Minister with Ministers of relevant Departments [Water Resources, Agriculture, Drinking Water Supply, Environment & Forests, Urban Development, Home, Rural Development etc.] as members.

The objective of setting up an Authority is to ensure that mitigation and preparedness is seen as the joint responsibility of all the Departments concerned and disaster management concerns are mainstreamed into their programmes. This holistic and multidisciplinary approach is the key to effective mitigation.

At the district level, the District Magistrate who is the chief coordinator will be the focal point for coordinating all activities relating to prevention, mitigation and preparedness apart from his existing responsibilities pertaining to response and relief. The District Coordination and Relief Committee is being reconstituted/ re-designated into Disaster Management Committees with officers from relevant departments being added as members. Because of its enhanced mandate of mitigation and prevention, the district heads and departments engaged in development will now be added to the Committee so that mitigation and prevention is mainstreamed into the district plan. The existing system of drawing up preparedness and response plans will continue. There will, however, also be a long-term mitigation plan. District Disaster Management Committees have already been constituted in several districts and are in the process of being constituted in the remaining multi-hazard prone districts. Similarly, we are in the process of creating Block/Taluq Disaster Management Committees in these 169 multi-hazard prone districts in 17 States. At the village level, in 169 multi-hazard prone districts, each village will have a Disaster Management Plan. The process of drafting the plan has already begun. The Disaster Management Committee which draws up the plans consists of elected representatives at the village level, local authorities; Government functionaries including doctors/paramedics of primary health centers located in the village, primary school teachers etc. The plan encompasses prevention, mitigation and preparedness measures. The Disaster Management Teams at the village level will consist of members of voluntary organizations like Nehru Yuvak Kendra and other non-governmental organizations as well as able-bodied volunteers from the village. The teams are provided basic training in evacuation, search and rescue etc. The Disaster Management Committee will review the disaster management plan at least once in a year. It would also generate awareness among the people in the village about

dos' and don'ts for specific hazards depending on the vulnerability of the village. A large number of village level Disaster Management Committees and Disaster Management Teams have already been constituted. The States have been advised to enact Disaster Management Acts. These Acts provide for adequate powers for authorities coordinating mitigation, preparedness and response as well as for mitigation/prevention measures required to be undertaken. Two States [Gujarat & Madhya Pradesh] have already enacted such a law. Other States are in the process. The State Governments have also been advised to convert their Relief Codes into Disaster Management Codes by including aspects of prevention, mitigation and preparedness.

In order to further institutionalize the new approach, the Government of India has decided to enunciate a National Policy on Disaster Management. A draft policy has accordingly been formulated and is expected to be put in place shortly. The policy shall inform all spheres of Central Government activity and shall take precedence over all existing sectoral policies. The broad objectives of the policy are to minimize the loss of lives and social, private and community assets because of natural or manmade disasters and contribute to sustainable development and better standards of living for all, more specifically for the poor and vulnerable sections by ensuring that the development gains are not lost through natural calamities/disasters.

The policy notes that State Governments are primarily responsible for Disaster management including prevention and mitigation, while the Government of India provides assistance where necessary as per the norms laid down from time to time and proposes that this overall framework may continue. However, since response to a disaster requires coordination of resources available across all the Departments of the Government, the policy mandates that the Central Government will, in conjunction with the State Governments, seek to ensure that such a

coordination mechanism is laid down through an appropriate chain of command so that mobilization of resources is facilitated.

The broad features of the draft national policy on disaster management are enunciated below:-

- i) A holistic and pro-active approach for prevention, mitigation and Preparedness will be adopted for disaster management.
- ii) Each Ministry/Department of the Central/State Government will set apart an appropriate quantum of funds under the Plan for specific schemes/projects addressing vulnerability reduction and preparedness.
- iii) Where there is a shelf of projects, projects addressing mitigation will be given priority. Mitigation measures shall be built into the ongoing Schemes/programmes
- iv) Each project in a hazard prone area will have mitigation as an essential term of reference. The project report will include a statement as to how the project addresses vulnerability reduction.
- v) Community involvement and awareness generation, particularly that of the vulnerable segments of population and women has been emphasized as necessary for sustainable disaster risk reduction. This is a critical component of the policy since communities are the first responders to disasters and, therefore, unless they are empowered and made capable of managing disasters, any amount of external support cannot lead to optimal results.
- vi) There will be close interaction with the corporate sector, nongovernmental organizations and the media in the national efforts for disaster prevention/vulnerability reduction.
- vii) Institutional structures/appropriate chain of command will be built up and appropriate training imparted to disaster managers at various levels to ensure

coordinated and quick response at all levels; and development of inter-State arrangements for sharing of resources during emergencies.

viii) A culture of planning and preparedness is to be inculcated at all levels for capacity building measures.

ix) Standard operating procedures and disaster management plans at state and district levels as well as by relevant central government departments for handling specific disasters will be laid down.

x) Construction designs must correspond to the requirements as laid down in relevant Indian Standards.

xi) All lifeline buildings in seismic zones III, IV & V – hospitals, railway stations, airports/airport control towers, fire station buildings, bus stands major administrative centers will need to be evaluated and, if necessary, retro-fitted.

xii) The existing relief codes in the States will be revised to develop them into disaster management codes/manuals for institutionalizing the planning process with particular attention to mitigation and preparedness. With the above mentioned institutional mechanism and policy framework in position and the actions taken to implement the policy guidelines, it is expected that the task of moving towards vulnerability reduction will be greatly facilitated.

Community Awareness on Early Warning System - Cyclone Forecasting

Tropical Cyclones are intense low-pressure systems which develop over warm sea. They are capable of causing immense damage due to strong winds, heavy rains and storm surges. The frequency of the TC in the Bay of Bengal is 4 to 5 times more than in the Arabian Sea. About 35% of initial disturbances in the north Indian Ocean reach TC stage of which 45% become severe.

Indian Meteorological Department (IMD) is mandated to monitor and give warnings regarding Tropical Cyclone (TC). Monitoring process has been

revolutionized by the advent of remote sensing techniques. A TC intensity analysis and forecast scheme has been worked out using satellite image interpretation techniques, which facilitate forecasting of storm surges. Data resources are crucial to early forecasting of cyclones. Satellite based observations are being extensively utilized. Satellite integrated automated weather stations have been installed on islands, oilrigs and exposed coastal sites. Buoys for supplementing the surface data network in the tropical ocean have been deployed. The Government has also started a National Data Buoy Program. A set of 12 moored buoys has been deployed in the northern Indian Ocean to provide meteorological and oceanographic data. Dynamic forecasting of TCs requires knowledge of the vertical structure of both the Cyclone and the surrounding environment. The rawin sonde remains the principal equipment for sounding. The Doppler radar wind profiler provides hourly soundings. A mesosphere, stratosphere, troposphere (MST) radar has also been installed at Thirupatti. Another profiler is being developed and will be deployed at IMD Pune. Another important source of upper level data is the aircraft reports. Increasing number of commercial jet aircraft are equipped with the Aircraft Meteorological Data Relay system. This data is being made available is also being used by the IMD for analysis and predictions. Radars have been used to observe TCs since long. Surveillance of the spiral rain bands and the eye of the TC is an important function of the coastal radars. 10 Cyclones Detection Radars have already been installed. These radars are providing useful estimates of storm centers up to a range 300-400 Km. Doppler radars provide direct measurements of wind fields in TCs. Due to range limitation; Doppler wind estimates are usually within a range of about 100 Km. IMD has deployed Doppler radars at 3 sites on the east coast. Another set of 3 Doppler radars are being deployed in Andhra Pradesh in near future.

The meteorological satellite has made a tremendous impact on the analysis of cyclones. All developing cloud clusters are routinely observed through Satellite cloud imagery & those showing signs of organization are closely monitored for signs of intensification. TC forecasters everywhere use the Dvorak technique to estimate storm location and intensity. It has been found to provide realistic estimates for TCs in the Bay of Bengal as well as Arabian Sea. INSAT data has also been used to study the structures of different TCs in the Bay of Bengal. IMD is also producing Cloud Motion Vectors (CMVs). Very High Resolution Radiometer (VHRR) payload onboard INSAT –2E which have been improved upon to provide water vapor channel data in addition to VIS & IR onboard INSAT – 2E. A separate payload known as Charged Couple Device (CCD) has also been deployed onboard this satellite.

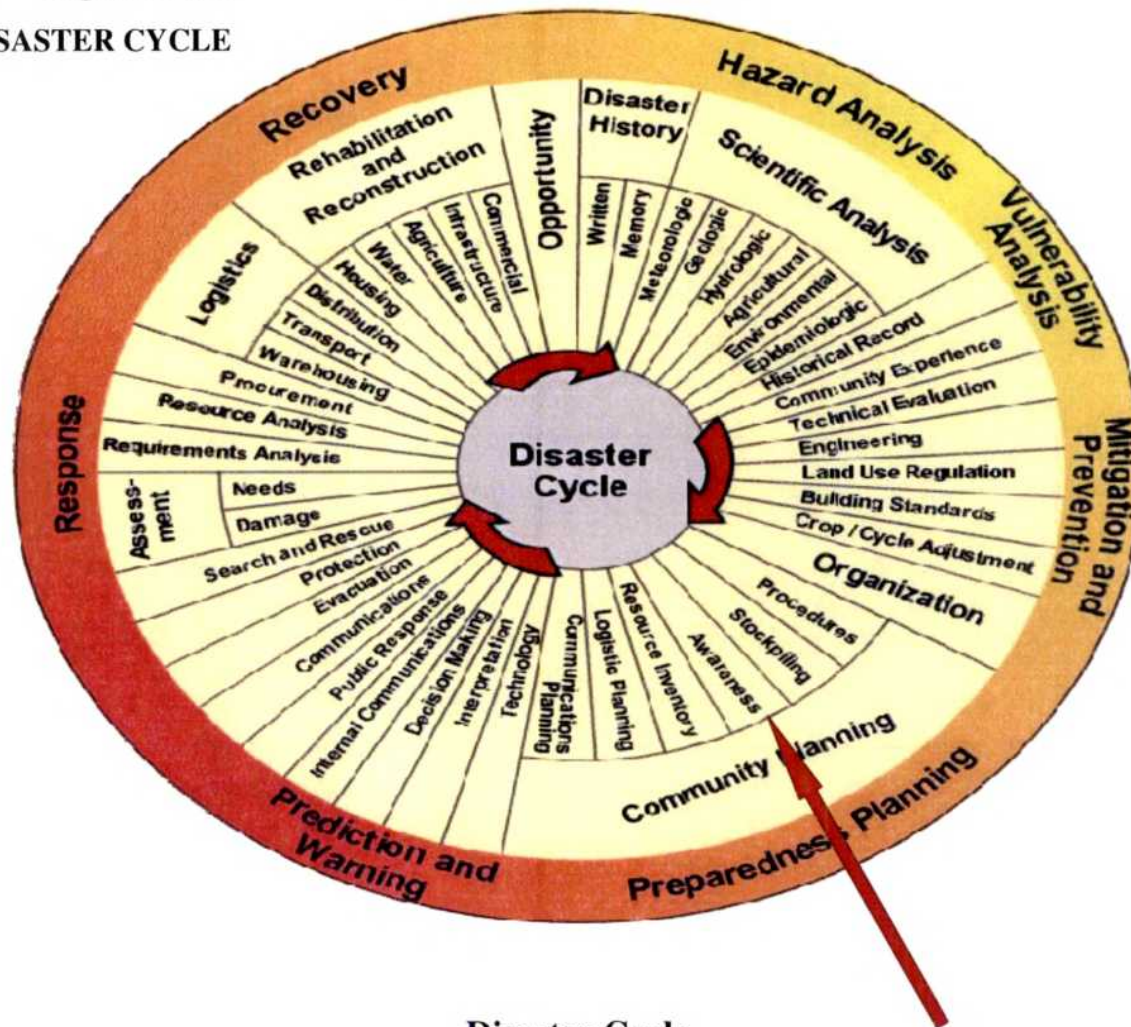
The goal of any warning system is to maximize the number of people who take appropriate and timely action for the safety of life and property. All warning systems start with detection of the event and with people getting out of harm's way. Such warning systems encompass three equally important elements namely; Detection and Warning; Communication; and Response. The two stage warning system has been in existence since long in IMD. Recently it has been improved upon by introducing two more stages - the 'Pre- Cyclone watch' and the 'post-landfall Scenario'. This four stage warning system meets the requirements of Public Administrators and Crisis Managers. The 'Pre-Cyclone Watch' stage contains early warning about the development of a cyclonic disturbance in the form of monsoon depression which has a potential to threaten the coast with cyclone force winds. The coastal stretch likely to be affected is identified. The IMD issues this early warning bulletin before the Cyclone-Alert Stage. This provides enough lead time for the crisis managers to undertake preparedness actions.

After the early warning on the 'Pre-Cyclone Watch' the Collectors of coastal and few immediate interior districts and the Chief Secretary of the concerned maritime State are warned in two stages, whenever any coastal belt is expected to experience adverse weather (heavy rain/gales/tidal wave) in association with a cyclonic storm or a depression likely to intensify into a cyclonic storm. The second stage of "Cyclone Alert" is sounded 48 hours in advance of the expected commencement of adverse weather over the coastal areas. Forecasts of commencement of strong winds, heavy precipitation along the coast in association with arrival of cyclone are issued at the alert stage. Landfall point is usually not identified at this stage. The third stage warning known as "Cyclone Warning" is issued 24 hours in advance. Landfall point is forecast in this stage of cyclone warning. In addition to the forecasts for heavy rains and strong winds, the storm surge forecast is also issued. Since the storm surge is the biggest killer so far as the devastating attributes of a storm are concerned, information in this regard is most critical for taking follow up action for evacuation from the low lying areas likely to be affected by the storm.

After the landfall of the cyclone the strong winds with gale force speeds continue over certain interior districts of the maritime States hit by the cyclone. To take cognizance of that, a fourth stage known as 'Post-landfall Scenario Stage' is now identified usually as a part of the 'Cyclone Warning Stage' either at the time of landfall of the disturbance or about twelve hour in advance of it. It includes warnings of strong winds and heavy rains likely to be encountered in the interior districts. For communications, the IMD makes use of 97 point-to-point tele printer links connecting different field offices. Switching computers have been provided at 5 Regional Centers. These computers are linked to the central Regional Telecom Hub Computer at New Delhi. In addition, 69 centers have been provided with 85 telex connections. Besides, 27 field offices have been provided with

Radio Teletype facility. IMD also utilizes VSAT technology which has been installed at field offices. In addition, there are a number of HF/RT and VHF links. Cyclone warnings are communicated to Crisis Managers and other concerned organizations by high priority telegrams, telex, telephones and Police wireless. Cyclone warning is provided by the IMD from the Area Cyclone Warning Centers (ACWCs) at Calcutta, Chennai and Mumbai and Cyclone Warning Centers (CWCs) at Vishakhapatnam, Bhubaneswar and Ahmadabad

Figure 1.2.1
DISASTER CYCLE



Disaster Cycle

The research study is about Strategy Planning for Community Awareness in Disaster Management with particular reference to TVT Kuppam, Sudhandeeranagar Kuppam, NTO Kuppam, and Pudhu Nagar Kuppam.

Contents in the cycle Sourced and compiled from the notes of World Bank Institute during my course for Comprehensive Disaster Risk Management at World Bank & NIDM-Latha Mazumder

PROFILE OF THE RESEARCH LOCATION

Thiruvallur district, a newly formed district bifurcated from the erstwhile Chengalpattu district (on 1st January 1997), is located in the North East part of Tamil Nadu. North Latitude between 12°15' and 13°15' East Longitude between 79°15' and 80°20' The district is surrounded by Kanchipuram district in the South, Vellore district in the West. Bay of Bengal in the East and Andhra Pradesh State in the North. The district spreads over an area of about 3422 Sq.kms. An insight into the early history of this region shows that the region was reined by kingdoms such as the Pallavas, the Golkondas, the Mughals, the French, the Dutch and also the British

Administrative Structure

The district has been divided into three revenue divisions viz, Thiruvallur, Tiruttani and Ponnari. There are three taluks under Thiruvallur division, two taluks under Tiruttani divisions and four taluks under Ponneri division. There are 46 firkas and 820 revenue villages. Likewise there are 14 blocks, 6 Municipalities and 19 town Panchayats which implement rural development activities.

Physical Features: The Coastal region is mostly flat while certain areas in Tiruttani and Pallipattu taluks are undulated and even hilly. The types of soil predominantly found are red non-calcareous and coastal alluvial. Also found are sandy soil mixed with soda or other alkali. The soil found in the coastal region is of the erinaceous type (sandy), suitable for casuarinas plants.

Population: The population of the district is 27, 38,866 persons with 51% male and 49% female as per the census 2001 (provisional).

Table 1.1.3

Population Distribution

	Number	Percentage
Total	27,38,866	
Male	13,90,292	50.76%
Female	13,48,574	49.24%
Rural	12,46,832	45.52%
Urban	14,92,034	44.48%
Density (Per km²)	800	
Sex ratio	970/1000	

Table 1.1.4 General Statistics

Birth Rate (per 1000 Population)	17.3
Death Rate (per 1000 Population)	5.4
Infant Mortality (per 1000 live births)	18.9
Maternal Mortality (per 1000)	0.5
Life Expectation (Average)	66.4
Average Marriage Age - Male	24 Years
Average Marriage Age - Female	19 Years

The district has a mixture of urban and rural characteristics. The Eastern part of Thiruvallur district is dominated by urban characteristics while the Southern and Northern part of the district has influence of Andhra culture due to its position.

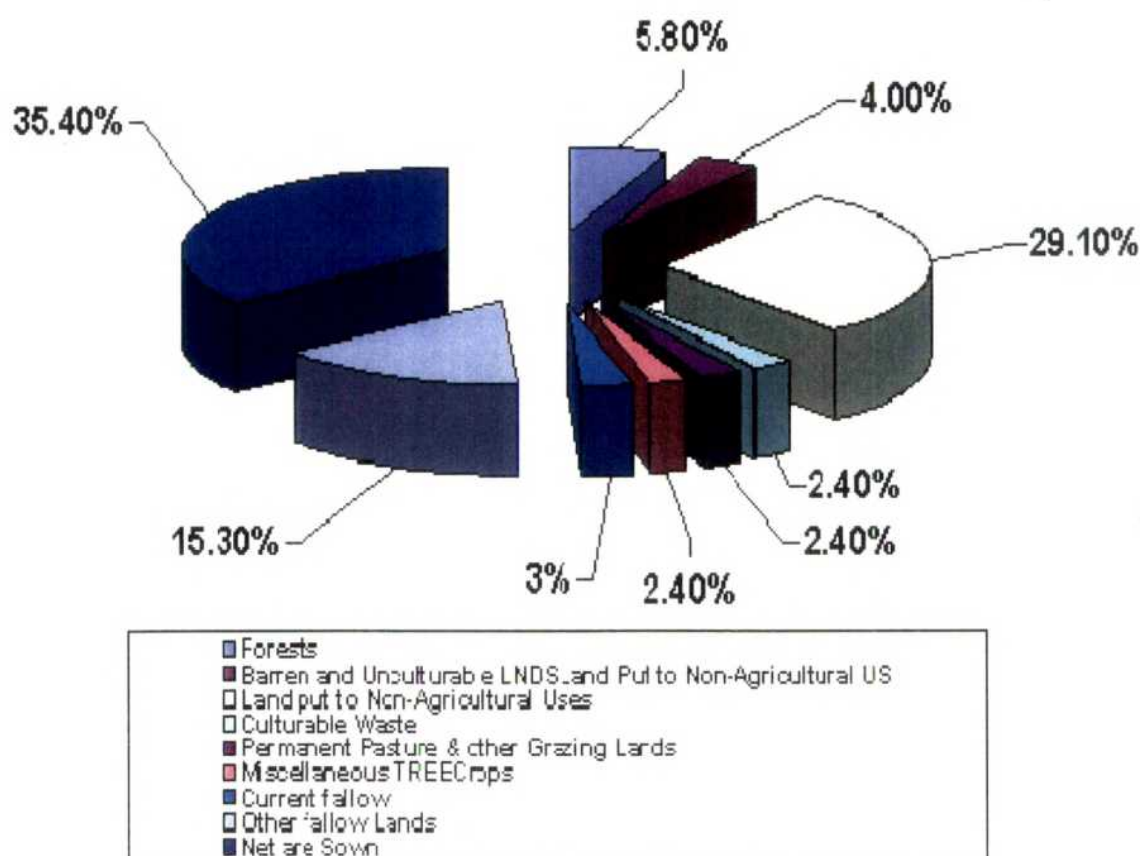
The languages spoken in the district are Tamil, Telugu, Hindi, Malayalam and Urdu. The district is dominated by the Hindus while people belonging to other religions are also present.

Land Use Pattern

The total geographical area of the district is 3, 42,243 hectares of which not sown area constitute 35% whereas forest covers 5.8% of the total area. The nine-fold clarification of the land is pattern is given below.

Figure: 1.2.2

Land use pattern



Rainfall and Climate

The average rainfall of the district is 1104.4 mm, of which the North East monsoon contributes to the tune of 690 mm. The actual rainfall received during the agricultural year 2001 - 02 is 1164.4mm.

The average temperature of the district is

Maximum 37.9°C

Minimum 18.5°C

Like other parts of Tamil Nadu, hot climate prevails during the month of April - May and humid climate during the rest of the year except December - February when it is slightly cold

3.7 PROFILE OF DISASTERS IN THE RESEARCH LOCATION

Tsunami

The giant tidal wave struck the following coastal areas in this District around 8.30 AM on 26.12.2004.

Ambathur Taluk

- ✓ Tiruvottiyur 1 & 2
- ✓ Kathivakkam
- ✓ Eranavur

Ponneri Taluk

- ✓ Pazhaverkadu
- ✓ Thangal Perumbulam
- ✓ Karungali
- ✓ Kattupalli

Table 1.1.5
Areas Affected - Ambathur Taluk

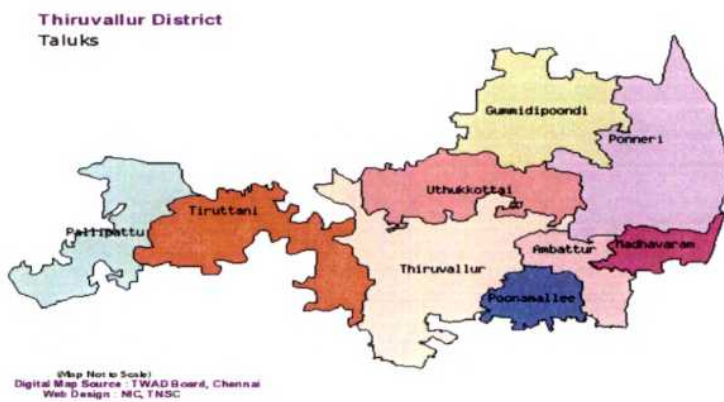
Kathivakkam	Chinna Kuppam Periakuppam Thazhalankuppam Mugathuvarakuppam Nettukuppam Ennore Kuppam
Ernavur	Indira Gandhi Kuppam Palagai Thotti Nagar Annai Sivagami Nagar Kasi Viswanathan Koil Kuppam Kasi Visalakshi Kuppam Ramkrishna Nagar Eranavur Kuppam Ondikuppam Kasi Koil Kuppam
Thiruvottiyur-1	Ondikuppam Pudunagar Bharathi Nagar Appar Nagar
Thiruvottiyur-2	Suthanthirapuram nagar Kuppam Thiruvottiyur Kuppam Masthan Kiol Kuppam Thiruchinangkuppam TVT Kuppam Kanni Koil Kuppam Singaravelar Kuppam Pudhunagar Kuppam Lakshmipuram Nalla Thanneer Odai Kuppam

Figure 1.2.3

Research Location Map



Name of the Kuppam
T.V.T Kuppam
Pudhu Nagar Kuppam
Sudhandeeranagar Kuppam
Nalla Thani Odi Kuppam



Relief centers were opened, six in Ambathur Taluk and seven in Ponneri Taluk and 1466 families in Ambathur Taluk and 3096 families in Ponneri Taluk were housed in these centres. Food materials were arranged locally and food packets were prepared and distributed to the affected persons who were lodged in the relief centers from 26.12.2004 onwards

Table 1.1.6 Abstract of Damages Caused to Public Property Asset Wise

S.No	Damage Type	No. of Works	Approx. Restoration Cost (Rs. In Lakhs)
1	Beach	1	0.5
2	Bore Well	5	22.28
3	BT Road	25	190.40
4	Buildings	3	12.00
5	Cement Road	9	113.90
6	Community Hall	4	32.00
7	Compound Wall	1	7.50
8	Fish Drying Yard	1	8.00
9	Hand Pump	3	6.00
10	Pathway to Burial Ground	1	3.75
11	Pipelines	3	8.00
12	Retaining Wall	2	41.50
13	Road	50	1195.30
14	Street Light Posts	10	8.00
15	SWD	5	42.00
16	Water Supply Line	6	19.75
17	WBM Road	1	3.25
TOTAL		130	1714.13

3.8 HAZARD PROFILE OF THE RESEARCH LOCATION

Probable hazard risk

- Natural: (Cyclone, Floods, **Tsunami**, Earthquake etc).
- Man-made disaster risk: (Road accidents, Fire disaster, chemical Industrial disaster risk and terrorist attack

Recent Disaster: (I) Tsunami and (II) Flood due to heavy Rain.

I. Social Sectors affected

- a. Housing
- b. Health
- c. Education,
- d. Culture,
- e. Sports

II. Infrastructure affected

- a. Transport and communications
- b. Energy
- c. Water and sewerage

III. Productive sectors

- a. Goods: agriculture, industry
- b. Services: commerce, tourism, etc.

IV. General Impact

- a. On the environment
- b. Gender perspective
- c. Employment and social conditions
- d. Macroeconomic assessment

Table 1.1.7**3.9 HISTORY OF HAZARDS IN INDIA****Details of Devastating Floods that occurred during 1980-1996**

S.No.	S.No. Duration	Area Affected	Synoptic Systems
1	17-23 July 1980	East Uttar Pradesh	Low Pressure area
2	17-23 July 1980	Central & Southwest Uttar Pradesh	Land depression
3	4-10 September 1980	Southeast Uttar Pradesh	Land depression
4	18-24 September 1980	South Orissa	Deep Depression
5	18-24 September 1980	Andhra Pradesh	Deep Depression
6	18-24 September 1980	Central Uttar Pradesh	Deep Depression
7	9-15 July 1981	Gujarat	Low pressure are
8	16-22 July 1981	Rajasthan	Low pressure area
9	9-29 July 1981	Uttar Pradesh	Low pressure area
10	6-12 August 1981	East Uttar Pradesh	Cyclonic Strom
11	3-9 September 1981	East Uttar Pradesh	Land depression
12	1. 19-25 August 1982	East Madhya Pradesh	Well marked low pressure area
13	28-31 August 1982	North Orissa	Depression
14	30 Aug – 3 Sept 1982	Uttar Pradesh	Land Depression
15	20-23 June 1983	Gujarat	Land Depression
16	11-17 August 1983	West Maharashtra	Trough off Maharashtra Coast
17	18-31 August 1983	Northeast Uttar Pradesh	Low pressure area
18	15-19 September 1983	Maratha and West Maharashtra	Low pressure area
19	8-14 September 1983	Southeast Uttar Pradesh	Land depression
20	21-27 June 1984	West Bengal	Well marked low pressure area
21	28 June – 11 July 1984	Uttar Pradesh	Low pressure area
22	23 August- 5 Sept 1985	Bihar	Low pressure area
23	12-25 September 1985	East Uttar Pradesh	Land Depression
24	11-18 September 1985	Bihar	Well marked low pressure are

25	17-23 July 1986	Bihar	Land Depression
26	7-20 August 1986	North Andhra Pradesh	Deep Depression
27	23-29 July 1987	Bihar	Low Pressure area
28	30 July-20 Aug 1987	North Bengal	Cyclonic circulation
29	3-16 September 1987	Bihar Plateau	Well marked low pressure area
30	15-19 July 1988	North Gujarat	Cyclonic Storm
31	25 Aug – 7 September 1988	North Gujarat	Cyclonic Storm
32	21-28 September, 1988	Punjab	Low pressure area
33	19-26 July, 1989	Coastal Andhra Pradesh	Depression
34	13-26 July 1989	Western Maharashtra	Depression
35	1-6 July, 1990	North West Rajasthan	Low pressure Area
36	16-29 August 1990	Vidarbha	Depression
37	23-29 August 1990	Gujarat	Depression
38	25-31 July 1991	Vidarbha	Deep depression
39	5-13 September 1991	North Bengal	Cyclonic Circulation
40	16-22 July 1992	Gujarat	Cyclonic Circulation
41	10-16 September 1992	Jammu & Kashmir	Cyclonic Circulation
42	10-16 September 1992	East Uttar Pradesh	Well marked low pressure area
43	1-14 July 1993	Gujarat	Cyclonic Circulation
44	8-14 July 1993	Punjab	Cyclonic circulation
45	15-20 July 1993	Bihar Plateau	Well marked low pressure area
46	15-21 July 1993	North Bengal	Well marked low pressure area
47	9-15 September, 1993	Uttar Pradesh	Well marked low pressure area
48	14-27 July 1994	Gujarat	Low pressure area
49	1-7 September 1994	Orissa	Low pressure area
50	1-7 September 1994	Vidarbha	Well marked low pressure area
51	17-23 August 1995	Bihar	Low pressure area
52	5-15 September, 1995	Haryana	Low pressure area
53	20-26 June 1996	Rajasthan	Low Pressure area
54	25 July – 7 August 1996	Bihar	Low Pressure area

Table 1.1.8

SOME SEVERE CYCLONES IN INDIA

Location	Date/ Area	Damages
Bengal	Oct, 1847	75,000 people and 6000 cattle killed. Damage to property
Bengal	October, 1874	80,000 people killed heavy loss to property and communication disrupted.
Andhra Pradesh	November, 1946	750 people and 30,000 cattle lost life. Damage to property and roads also reported.
Tamil Nadu	December, 1972	80 people and 150 cattle killed and communication disrupted.
Bengal	September, 1976	10 people and 40,000 cattle lost life. Damage to property including communication
Andhra Pradesh	November, 1977	8547 people and 40,000 cattle lost life. Communication disrupted heavy loss to property
Tamil Nadu	May, 1979	700 people and 300,000 cattle lost life. Communication disrupted.
Orissa	September, 1985	84 people and 2600 cattle lost life. Land of 4.0 has damaged.
Andhra Coast	November, 1987	50 people and 25,800 cattle lost life, 84,00 houses, roads, and other communication disrupted.
Orissa	June, 1989	61 people and 27,000 cattle lost life, 145,000 houses, communication disrupted.
Andhra Pradesh	May, 1990	928 human lives lost, 14,000 houses damaged.
Tamil Nadu	November, 1991	185 people and 540 cattle dead. Property including roads worth 300 crore damaged.
Bengal	April, 1993	Over 100 casualties, communication system including road disrupted and damaged.
Bengal	November, 1994	More than a thousand houses damaged in 26 villages, damage to lake and fisheries, disrupted all communication.
Andhra Coast	October, 1996	1057 casualties, 647,000 houses damaged road network completely damaged.
Gujarat	June, 1998	1261 casualties, 2.57 lakh houses damaged.
Orissa	October, 1999	10,086 Casualties, 21.6 Lakh houses damaged

Table 1.1.9

**SOME DAMAGING EARTHQUAKES IN INDIA AND
APPROXIMATE
NUMBER OF LIVES LOST**

Year and Place of Occurrence	Magnitude	Maximum	Intensity	Other Features
1618	Bombay	-	-	2000 lives lost
1720	Delhi	6.5	-	some lives lost
1737	Bengal	-	-	300,000 lives lost
1803	Matura	6.5	-	The shock felt up to Calcutta.
1803	Kumaon	6.5	-	Killed 200-300 people.
1819	Kutchch	8.0	XI	Chief towns of Tera, Kathara and Mothala razed to the ground.
1828	Srinagar	6.0	Intensity	1000 people killed.
1833	Bihar	7.7	X	Hundreds of people killed
1848	Mt.Abu, Rajasthan	6.0	-	Few people killed
1869	Assam	7.5	-	Affected an area of 2,50,000 Sq. miles.
1885	Srinagar	7.0	-	Kamiarary area destroyed.
1897	Shillong	8.7	XII	Wide spread destruction in Shillong.
1905	Himachal Pradesh	8.0	XI	Thousands of people killed.
1906	Himachal Pradesh	7.0	-	Heavy damage.
1916	Nepal	7.5	-	All houses collapsed at Dharchulla.
1918	Assam	7.6	-	Heavy damage.
1930	Dhubri, Meghalaya	7.1	IX	Heavy damage in Dhubri.
1934	Bihar, Nepal	8.3	XI	Large number of border area people killed.
1935	Quetta (in Pakistan)	7.5	IX	25,000 people killed
1941	Andaman	8.1	X	Very heavy damage.

1947	Dibrugarh	7.8	-	Heavy damage.
1950	Assam	8.6	XII	Heavy damage to life and property.
1952	NE India	7.5	-	Heavy damage.
1956	Bulandshahar, U.P.	6.7	VIII	Many people killed
1956	Anjar, Gujarat	7.0	VIII	Hundreds of people killed
1958	Kapkote, U.P.	6.3	VIII	Many people killed
1967	Koyna,	6.1	VIII	Koyna Nagar razed.
1969	Bhadrachalam	6.5	-	Heavy damage.
1986	Dharamshala (H.P)	5.7	VIII	Koyna Nagar razed. Lots of damage.
1988	Assam	7.2	IX	Few people killed
1988	Bihar- Nepal	6.5	VIII	Large number of people killed.
1991	Uttarkashi	6.6	VIII	Lots of damage to life and property.
1993	Latur	6.4	VIII	Heavy damage to life and property about, 1000 people killed.
1997	Jabalpur	6.0	VIII	Lots of damage to property, about 39 lives lost.
1999	Chamoli	6.8	VIII	Lots of damage to property about 100 people lost lives.
2001	Bhuj	6.9	X	Huge devastation , about ~ 14000 people lost lives

RECENT DISASTERS IN TAMIL NADU

Photograph 1.3.7

FLOODS due to HEAVY RAINS



IN SPATE: A view of the Adyar River, in spate in the month of November. It is almost touching the bridge at Saidapet, which is a gateway to the main city of Chennai.



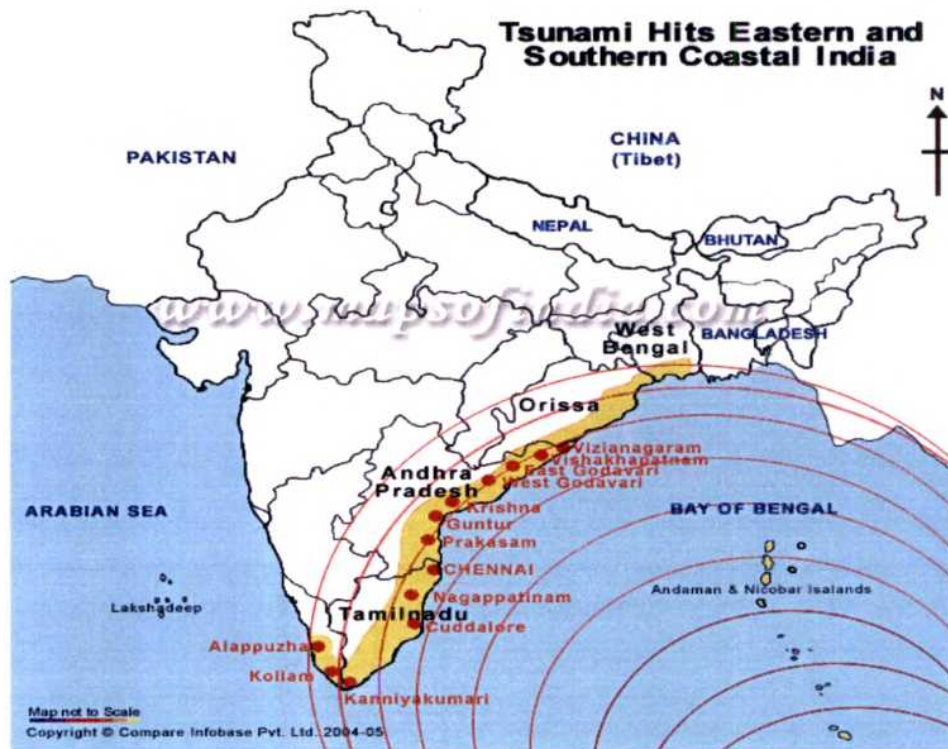
Source: Volume 18 - Issue 21, Oct. 13 - 26, 2001 India's National Magazine from the publishers of THE HINDU. On September 25 '01 an earthquake struck Chennai and other parts of Tamil Nadu, including the composite districts of

Thanjavur, North Arcot, South Arcot and Chengalpattu, the Union Territory of Pondicherry, Nellore and Chittoor districts in Andhra Pradesh, and parts of Karnataka including its capital Bangalore. There was no major damage anywhere. The movement of the Indian plate was the basic cause of the earthquake that struck some parts of Tamil Nadu, Andhra Pradesh and Karnataka on September 25. Dr. L.S. Suryanarayanan, Director-in-charge, Geological Survey of India (GSI), Tamil Nadu, Kerala and Pondicherry, said the focus of the earthquake was 12 km below the sea surface.

The basic cause of the earthquake was the Indian plate's movement. The Himalayas form the northern margin of this plate. According to Mr. Suryanarayanan, the reason for the movement is the heat generation inside the earth. This heat difference led to the movement of the plate several million years ago. When movements take place not only at intra-plate but inter-plate junctions, collisions occur and this leads to earthquakes.

Figure 1.2.4 TSUNAMI: Year of Occurrence: 2004 Coastal Areas of India

IMPACT OF THE TSUNAMI ON INDIA



The **2004 Indian Ocean earthquake**, was a great undersea earthquake that occurred at 00:58:53 UTC (07:58:53 local time) December 26, 2004 with an epicenter off the west coast of Sumatra, Indonesia. The earthquake triggered a series of devastating tsunamis along the coasts of most landmasses bordering the Indian Ocean, killing large numbers of people and inundating coastal communities across South and Southeast Asia, including parts of Indonesia, Sri Lanka, India, and Thailand. Although initial estimates had put the worldwide death toll at over 275,000 with thousands of others missing, more recent analysis compiled by the United Nations lists a total of 229,866 people lost,

including 186,983 dead and 42,883 missing. The figure excludes 400 to 600 people who are believed to have perished in Myanmar which is more than that government's official figure of only 61 dead. The catastrophe is one of the deadliest disasters in modern history.

Table 1.1.10

SEVERITY, LOSSES, DAMAGES, (DIRECT & INDIRECT LOSSES): DISASTER SNAPSHOT 2004 TSUNAMI

(Source: NIDM-Ministry of Home Affairs).

State	Deaths		Injured	Missing ¹	Evacuees	Refugees
	Official ¹	Estimated				
<u>Tamil Nadu</u>	7,960	8,000	—	—	500,000	310,000
<u>Andaman & Nicobar</u>	1,310	<u>7,000</u>	200	5,544	17,000	37,000
<u>Pondicherry</u>	590	665	—	75	70,000	6,100
<u>Andhra Pradesh</u>	105	116	—	11	34,000	0 (All returned)
<u>Kerala</u>	171	171	<u>700</u>	—	25,000	25,000
Total	10,136	16,000	900	5,630	650,000	380,000

Inference: The impact on Tamil Nadu is much higher compared to other regions.

Table 1.1.11**TSUNAMI DAMAGE IN INDIA**

TSUNAMI DAMAGE IN INDIA					
Factor	<u>Andhra Pradesh</u>	<u>Kerala</u>	<u>Tamil Nadu</u>	<u>Pondicherry</u>	Total
Population affected	211,000	691,000	2,470,000	43,000	3,415,000
Area affected (km ²)	7.9	Unknown	24.87	7.9	40.67
Length of coast affected (km)	985	250	1,000	25	2,260
Extent of penetration (km)	0.5 - 2.0	1 - 2	1 - 1.5	0.30 - 3.0	
Reported height of tsunami (m)	5	3-5	7-10	10	
Villages affected	301	187	362	26	876
Dwelling units	1,557	11,832	91,037	6,403	110,829
Cattle lost	195	Unknown	5,476	3,445	9,116

Source: Govt.of India release. **Inference:** Tamil Nadu is the most vulnerable and most affected region comparatively.

VULNERABILITY OF WOMEN AND CHILDREN IN DISASTER SITUATIONS

1. Women have less access to resources – social networks and influence, transportation, information, skills (including literacy), control over land and other economic resources, personal mobility, secure housing and employment, freedom from violence and control over decision-making - that are essential in disaster preparedness, mitigation and rehabilitation.
2. Women are victims of the gendered division of labor. They are over-represented in the agriculture industry, self-employment and the informal economy, in under-paid jobs with little security and no benefits such as healthcare or union representation. The informal and agricultural sectors are usually the most impacted by natural disasters, thus women become over-represented among the unemployed following a disaster.
3. Because women are primarily responsible for domestic duties such as childcare and care for the elderly or disabled, they do not have the liberty of migrating to look for work following a disaster. Men often do migrate, leaving behind very high numbers of female-headed households. The failure to recognize this reality and women's double burden of productive and reproductive labor means that women's visibility in society remains low, and attention to their needs is woefully inadequate.
4. Because housing is often destroyed in the disaster, many families are forced to relocate to shelters. Inadequate facilities for simple daily tasks such as cooking means that women's domestic burden increases at the same time as her economic burden, leaving her less freedom and mobility to look for alternative sources of income.
5. When women's economic resources are taken away, their bargaining position in the household is adversely affected.

6. Disasters themselves can serve to increase women's vulnerability. Aside from the increase in female-headed households and the fact that the majority of shelter residents are women, numerous studies have shown an increase in levels of domestic and sexual violence following disasters.
7. As one of the primary aspects of women's health in particular, reproductive and sexual health are beginning to be recognized as key components of disaster relief efforts, however attention to them remains inadequate and women's health suffers disproportionately as a result.

Mitigation and preparedness measures go hand in hand for vulnerability reduction and rapid professional response to disasters. The Bhuj earthquake in January 2001 brought out several inadequacies in the system. The search and rescue teams had not been trained professionally; specialized dog squad to look for live bodies under the debris were not available; and there were no centralized resource inventory for emergency response. Although army played a pivotal role in search and rescue and also set up their hospital after the collapse of Government hospital at Bhuj, the need for fully equipped mobile hospitals with trained personnel was felt acutely. Despite these constraints, the response was fairly well organized. However, had these constraints been taken care of before hand, the response would have been even more professional and rapid which may have reduced the loss of lives. Specialist search and rescue teams from other countries did reach Bhuj. However, precious time was lost and even with these specialist teams it was not possible to cover all severely affected areas as quickly as the Government would have desired. It was, therefore, decided that we should remove these inadequacies and be in a stage of preparedness at all times.

SOURCE: Disaster Management in India; Government of India Ministry of Home Affairs publication

1.2 INTRODUCTION TO TOPIC

STRATEGY MEANING

Strategy originates from a Greek word *stratēgos*, which in turn is derived from two words: *stratos* (army) and *ago* (ancient Greek for leading) *Stratēgos* referred to a 'military commander' during the age of Athenian Democracy. **Strategy** which was originally a military term is now being used in business/government /social planning context. Strategy pertains to **why and how the plan will work**, in relation to all factors that influence upon the business entity and activity, target stake holders ,demographics, technology and communications.

Johnson and Scholes (Exploring Corporate Strategy) define strategy as follows: "Strategy is the *direction* and *scope* of an organization over the *long-term*: which achieves *advantage* for the organization through its configuration of *resources* within a challenging *environment*, to meet the needs of *markets* and to fulfill *stakeholder* expectations".

In other words, **strategy** is about:

- ✓ trying to get to in the long-term (**direction**)
- ✓ What kind of activities is involved
- ✓ How to perform better
- ✓ What resources (skills, assets, finance, relationships, technical competence, and facilities) are required
- ✓ What external, environmental factors affect the activity?
- ✓ What are the values and expectations of those who have power in and around the activity (**stakeholders**)

THE CONCEPT OF STRATEGIC MANAGEMENT

Strategic management is the art and science of formulating, implementing and evaluating cross-functional decisions that will enable to achieve its objectives. It is the process of specifying the objectives, developing policies and plans to achieve these objectives, and allocating resources to implement the policies and plans to achieve the objectives. Strategic management, therefore, combines the activities of the various functional areas of a business to achieve organizational objectives. “Strategic management is an ongoing process”.

DISASTER MEANING

Disaster refers to a probability that a phenomenon, natural or man made, occurs at a specific time and place (Potential) danger of damages to lives and material goods Possibility to which the inhabitants of a specific location are exposed. Disaster threats may be classified in three categories according to their origin:

- **Geological (land)** that includes earthquakes, volcanic eruptions, avalanches, and landslides.
- **Hydro-meteorological (water)** such as floods, hurricanes, rain.
- **Technological (human culture)**, such as the possible breakage of a polydactyl, fires or toxic waste from industrial and agricultural activities. It is important to indicate that threats could chain to each other, thus raising the probability of a disaster. (Source: Regional Disaster Information Center. Bibliodes: Prevention Pays. 1999, no.28)

Vulnerability: A fragile society is vulnerable. A vulnerable society is less capable of absorbing the consequences of natural or man-made disasters, provoked by phenomena or frequent accidents of lesser magnitude, by one of great magnitude, or by the accumulation of phenomena of varied intensity. Vulnerability is also the

weakness, incapacity or difficulties to avoid, resist, survive and overcome a disaster.

Risk: Probability of social, environmental and economic damages, in a given place and a determined exposure time schematically speaking, risk is the outcome of one or more threats and of vulnerability factors

Disaster risk Management is a systematic process of using administrative decisions, organizations, operational skills, and capacities to implement policies, strategies, and coping capacities of the society and communities to lessen the impacts of natural hazards and related environment and technological disasters. This comprises all forms of activities including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards. (Source: UN/ISDR Terminology) United Nations. International Strategy for disaster Reduction

The Strategic planning for community awareness in Disaster Management emphasizes that disaster risk reduction is a central issue for development policies, in addition to being of interest to various science, humanitarian and environmental fields. Disasters create obstacles for development achievements, impoverishing people and nations. Without serious efforts to address disaster losses, disasters will become in increasing serious obstacles to the achievement of the Millennium Development goals.

The strategic planning for community awareness on disaster management will lead to the following priorities:

1. Prioritizing disaster risk reduction
2. Building infrastructure and Early Warning System,

3. Developing a culture of safety and resilience.
4. Reducing the risk in important sectors
5. Improve preparedness for response.

There is a need to develop mental models capable of reconciling knowledge of **multiple** goals with the collective expertise of those responding represents a **significant** challenge for training. In addition to providing multiple, expertly evaluated simulations to facilitate the development and practice of specific skills, the ability of assessment centre methodology to promote tacit knowledge and self-efficacy renders it an appropriate vehicle for developing the mental models that underpin the core disaster management competencies of situational awareness and naturalistic and team decision making.

National Policy framework is a set of policies adopted by a national authority to define and coherently address a particular issue and to guide decision making where these policies comprise relevant assessments, strategies, goals, approaches, rules, plans, activities, priorities, agents and responsibilities. A national disaster risk reduction policy framework can guide all stakeholders-sector agencies, local governments and others – in the development of complementary risk reduction policies in their areas of authority.

Mitigation: Activities that actually eliminate or reduce the chance of occurrence or the effects of a disaster.

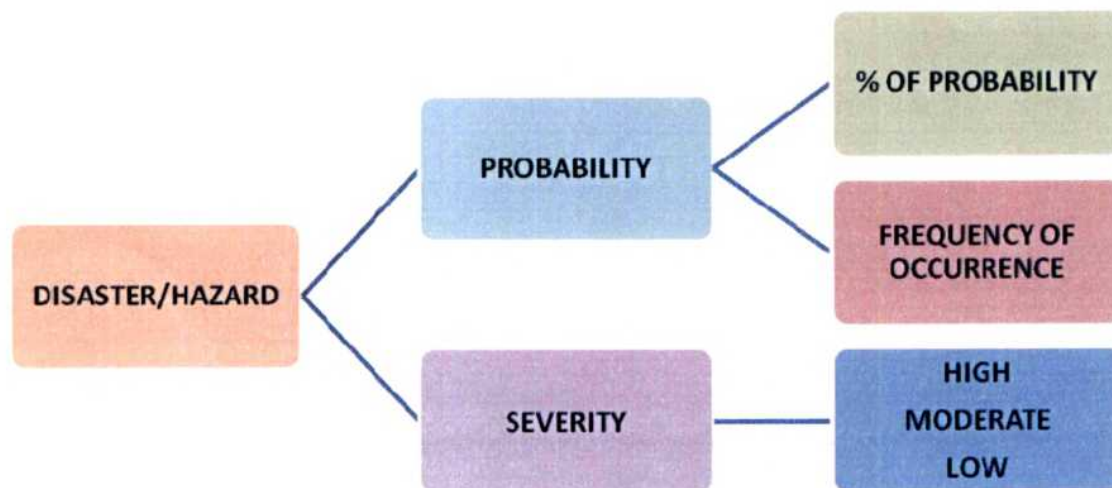
Preparedness: Planning how to respond in case an emergency or disaster occurs and working to increase resources available to respond effectively. Designed to help save lives and minimize damage by preparing people to respond appropriately when an emergency is imminent.

Response: Activities that occur during or immediately following a disaster. They are designed to provide emergency assistance to victims of the event and reduce the likelihood of secondary damage.

Recovery: The final phase of the emergency management cycle. Recovery continues until all systems return to normal, or near normal. Short-term recovery returns vital life support systems to minimum operating standards. Long-term recovery from a disaster may go on for years until the entire disaster area is completely redeveloped; either as it was in the past or for entirely new purposes that is less disaster-prone.

Figure 1.2.5

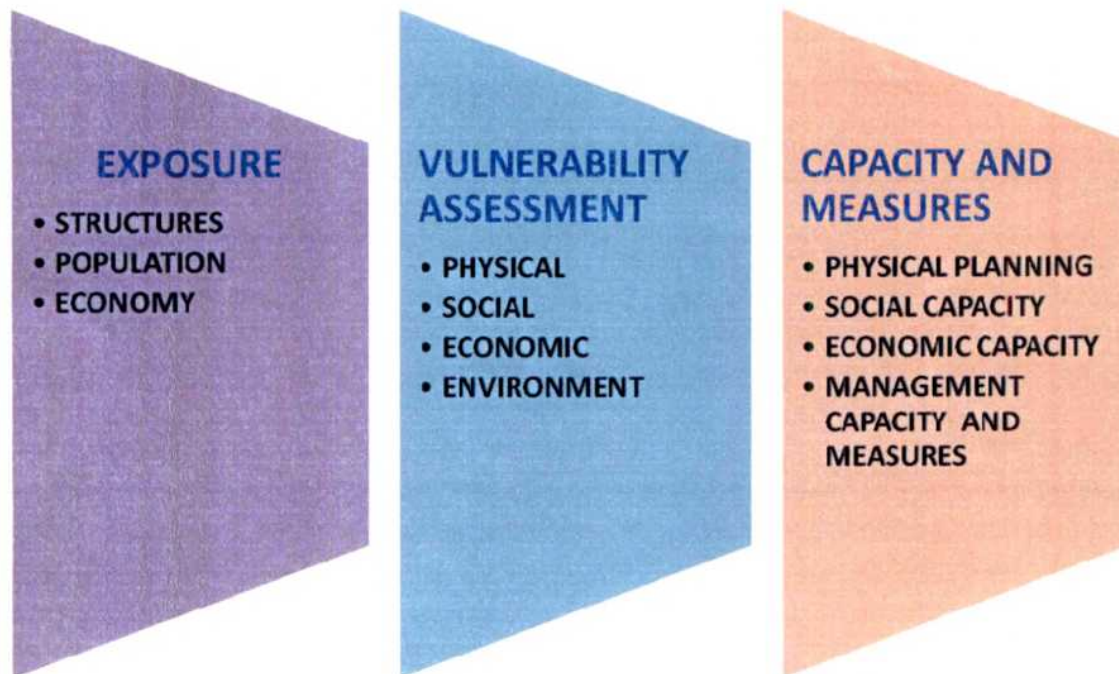
Factors Determining Disaster Risk and Vulnerability



After intense research and review of literature, it is understood that the vulnerability analysis and determining the disaster risk of every region should have specific outcome. The analysis by experts should indicate the percentage of probability of occurrence of an event and the frequency in which it is likely to occur. Secondly another group of experts after analysis should also be in a position to state the severity of the event according to the physical conditions and the environment.

Figure 1.2.6

ANALYSIS OF DISASTER RISK AND VULNERABILITY



General overview on Disaster Risk reduction process

Pre-Disaster Phase

- ✓ Risk Identification
- ✓ Mitigation
- ✓ Risk Transfer
- ✓ Preparedness

Post-Disaster Phase

- ✓ Emergency response
- ✓ **Rehabilitation and Recovery**
- ✓ **Reconstruction**

Disasters have a major impact on the living conditions, economic performance, and environmental assets of affected countries. Consequences may be long-term and may cause irreversible damages to environmental, economic and social structures. The losses from natural disasters are increasing and have a disproportionate impact on less developed countries. They have devastating effects on poorer countries' standard of living and overall development prospects. The World Bank has been actively involved in post-disaster recovery and reconstruction projects in each region and loaned US\$40 billion for reconstruction and mitigation between 1980 and 2003. In addition to lending directly for recovery and reconstruction, the Bank has been reassigning significant loan amounts committed to regular development projects (as affected countries often do themselves) to the timely funding of urgent reconstruction needs. Recognizing the importance of disaster mitigation and management in order to avoid the enormous losses from natural disasters, it is essential to shift from traditional post-disaster relief and reconstruction assistance toward supporting a culture of prevention, with the purpose of sustainable development. This new approach increasingly relies on knowledge sharing, creating communities of practice, and awareness rising in disaster risk management.

In severe Disaster situations, residents of the Kuppams face a sharply increased pressure to migrate in search of work as there are difficulties in earning daily living. Their health and hygiene deteriorates as there is physical strain. They take decisions about the welfare of their entire and safe living in chaotic times.

Education and public information campaigns should focus on capacity building and recovery measures as well. Information on where food or other supplies can be obtained and the claims to such relief should be informed to the general public but should keep the vulnerability of the Kuppams residents very much in mind. Illiteracy and other factors may limit a woman's access to such information. The purpose of emergency management is to help minimize the threat to life and property during disasters and emergencies through mitigation, preparedness, and response and recovery actions. These actions include day-to-day activities individuals can do in their homes such as mitigation of fire damage by clearing away dead brush and stacking logs away from buildings, as well as large scale planned activities performed at organization level, such as applying for government assistance for the county after a tsunami or flood.

CHAPTER II
REVIEW OF LITERATURE

REVIEW OF LITERATURE

The significance of the conclusions of the recent World Conference on Disaster Reduction to the Commission's agenda highlighted both the special vulnerability of the community dwelling in the coastal regions which includes many women and children in disaster situations, and the community's special capacity to contribute to community resilience and for recovery and development following a disaster.

Turner (1976), elaborated the sequence of events, which are the basis of development of a disaster. These stages are: (1) notionally normal starting points; (2) incubation period, (3) precipitation event; (4) onset; (5) rescue and salvage and (6) fully cultural readjustment.

Shrivastava (1992), proposed a model for industrial crisis through comparison of three crises: the Bhopal disaster, the Tylenol poisoning and the explosion of space shuttle challenger.

Mayers (1993), has also summarized disaster management process in four periods as follows: (i) normal operations; (ii) emergency response; (iii) interim process; and (iv) restoration.

Keller and Al-Madhari (1996), proposed a model for the probabilistic prediction of disaster magnitude consequences and return period. As such it is particularly suitable for obtaining risk profiles.

Larson and Enander (1997), proposed a theoretical two-dimensional model to investigate what people are prepared to do in the way of disaster preparedness and to examine how these assessments may lead to personal factors and attitude.

Alexander (1997) argues that there is room for improvement in the approaches to disaster management based on the following three factors: (1) death tolls have not fallen dramatically in response to improved mitigation; (2) large-scale transfer of **technology** has not occurred and (3) disaster relief has not been adequately **combined** with mitigation and economic development. Therefore, this section **proposes** a comprehensive model for disaster management with improvements over existing models.

The models discussed in the previous section describe how the relationship between different phases of the disaster management process is mediated. It can be inferred from the study of these models that most revolve around the four major phases of disaster management: prevention, mitigation, response and recovery. Such models are not planned to cover all the aspects of the disaster management domain and have some limitations; for example, logical models (category-1) do not go beyond describing disaster stages and only provide conceptual frameworks for the very basic activities of a disaster. The expand-contract model of category-1 does not encapsulate hazard assessment and risk management activities. Similarly, the crunch and release model only identifies the underlying causes of a disaster and do not highlight other major activities of disaster management.

The integrated model (category-2) covers most of the activities of the disaster management domain but does not encapsulate the activities of response and recovery. In addition, it only states the top level actions of disaster management rather than providing the detailed activities involved in each phase.

In category-3, the models focus on vulnerable conditions that might affect disaster management by identifying the underlying pressure and root causes of a disaster. The discussion about conditions affecting the disaster management cycle is

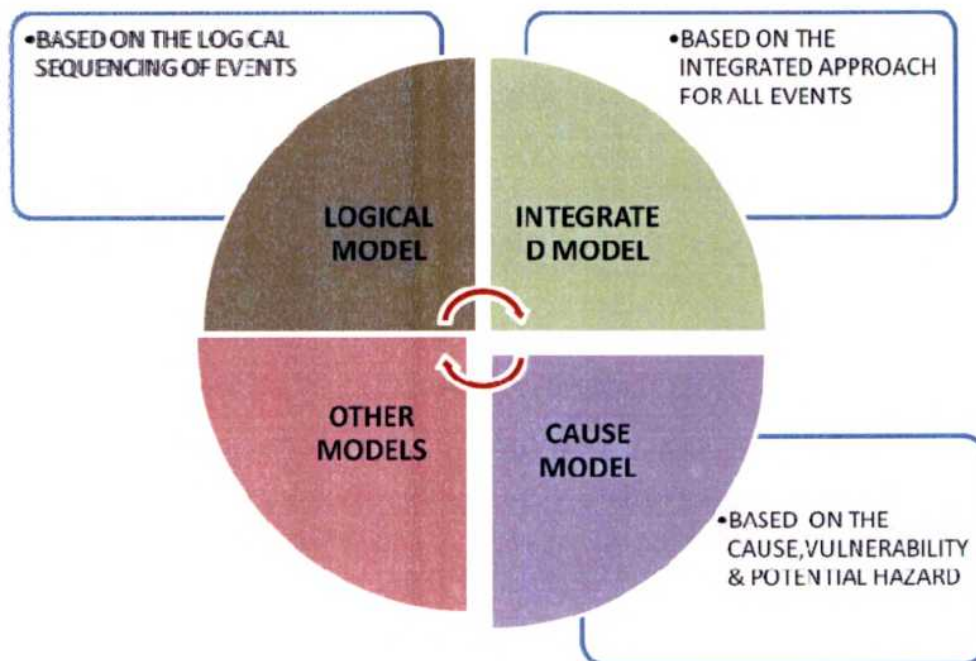
limited to vulnerability conditions. The models in this category do not consider conditions such as environmental factors that might change the severity of a disaster .

Kelly (1998), states that, there are four main reasons why a disaster model can be useful. These are as follows:

1. A model can simplify complex events by helping to distinguish between critical elements. Its usefulness is more significant when responding to disasters with severe time constraints.
2. Comparing actual conditions with a theoretical model can lead to a better understanding of the current situation and can thus facilitate the planning process and the comprehensive completion of disaster management plans.
3. The availability of a disaster management model is an essential element in quantifying disaster events.
4. A documented disaster management model helps establish a common base of understanding for all involved. It also allows for better integration of the relief and recovery efforts.

Therefore, based on the above, it can be argued that a well defined and clear model is highly beneficial in the management of disasters because it facilitates the securing of support for disaster management efforts. Hence, disaster management needs a formal system, or a model, to manage and possibly reduce the negative consequences of a disaster. Based on a survey of relevant literature, the researcher has separated different disaster management models into the following main categories: logical, integrated, causes and others. Existing disaster management models fit into one of these categories, as shown in Figure below. Logical models provide a simple definition of disaster stages and emphasize the basic events and

actions which constitute a disaster. Integrated models characterize the phases of a disaster by the evolution of functions such as strategic planning and monitoring. In these models, modules are linked as events and actions. The cause category, which is not based on the idea of defining stages in a disaster, suggests some underlying causes of disasters. The last category, describes miscellaneous models. The overall objectives of the **Weichselgartner model (2001)** are the assessment of possible damage and the planning of future actions to reduce this possible damage. It is argued that the assessment of vulnerability alone will not reduce natural hazards. Therefore, it is important that all measures taken are constantly reviewed and assessed. The model illustrates the process cycle and the integration of geographic placed-based concepts in disaster management

Figure 2.2.7.**CATEGORIZING OF DISASTER MANAGEMENT MODELS**

(Details compiled from information sourced through secondary data)

The various approaches studied in the past are presented to explain the key elements of the disaster management domain as well as its operations and activities. Such approaches are discussed under the categorization highlighted in Figure 2.2.7. The traditional process of disaster management consists of two phases (1) pre-disaster risk-reduction and (2) post-disaster recovery phase. The first consists of activities such as prevention, mitigation and preparedness while the second includes the activities of response, recovery and rehabilitation.

The important characteristic of expand and contract model is that it can be analyzed as a continuous process. The different disaster management phases,

rather than in a sequential manner, run parallel to each other, albeit with varying degrees of emphasis. These activities are expressed as the different strands (ADPC, 2000; Atmanand, 2003) and continue side by side, expanding or contracting as needed (DPLG-2, 1998). This model overcomes the limitations of the traditional model which is sequential in nature. This approach acknowledges that disaster management is a discipline which consists of various activities and actions that occur simultaneously

Ibrahim-Razi et al.'s (2003b), model represents the technological disaster pre-condition stages. The model was discussed in detail by Shaluf et al. (2003), and Ibrahim et al. (2003a). The model is composed of eight phases: (1) inception of error; (2) accumulation of errors; (3) warning; (4) failure of correction; (5) disaster impending stages; (6) triggering events; (7) emergency stage and (8) disaster.

In summary, several models for disaster management have been proposed by researchers and agencies. The significance and usefulness of these different models have been discussed above, highlighting the instances and areas of applicability.

Kimberly (2003) defines mitigation, preparation, response and recovery as four phases of disaster management. This model portrays response as the biggest and most visible phase of disaster management. It places mitigation and preparation at the base, suggesting that they are both driving forces behind a successful response. The recovery phase has been placed at the top because it is what remains after the response. Moreover, it takes the largest amount of time and is the most costly. The limitation of this model is that it is very much focused on emergency management in hospitals and can not be significantly used in other applications. Since this model is restricted to hospital emergency management, its scope is limited

Tuscaloosa emergency management model (2003), which is an open-ended process. The four phases in the cycle begin and end with mitigation that is, the on-going attempt to limit the effects of a disaster

The first task in an integrated disaster management model is hazard assessment **which** provides the information necessary for the next phase, risk management. These results in decisions about the balance of mitigation and preparedness actions needed to address the risks (**Manitoba-Health-Disaster-Management, 2002**). This model has altogether six independent elements such as a strategic plan, hazard assessment, risk management, mitigation, preparedness and monitoring and evaluation. Each element observes its own boundaries and involves its own set of activities and processes. These elements are dependent on each other in terms of providing support and can be further broken down into layers of sub-components. The advantage of this model is that it provides a balance between preparedness and flexibility in order to respond fluidly to the specific needs of disasters. Since this model provides the link between actions and events in disasters such links can be tight or loose. For example, it strongly links hazard and risk management activities but fails to provide a tight linkage between the four stages of disaster management which are important elements in a disaster management process.

The **crunch model** provides the framework for understanding the causes of a disaster (**ADPC, 2000; Bankoff, 2001; Heijmans, 2001; Cannon, 2004; Marcus, 2005**). The progression of vulnerability of a community is revealed and the underlying causes that fail to satisfy the demands of the people are identified. The model then goes on to estimate the dynamic pressure and unsafe conditions

The **pressure and release model (Blaikie et al., 1994; ADPC, 2000; Heijmans, 2001; Marcus, 2005)** can be considered as the reverse of the crunch model. It indicates how the risk of disasters can be reduced by applying preventive and

mitigation actions. It begins by addressing the underlying causes, and analyzing the nature of hazards. This leads to safer conditions which help in order to prepare the community to deal disasters. The Indian Ocean tsunami and its impact on millions of people in the region demonstrate the high vulnerability of people in disaster situations when many existing predisposing factors are also in place (Blaikie et al., 2005).

Bhatta, B.B. (1997). *The Natural Calamities in Orissa in the 19th Century*. New Delhi: Commonwealth Publishers (NCDM 751)

The book that emanates from the doctoral research of the author principally focuses on studying the natural calamities in Orissa in the 19th century (from 1803 A.D. to 1900 A.D.) and the consequent British policies towards it. More specifically, the natural calamities included for the purposes of the study are the floods and cyclones that occurred in the entire 19th century, the famines in the first half of the 19th century, the great famine of 1866 and other famines during the second half of their century. The study also delves on the causes, courses and consequences (specifically economic) of the various disasters cited above. In terms of geographical scope the study restricts itself to the so called British Orissa, covering Cuttack, Puri, Balasore districts and some parts of the tributary states. The study is based only on the secondary literature available on the subject.

Acharya, N. (2000). *Double Victims of Latur Earthquake*. *Indian Journal of Social Work*, 61(4), 558-564 This paper deals with the invisibility of gender dimension in the relief and rehabilitation process. It highlights the way an unthoughtful rehabilitation intervention strengthens patriarchy and subjects women to physical and mental pain. Here the focus is on the use of a pervasive medical technology, re-canalisation with a plea to preserve the social fabric, but which makes women mere 'tubes and wombs' instead.

Chowdhury, R.C. ; Prasad Rao, K; Jena, A.C. & Chakravarty,B. (2001). *Disaster Management: Orissa Cyclones, Floods and Tidal Waves Disaster (October 1999). Hyderabad: National Institute of Rural Development. (TISS 361.55413 C35D)*

The book that has been published by the National Institute of Rural Development, Hyderabad is an outcome of a research study conducted in the aftermath of the Orissa Super Cyclone of 1999. The study was conducted with a two fold objective of providing an account of the devastation and damages that the super cyclone resulted in and to also provide an appraisal of rescue, relief, rehabilitation, revival and reconstruction activities. Nine districts of Orissa were included for the purposes of the study which were Ganjam, Puri, Khurdha, Cuttack, Jagatsingpur, Kendrapara, Jajpur, Bhadrak and Balasore. Case studies were developed for the people affected by the cyclone. Selection of sites and respondents for case studies was purposive. Their availability, accessibility, willingness and ability to communicate were the determining factors. Focused group discussions were held with the state, district and block officials to elicit information on the initiatives for mitigation prior to, during and post event periods. Primary data was collected over a period of two weeks from December 14 to 30, 1999. Along with the primary sources of data collection, the study also used information published by the print media and government reports to understand the damages, relief, and revival, reconstruction of infrastructure and relocation of the victims. The study however admits to its limitation of not delving upon the recovery of a cross-section of people to pre-disaster status as the rehabilitation process was still in progress and the rehabilitation had just began during the study period.

Andharia, J. (2002). *Institutionalizing Community Participation: The Challenge in Disaster Management Practice. Indian Journal of Social Work, 63(2), 236-242.* The paper briefly discusses the need and scope of participatory

approaches in disaster management practices emphasizing the contradictions of institutionalized participation. The role of Panchayati Raj Institutions and the significance of devolution of power are stressed. The paper argues for a need to reduce the gap between policy statements and actual practice.

Diaz, J. O. P., Murthy, R. S., & Lakshminarayana, R. (Eds.). (2004). *Disaster Mental Health in India*. Indian Red Cross Society. NIDM G-121

The editors begin the book by acknowledging that psychosocial interventions in respect of disasters have seen a shift from identifying psychiatric ailments to providing psychosocial care, psycho education, enhancing coping mechanisms of survivors and encouraging formation of community based self help groups. It is in this light that the Indian Red Cross Society desired to have a Disaster Mental Health/Psychosocial Care component integrated into their Disaster Preparedness and Disaster Response plan. The book was seen as a means to it since it provided a forum/opportunity to understand disaster mental health responses in India. The chapters in the book have been written by representatives from several governmental and non governmental organizations, which have had direct experience of engaging in the field on this area. The themes on which the authors have delved include the nature of psychosocial interventions undertaken by various organizations in the case of recent disasters, the theoretical underpinnings for these interventions, the status of disaster mental health in India at the policy level and the roles of different professionals such as psychiatrists, psychologists, social workers and nurses following a disaster. The religion-cultural, socioeconomic and political dimension of disaster response is also examined through the book. Finally the book concludes by tracing the trajectory that disaster mental health interventions have traversed from the Bangalore circus fire tragedy in 1981 to the Gujarat riots in 2002 and the challenges that were faced therein.

The book brings into the discourse both natural disasters and human made disasters such as communal riots.

Chakrabarti, P. G. D., & Bhat, M. R. (Eds.). (2006). *Micro Finance and Disaster Risk Reduction*. New Delhi: Knowledge World.

The book is based on the proceedings of the International Workshop on 'Disaster Risk Mitigation: Potential of Micro-finance for Tsunami Recovery', held at New Delhi in 2005. The backdrop to the workshop and thereafter the book was the comparatively higher level of suffering that the economically poorer sections of society have to go through in the aftermath of a disaster and the potential of micro credit in enabling them to recover from the disaster. The book begins by the proposition that while the rich have their assets insured such is not the case with the poor. Further in the virtual absence of proprietary or tenancy rights over their little property, they stand little chance of getting compensation from the authorities. In such a situation, the jewellery of the women becomes the first collateral for obtaining credit from money lenders at a very high rate of interest.

This begins an unending cycle of indebtedness. It is in this backdrop that micro credit is explored to examine its potential in acting as a safety net and shock absorber for people to cope up with a disaster situation. To this end the workshop wanted to draw a comparison between the coping capacity of communities with micro credit groups and without micro credit groups. It also wanted to understand the problems that such groups faced in maintaining liquidity when everybody wanted to withdraw their savings and in further advancing credit at an affordable rate. The linkage of these groups to relief and rehabilitation agencies of the local government was also explored through the means of this workshop.

The book offers 13 articles which present the national and international experiences of the value of micro finance institutions in enabling people to recover from disasters. Within the Indian context both governmental and non

governmental experiences in this respect find place in the book. The context that is taken by most of the authors of these articles is the tsunami which struck Indian sub continent in 2004. The articles also explore in detail the desirable and undesirable practices for micro finance institutions in the event of a disaster.

Sethi, V.K. (2006). *Disaster Management*. New Delhi: Max Ford Books NIDM 211: The book bases itself on the premise that a proactive stance is required to reduce the toll of disasters. This would entail a comprehensive approach that encompasses both pre-disaster risk reduction and post disaster recovery. The natures of activities that need to be undertaken to this end have been detailed out. The broad measures that find place in the book are risk analysis to identify the kinds of potential impacts on people, preventive measures that could be taken to reduce the impact of the disaster if it were to occur and post disaster rehabilitation and reconstruction to support effective recovery and to safeguard against future disasters. The book also provides specific insights on the steps being taken by the Indian Government to deal with disasters. Various international policy guidelines find mention at different places in the book.

Ahmed, S. (2006). *Gender, vulnerability and disasters: Key concerns for policy and practice. Disaster and Development, 1 (1), 165-177.*

The paper draws attention to the differential ability of men, women, elderly, children, and those from marginalized communities, to respond to disaster situation. Several factors determine the vulnerability of a population group such as spatial, physical, financial, and socio-political. Amongst these different vulnerabilities, the author through the means of this paper explores the gender dimension. The paper points out some gendered impacts of disaster such as access to land, water, labour, education and participation in decision making. It derives that despite some progress being made in recent years towards linking gender with

disaster and development, disaster management is still largely not gendered. In the above context, the paper argues that not only do we need to be better equipped to define and measure vulnerability, but also focus on enabling vulnerable communities, especially women, to cope with or adapt to recurring annual disasters (drought, floods and coastal storms). This requires a multifaceted approach focusing on livelihood diversification, resource mobilization, infrastructure development, technological innovation and strengthening participatory decentralized governance.

Srinivasan, K., & Nagarak, V. K. (2006) *The State and Civil Society in Disaster Response: Post Tsunami Experiences in Tamil Nadu. *Disaster and Development*, 1 (1), 77-99.* The paper is based on the report “The state and civil society in disaster response: An analysis of the Tamil Nadu Tsunami experience” which was published by Tata Institute of Social Sciences in December 2005. The paper, an abridged version of the report, is an outcome of a study conducted in four Tsunami affected districts of Tamil Nadu - Chennai, Kanyakumari, Nagapattinam and Cuddalore, about a year after Tsunami of December 26, 2004. The study’s primary objective was to identify the factors that influence effectiveness and reach of the relief and rehabilitation processes. Issues related to vulnerability and exclusion, equity, transparency and accountability in different sectors of disaster intervention are also explored as part of this.

Sinha, D.K. (2007). *Natural Disaster Reduction: South East Asian Realities, Risk Perception and Global Strategies*. London: Anthem Press (NIDM 407). The book has been written in the backdrop of the Indian Ocean tsunami of December 26, 2004 which affected the South East Asian Region. The perspectives presented during the International Decade on Natural Disaster Reduction are used as the beginning point for discussions on the subjects touched upon in the book. The author who has written and lectured on natural hazards and risk management

has partitioned his discussions into nine chapters. The first chapter provides a country wise overview of the nature of disasters that strike them, the precipitating factors for them and measures being taken to mitigate their effects. The nature of damage caused by the Tsunami and the media reporting of the same form the content for the second chapter. The following chapter presents the outcomes of the various events held during the International Decade on Disaster Reduction. The fourth and the fifth chapter examine the factors that increase the natural disaster vulnerability and more specifically the role of climatic changes in this respect. The early warning systems and the essential attributes that they must fulfill are the subject of discussion in the next chapter. The subsequent chapters deal with the efforts that need to be made at the local and global level to reduce the vulnerability to disasters and minimize the damage if a disaster were to occur.

Aravind Raj, E. & Sekar, K. (2007) Community Based Disaster Preparedness. In K. Sekar, R. Parthasarathy, D. Muralidhar, & M. Chandrasekhar Rao (Ed.). Handbook of Psychiatric Social Work (pp. 248-254). Bangalore: National Institute of Mental Health and Neuro Sciences.

The chapter emanates from the paradigm shift in disaster management from relief and rehabilitation to preparedness, prevention, mitigation and planning. Within this the authors emphasize the potential of Community Based Disaster Preparedness (CBDP). The core differences between the service delivery approach and community based approach are brought out to highlight the comparative advantages of the approach being advocated. Further the different models of CBDP are discussed. The authors argue that psychosocial care has been limitedly included as part of the CBDP programme in India. What gets thereafter enumerated is the manner in which psychosocial care needs to be incorporated as part of CBDP. The authors detail out the desired focus of psychosocial disaster preparedness programme during the three phases of pre-disaster, during disaster

and after disaster. Finally the potential role of Schools of Social Work in CDBP is discussed using certain prior experiences of the Psychiatric Social Work Department at NIMHANS

PROCESS OF STRATEGY PLANNING FOR COMMUNITY AWARENESS IN DISASTER MANAGEMENT

The Strategic planning for community awareness in Disaster Management is clearly being explained at different levels in the Hyogo framework of action. **The Hyogo framework for action emphasizes** that disaster risk reduction is a central issue for development policies, in addition to being of interest to various science, humanitarian and environmental fields. Disasters undermine development achievements, impoverishing people and nations. Without serious efforts to address disaster losses, disasters will become in increasing serious obstacles to the achievement of the Millennium Development goals.

To help attain the expected outcome, the Hyogo framework action plan identifies **five specific Priorities for Action.**

- ✓ Making disaster risk reduction a priority
- ✓ Improving risk information and Early Warning System,
- ✓ Building a culture of safety and resilience.
- ✓ Reducing the risk in key sectors
- ✓ Strengthen preparedness for response.

Fundamental to disaster readiness planning is developing training strategies to compensate for the limited opportunities available for acquiring actual disaster response experience. With regard to communication, decision making and integrated emergency management response, the need to develop mental models

capable of reconciling knowledge of multiple goals with the collective expertise of those responding represents a significant challenge for training. In addition to providing multiple, expertly evaluated simulations to facilitate the development and practice of specific skills, the ability of assessment centre methodology to promote tacit knowledge and self-efficacy renders it an appropriate vehicle for developing the mental models that underpin the core disaster management competencies of situational awareness and naturalistic and team decision making.

There are many examples of the contribution a community can make in such situations. Experiences show that without the deliberate involvement of the community in the planning and implementation of preparedness, response and recovery program the overall national performance will suffer.

APPROACHES TO DISASTER MANAGEMENT

Mc Entire et al. (2002) literature of disaster management was reviewed and four models are identified, including the disaster-resistant community, the disaster-resilient community, sustainable development/sustainable hazards mitigation and invulnerable development concepts. Concluding that these models are incomplete, they presented the 'comprehensive vulnerability management' concept in order to provide a holistic approach to disaster management. The present paper puts forth another model called 'disaster knowledgeable community'. The tables offer a comparison of these models. Table 1 (2.1.3) compares the models in terms of type and phase of disasters. Table 2 (2.1.4) compares the approaches to disaster management by highlighting the role of actors and variables.

Table 2.1.12

Comparison of type and phase of disasters

		Phases/ functional areas	
A	Disaster-resistant community	Natural, technological, civil, biological	Mainly preparedness and response
B	Disaster-resilient community	Natural	Mitigation
C	Sustainable development & sustainable hazards mitigation	Natural	Recovery and mitigation to a lesser extent
D	Invulnerable development	Natural (especially flooding) and technological to a lesser extent	Mitigation and recovery
E	Comprehensive vulnerability management	Natural, technological, civil, biological	Mitigation, preparedness, response, and recovery
F	Disaster knowledgeable community	Natural, technological, civil, biological	Mainly preparedness and response

Table 2.1.13.

Comparison of paradigms in terms of actors and variables

		Variables	
A	Disaster-resistant community	Mainly the public sector (particularly emergency managers and first responders)	Mainly physical
B	Disaster-resilient community	Mainly the public sector (particularly urban planners and engineers)	Mainly physical
C	Sustainable development and sustainable hazards mitigation	Mainly individuals and groups involved in recovery from the public,	Social and physical to a lesser extent

		private, and nonprofit sectors	
D	Invulnerable development	Urban planners, engineers, insurance agencies, non-government organizations, environmentalists, and citizens	Physical and social to a lesser extent (depending on the scholar and due to the excessive focus on hazards)
E	Comprehensive vulnerability management	Most, if not all, organizations from the public, private, and nonprofit sectors, as well as citizens in general	Physical and social
F	Disaster knowledgeable community	Mainly citizens in multiple aspects, as well as organizations	Social and physical

The International Federation's key messages to the World Conference included the need for clear recognition by governments and other stakeholders of the role a community commonly plays in providing community support after disasters strike. Allied to this is the unhappy fact that women, because of their greater vulnerability, are often the people who suffer most from the very poverty, which affects their communities due to disasters.

The International Federation expressed the firm view at the Conference that governments, if they are to prepare effectively for the onslaught of disasters, must reach out to the community and other under-represented groups both as beneficiaries and as participants in the decision-making integral to disaster preparedness and response work.

However, in recent days, communities form self Help groups among themselves and have proven themselves indispensable when it comes to responding to disasters like Heavy rains causing floods, earth quakes, Storms, landslides, which

are mainly due to the climatic changes, change in the atmospheric pressures, environmental issues, and lack of balance in the eco system. The adverse affects of such natural calamities are due to poor planning and unprepared community. The most vulnerable to disasters are the women and children who have limited knowledge about coping with such a disaster. Many countries throughout the world face significant risk from natural hazards. However, countries and communities differ significantly in their degree of vulnerability to natural disasters. This is also true of groups within any particular country or community. There is, then, significant inequality in disaster vulnerability even when the physical dimensions of particular threats are similar (Parker and Thompson 1991). Developing countries are the most vulnerable to natural hazards because they have fewer financial and other requisite resources, such as knowledge, institutional arrangements, and technology, to counteract them. Finally, within both developing and industrialized societies, the most vulnerable are the poor, particularly those living in the coastal zones.

Until recently, disaster scholars and practitioners have hardly engaged in climate change debates. Scientific assessments on climate change have mainly involved atmospheric scientists and experts in the area of environment and energy. Key questions in the scientific discourse were: if observed climate change was accidental or systematic, what role could be attributed to the human-caused emissions of greenhouse gases? Which models can tell us about future developments? How much reduction in emissions is needed to mitigate the risks of climate change? Climate change scenarios are typically expressed in terms of time scales of 50–100 years. Such projections about globally very significant changes in the decades to come are difficult to comprehend or translate into real life today in a certain city or rural area. Recently, however, it has become more

evident that climate change will not express itself primarily through slow shifts in average conditions over a long period. Marten van Aalst in the paper presented at an international conference discusses the mounting evidence that it is extreme events, such as droughts, floods and heat waves, which we must prepare for. More extreme weather events are due to increased energy within the climate system. Already, in the past decade, weather-related natural hazards have been the cause of 90% of natural disasters and 60% of related deaths and have been responsible for 98% of the impacts on disaster-affected populations, the majority in areas of developing countries (IFRC, 2005).

The World Meteorological Organization reported in December 2005 that the year gone broke dozens of weather records all over the world, from drought in Brazil, to cold spells in Pakistan to hurricanes in the Atlantic Ocean. Except for 1996, all of the past 10 years rank among the 10 hottest years since 1850. Extreme weather conditions result in disasters, and hence the attention of policymakers is turning to questions regarding how people and societies can adapt to the risks posed by climate change and prepare for disasters. The annual Conferences of Parties to the 1992 United Framework Convention on Climate Change (UNFCCC) pay increasing attention to the issue of climate risk reduction. Climate change was acknowledged (after tough negotiations) as an underlying threat in relation to disasters in the 'Hyogo Framework for Action 2005–15', the outcome strategy of the World Conference on Disaster Reduction, held in Kobe, Japan, on 18–22 January 2005. Policy attention regarding climate-related disasters has also been enhanced in processes pertaining to sustainable development and the Millennium Development Goals.

The issue of *Disasters* explores the commonalities and synergies between the science and policy communities concerned with adaptation to climate change and the communities of disaster studies and disaster reduction. The potential for cross-

fertilization between disciplines seems obvious, considering the way in which climate change is altering disaster risks, and the contributions that disaster risk reduction can make to climate change adaptation. An international conference on climate change and disaster risk reduction, organized by the Red Cross/Red Crescent Center on Climate Change and Disaster Preparedness in The Hague, Netherlands, on 14–15 June 2005, affirmed the shared concerns and methodologies between the networks (while recognizing their internal diversity), yet stressed that misconceptions exist about their respective concepts, aims and applications.

A core insight disaster studies can bring to climate-related research is that *vulnerability* is critical to discerning the nature of disasters. Since the 1980s, disasters have not been regarded as purely physical happenings requiring largely technological solutions but primarily as the result of human actions. Social processes generate unequal exposure to risk by making some people more prone to disaster than others and these inequalities are largely a function of power relations in every society. This can be understood in terms of the vulnerability of an individual, household, community or society (see Hilhorst and Bankoff, 2004). Several of the papers in this issue argue that indeed, vulnerability is a key concept in bridging understanding of, and the response to, climate change-related risks and the impact of disasters. A focus on vulnerability lays bare the compounded nature of disasters in which climate related processes coalesce with environmental degradation, conflict, disease and poverty to bring about and magnify the loss and damage caused by natural hazards. While socio-economic development and institution building are, on the one hand, important ways of reducing much of the vulnerability associated with disasters, disasters, on the other hand, negatively affect the ability of societies to develop further.

As several of the papers assert, however, institutional barriers hamper efforts to develop an integrated approach among the climate change, disasters and development communities.

Disaster studies can draw on climate change debates by adopting a more long-term perspective and placing emphasis on the interrelated nature of local and global processes.

The primary message of climate change for disasters management is that vulnerability reduction is even more urgent than before. When the frequency and the scale of devastation of disasters increase, it becomes a prerequisite of disaster management and climate change adaptation to enhance capacity-building and resilience. Given that climate-related disaster trends inflate the need for attention to community based approaches, it becomes all the more important to assess critically their strengths and weaknesses. Climate change models typically do the need to refine the study of climate-related disasters and to consider their impact at much smaller scales than the growing body of community-based disaster management experience highlights.

The year 1999 witnessed a super cyclone striking the eastern coast of India (Orissa State). It was a major natural disaster affecting the subcontinent in recent years. The Bangladesh Cyclone of 1971, droughts of 1972 and 1987, the heat wave in 1995 and 1998 and cold wave in 2003 killing several hundred people are still fresh in public memory. The drought and failed monsoon of 2002, in particular, an unusually dry July, is matter of concern for scientists and planners. However, many may not remember that the worst drought in India during the last century occurred in 1918.

The data on climate anomalies, extreme and disastrous weather events in respect of the subcontinent lie scattered in various published literature of the India

Meteorological Department and in the scientific and technical papers documenting the research work of many authors.

The India Meteorological Department was established as a National agency in 1875 amalgamating various provincial meteorological services, which existed in the 19th century, [Kelkar (2000)]. However, instrumental data and records for a few stations in India existed since 18th century. Some of the oldest observatories include Madras now known as Chennai (September 1793), Bombay (1823) and Calcutta (December 1829).

The first seismological observatory was set up in Alipore (Calcutta) in 1898. The new names for Bombay and Calcutta are Mumbai and Kolkata. Basically, the climate of India is dominated by the summer monsoon (June to September). The entire year is, however, divided into four seasons: (i) Winter (January and February) (ii) Pre-monsoon or Hot Weather season (March to May) (iii) Southwest or Summer Monsoon season (June - September) (iv) post monsoon season (October to December).

Year to year deviations in the weather and occurrence of climatic anomalies / extremes in respect of these four seasons are: -

- (i) Cold wave, Fog, Snowstorms and Avalanches
- (ii) Hailstorm, Thunderstorm and Dust storms
- (iii) Heat wave
- (iv) Tropical cyclones and Tidal waves
- (v) Floods, Heavy rain and Landslides
- (vi) Droughts

These are all related to the meteorological factors, whereas earthquakes, volcanoes and tsunamis are other geophysical triggered disasters. The daily living conditions and responsibilities of community is subject to much risk before, during, and after disaster. Women and men equally in disaster-impacted communities also exercise

formal and informal leadership roles and are central actors in family preparation for, and recovery from, disaster.

Because effective disaster response and mitigation depend on accurate knowledge of vulnerabilities and capacities, community assessment and mapping should include social as well as environmental factors. Gender-specific data are a vital planning tool for practitioners, though not always easily available.

Disaster planners can work with local researchers, women's groups, and community leaders to create this knowledge base, ensuring more inclusive and comprehensive planning and engaging community as partners in disaster preparedness and mitigation.

Disaster Management Act, INDIA After 2004, Indian Ocean tsunami, the government of India prepared a comprehensive piece of legislation on disaster management that became the Disaster Management Act 2005. The act set up disaster management authorities at the national, state and district levels involving multiple disciplines and sectors at each level. It empowered these authorities with clear functions and responsibilities. The act also created the National Institute of Disaster Management, which has responsibility of training and capacity building on disaster management, and National Disaster response force for efficiently responding to disaster situation. Additionally the act set up a disaster response funds and disaster mitigation funds at the three levels of government. The National Disaster Management authority under the Chairmanship of the Prime Minister of India has started functioning from September 2005 and is developing various policies, guidelines, modules, and standards for holistic management of various kinds of natural and human induced disasters.

ASIA

- Assessing disaster information can be time consuming and laborious. Not only is data scattered but also frequently identification of the disaster can be confusing in countries with many disaster events. To address both of these issues, The Asian disaster Reduction center (ADRC) proposed a unique global identification code for disasters, a Global Disaster Identifier Number. ADRC has also developed a unique geographical information system for disaster management called VENTEN with the objective of providing a common structure for referring to disasters and related data. Living with risk, p.205
- Achievements of the ASEAN Regional Forum (ARF) include a series of training activities, developing a matrix of past cooperation in disaster relief among member countries, conducting an inventory of early warning systems and drafting guidelines for post-disaster responsibilities. Its annual meetings, by drawing participation from senior levels of ministries of foreign affairs, defense, disaster management, have provided a unique platform to consider multiple aspects of disaster management. Living with Risk, p.160
- In the Philippines, the Citizen's Disaster Response Network (CDRN) is a national network of 14 NGOs that promotes community-based disaster preparedness work. Since its inception in the early 1980s it has conducted advocacy work to help reduce the impacts of hazards. Living with risk p. 182

DISASTER MANAGEMENT IN INDIA- A STATUS REPORT

Courtesy: Ministry of Home Affairs, National Disaster Management Division

India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year. The loss in terms of private, community and public assets has been astronomical.

At the global level, there has been considerable concern over natural disasters. Even as substantial scientific and material progress is made, the loss of lives and property due to disasters has not decreased. In fact, the human toll and economic losses have mounted. It was in this background that the United Nations General Assembly, in 1989, declared the decade 1990-2000 as the International Decade for Natural Disaster Reduction with the objective to reduce loss of lives and property and restrict socio-economic damage through concerted international action, especially in developing countries.

The super cyclone in Orissa in October 1999 and the Bhuj earthquake in Gujarat in January 2001 underscored the need to adopt a multi dimensional endeavor involving diverse scientific, engineering, financial and social processes the need to adopt multi disciplinary and multi sectoral approach and incorporation of risk reduction in the developmental plans and strategies.

Over the past couple of years, the Government of India has brought about a paradigm shift in the approach to disaster management. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process. Another corner stone of the approach is that mitigation has to be multi-disciplinary spanning across all sectors of development. The new policy also emanates from the belief that investments in mitigation are much more cost effective than expenditure on relief and rehabilitation.

Disaster management occupies an important place in this country's policy framework as it is the poor and the under-privileged who is worst affected on account of calamities/disasters.

The steps being taken by the Government emanate from the approach outlined above. The approach has been translated into a National Disaster Framework covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness and response and human resource development. The expected inputs, areas of intervention and agencies to be involved at the National, State and district levels have been identified and listed in the roadmap. This roadmap has been shared with all the State Governments and Union Territory Administrations. Ministries and Departments of Government of India, and the State Governments/UT Administrations have been advised to develop their respective roadmaps taking the national roadmap as a broad guideline. There is, therefore, now a common strategy underpinning the action being taken by all the participating organizations /stakeholders.

The changed approach is being put into effect through:

- (a) Institutional changes
 - (b) Enunciation of policy
 - (c) Legal and techno-legal framework
- Disaster Management in India
- (d) Mainstreaming Mitigation into Development process
 - (e) Funding mechanism
 - (f) Specific schemes addressing mitigation
 - (g) Preparedness measures
 - (h) Capacity building
 - (i) Human Resource Development and, above all, community participation.

Disaster Management in India

Institutional and Policy Framework

The institutional and policy mechanisms for carrying out response, relief and rehabilitation have been well established since Independence. These mechanisms have proved to be robust and effective insofar as response, relief and rehabilitation are concerned.

The changed policy/approach, however, mandates a priority to pre-disaster aspects of mitigation, prevention and preparedness and new institutional mechanisms are being put in place to address the policy change.

Mitigation, preparedness and response are multi-disciplinary functions, involving a number of Ministries/Departments. Institutional mechanisms, which would facilitate this inter-disciplinary approach, are being put in place. It is proposed to create Disaster Management Authorities, both at the National and State levels, with representatives from the relevant Ministries/Departments to bring about this coordinated and multi-disciplinary with experts covering a large number of branches. The National Emergency Management Authority proposed to be

constituted. The organization will be multi-disciplinary with experts covering a large number of branches. The National Emergency Management Authority is proposed as a combined Secretariat/Directorate structure – a structure that will be an integral part of the Government while, at the same time, retaining the flexibility of a filed organization. An officer will head the Authority of the rank of Secretary/Special Secretary to the Government in the Ministry of Home Affairs with representatives from the Ministries/Departments of Health, Water Resources, Environment & Forest, Agriculture, Railways, Atomic Energy, Defense, Chemicals, Science & Technology, Telecommunication, Urban Employment and Poverty alleviation, Rural Development and Indian Meteorological Department as Members. The authority would meet as often as Disaster Management in India required and review the Status of warning systems, mitigation measure and disaster preparedness. When a disaster strikes, the Authority will coordinate disaster management activities.

The Authority will be responsible for:-

- Providing necessary support and assistance to State Governments by way of resource data, macro-management of emergency response, specialized emergency response teams, sharing of disaster related data base etc.
- Coordinating/mandating Government's policies for disaster reduction/mitigation
- Ensuring adequate preparedness at all levels
- Coordinating response to a disaster when it strikes
- Assisting the Provincial Government in coordinating post disaster relief and rehabilitation
- Coordinating resources of all National Government Department/agencies involved.
- Monitor and introduce a culture of building requisite features of disaster mitigation in all development plans and programmes.

- Any other issues of work, which may be entrusted to it by the Government

The States have also been asked to set up Disaster Management Authorities under the Chief Minister with Ministers of relevant Departments [Water Resources, Agriculture, Drinking Water Supply, Environment & Forests, Urban Development, Home, Rural Development etc.] as members. 10 States and UTs – Tamil Nadu, Arunachal Pradesh, Uttaranchal, Orissa, Gujarat, Kerala, Nagaland, Delhi, A&N administration and Chandigarh Administration have notified the authority. The other States are in the process of setting up similar authorities.

Re-structuring of the Relief Department in the States: At the State level, the work of post calamity relief was being handled by the Departments of Relief & Rehabilitation. The Government of India is working with the State Governments to restructure the Departments of Relief & Rehabilitation into Departments of Disaster Management with an enhanced area of responsibility to include mitigation and preparedness apart from their present responsibilities of relief and rehabilitation. The changeover has already happened in 11 States/UTs - Andhra Pradesh, Arunachal Pradesh, Bihar, Himachal Pradesh, Rajasthan, Tamil Nadu, Uttaranchal, Nagaland, Andaman & Nicobar Administration, Sikkim and Lakshadweep. The change is under process in other States. The States have been advised to restructure/re-group the officers/staff within the Department of Disaster Management with definite functions to pursue the holistic approach to disaster management. The four functional groups to be assigned with specific tasks within the departments are as indicated below: -

1. Functional Group 1: Hazard Mitigation
2. Functional Group 2: Preparedness and Capacity Building
3. Functional Group 3: Relief and Response
4. Functional Group 4: Administration and Finance

At the district level, the District Magistrate who is the chief coordinator will be the focal point for coordinating all activities relating to prevention, mitigation and preparedness apart from his existing responsibilities pertaining to response and relief. The District Coordination and Relief Committee is being reconstituted/ re-designated into Disaster Management Committees with officers from relevant departments being added as members. Because of its enhanced mandate of mitigation and prevention, the district heads of the departments engaged in development are now being included in the Committee so that mitigation and prevention is mainstreamed into the district plan. The existing Disaster Management in India system of drawing up preparedness and response plans will continue. There will, however, also be a long-term mitigation plan. District Disaster Management Committees have already been constituted in 256 districts and are in the process of being constituted in the remaining districts.

Similarly, sub-divisional and Block/ Taluka level Disaster Management Committees are also being constituted. At the village level Disaster Management Committees and Disaster Management Teams are being constituted. Each village in multi-hazard prone district will have a Disaster Management Plan. The process of drafting the plans at all levels has already begun. The Disaster Management Committee, which draws up the plans, consists of elected representatives at the village level, local authorities; Government functionaries including doctors/paramedics of primary health centers located in the village, primary school teachers etc. The plan encompasses prevention, mitigation and preparedness measures. The Disaster Management Teams at the village level will consist of members of youth organizations like Nehru Yuvak Kendra and other nongovernmental organizations as well as able-bodied volunteers from the village. The teams are provided basic training in evacuation, search and rescue, first aid trauma counseling etc. The Disaster Management Committee will

review the disaster management plan at least once in a year. It would also generate awareness among the people in the village about dos' and don'ts for specific hazards depending on the vulnerability of the village. A large number of village level Disaster Management Committees and Disaster Management Teams have already been constituted.

Disaster Management Policy: Disaster management is a multidisciplinary activity involving a number of a number of Departments/agencies spanning across all sectors of development. Where a number of Departments/agencies are involved, it is essential to have a policy in place, as it Disaster Management in India - serves as a framework for action by all the relevant departments/agencies. A National policy on disaster management has been drafted, and is in the process of consultations. In the line with the changed focus, the policy proposes to integrate disaster mitigation into development planning. The policy shall inform all spheres of Central Government activity and shall enjoin upon all existing sectoral policies.

The broad objective of the policy is to minimize the loss of lives and social, private and community assets because of natural or man-made disasters and contribute to sustainable development and better standards of living for all, more specifically for the poor and vulnerable section by ensuring that the developments gains are not lost through natural calamities/ disaster.

The policy notes that State Governments are primarily responsible for Disaster management including prevention and mitigation, while the Government of India provides assistance where necessary as per the norms laid down from time to time and proposes that this overall framework may continue. However, since response to a disaster requires coordination of resources available across all the Departments of the Government, the policy mandates that the Central

Government will, in conjunction with the State Governments, seek to ensure that such a coordination mechanism is laid down through an appropriate chain of command so that mobilization of resources is facilitated.

The broad features of the draft national policy on disaster management are enunciated below:-

- i) A holistic and pro-active approach towards prevention, mitigation and preparedness will be adopted for disaster management.
- ii) Each Ministry/Department of the Central/State Government will set apart an appropriate quantum of funds under the Plan for specific schemes/projects addressing vulnerability reduction and preparedness.

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- iii) Where there is a shelf of projects, projects addressing mitigation will be given priority. Mitigation measures shall be built into the on-going schemes/programmes
- iv) Each project in a hazard prone area will have mitigation as an essential term of reference. The project report will include a statement as to how the project addresses vulnerability reduction.
- v) Community involvement and awareness generation, particularly that of the vulnerable segments of population and women has been emphasized as necessary for sustainable disaster risk reduction. This is a critical component of the policy since communities are the first responders to disasters and, therefore, unless they are empowered and made capable of managing disasters, any amount of external support cannot lead to optimal results.
- vi) There will be close interaction with the corporate sector, nongovernmental organizations and the media in the national efforts for disaster prevention/vulnerability reduction.

vii) Institutional structures/appropriate chain of command will be built up and appropriate training imparted to disaster managers at various levels to ensure coordinated and quick response at all levels; and development of inter-State arrangements for sharing of resources during emergencies.

viii) A culture of planning and preparedness is to be inculcated at all levels for capacity building measures.

ix) Standard operating procedures and disaster management plans at state and district levels as well as by relevant central government departments for handling specific disasters will be laid down.

x) Construction designs must correspond to the requirements as laid down in relevant Indian Standards.

xi) All lifeline buildings in seismic zones III, IV & V – hospitals, railway stations, airports/airport control towers, fire station buildings, bus stands

Disaster Management in India - major administrative centers will need to be evaluated and, if necessary, retro fitted.

xii) The existing relief codes in the States will be revised to develop them into disaster management codes/manuals for institutionalizing the planning process with particular attention to mitigation and preparedness.

xiii) To promote international cooperation in the area of disaster response, preparedness, and mitigation in tune with national strategic goals and objectives.

The States have also been advised to formulate State DM Policies with the broad objective to minimize the loss of lives and social, private and community assets and contribute to sustainable development. The States of Gujarat and Madhya Pradesh have States Policies for Disaster Management in place while other States are in process.

Legal and Techno-legal Framework

Disaster Management Act: The States have been advised to enact Disaster Management Acts. These Acts provide for adequate powers for authorities coordinating mitigation, preparedness and response as well as for mitigation /prevention measures required to be undertaken. Two States Gujarat & Bihar have already enacted such a law. Other States are in the process.

Disaster Management Code: In line with the changed approach, the State Governments have also been advised to convert their Relief Codes into Disaster Management Codes by building into it the process necessary for drawing up disaster management and mitigation plans as well as elements of preparedness apart from response and relief. A Committee constituted under the Executive Director, National institute of Disaster Management has drafted a Model Disaster Management in India Management Code which is being circulated to the States so as to assist them in this process. Some States have constituted committees to revise the codes as per GOI guidelines. The revised codes will ensure that the process of drawing up disaster management plans and mitigation and preparedness measures get institutionalized. Disaster Management in India

Disaster Prevention and Mitigation

The Yokohama message emanating from the international decade for natural disaster reduction in May, 1994 underlined the need for an emphatic shift in the strategy for disaster mitigation. It was inter alia stressed that disaster prevention, mitigation, preparedness and relief are four elements that contribute to and gain, from the implementation of the sustainable development policies. These elements along with environmental protection and sustainable development, are closely inter related, and it was therefore, recommended that Nations should incorporate them in their development plans and ensure efficient follow up measures at the community, sub-regional, regional, national and international levels. The

Yokohama Strategy also emphasized that disaster prevention, mitigation and preparedness are better than disaster response in achieving the goals and objectives of vulnerability reduction. Disaster response alone is not sufficient as it yields only temporary results at a very high cost. Prevention and mitigation contribute to lasting improvement in safety and are essential to integrated disaster management.

Mainstreaming Disaster Management into Development: The Government of India have adopted mitigation and prevention as essential components of their development strategy. The Tenth Five Year Plan document has a detailed chapter on Disaster Management. The plan emphasizes the fact that development cannot be sustainable without mitigation being built into developmental process. Each State is supposed to prepare a plan scheme for disaster mitigation in accordance with the approach outlined in the plan. In brief, mitigation is being mainstreamed into developmental planning. Disaster Management in India

Financial Arrangement: As indicated in the earlier chapter, the Finance Commission makes recommendations with regard to devolution of funds between the Central Government and State Governments as also outlays for relief and rehabilitation. The earlier Finance Commissions were mandated to look at relief and rehabilitation. The Terms of Reference of the Twelfth Finance Commission have been changed and the Finance Commission has been mandated to look at the requirements for mitigation and prevention apart from its existing mandate of looking at relief and rehabilitation. A Memorandum has been submitted to the Twelfth Finance Commission after consultation with States. The Memorandum proposes the creating of a disaster mitigation fund, which will assist the States in taking mitigation measures like retrofitting of lifeline buildings, coastal shelterbelt plantation etc.

The Government of India has issued guidelines that where there is a shelf of projects, projects addressing mitigation will be given a priority. It has also been mandated that each project in a hazard prone area will have disaster prevention/mitigation as a term of reference and the project document has to reflect as to how the project addresses that term of reference.

Flood Preparedness and response: In order to respond effectively to floods, Ministry of Home Affairs has initiated National Disaster Risk Management Programme in all the flood-prone States. Assistance is being provided to the States to draw up disaster management plans at the State, District, Block/Taluka and Village levels. Awareness generation campaigns to sensitize the all the stakeholders on the need for flood preparedness and mitigation measures. Elected representatives and officials are being trained in flood disaster management under the programme. Bihar, Orissa, West Bengal, Assam and Uttar Pradesh are among the 17 multi-hazard prone States where this programme is Disaster Management in India being implemented with assistance from UNDP, USAID and European Commission.

Earthquake Risk Mitigation: A comprehensive programme has been taken up for earthquake risk mitigation. Although, they laid down the standards for construction in the seismic zones, these were not being followed. The building construction in urban and suburban areas is regulated by the Town and Country Planning Acts and Building Regulations. In many cases, the Building regulations do not incorporate the BIS codes. Even where they do, the lack of knowledge regarding seismically safe construction among the architects and engineers as well as lack of awareness regarding their vulnerability among the population led to most of the construction in the urban/sub-urban areas being without reference to BIS standards. In the rural areas, the bulk of the housing is non-engineered construction. The mode of construction in the rural areas has also changed from

mud and thatch to brick and concrete construction thereby increasing the vulnerability. The increasing population has led to settlements in vulnerable areas close to the river bed areas which are prone to liquefaction. The Government have moved to address these issues.

National Core Group for Earthquake Risk Mitigation: A National Core Group for Earthquake Risk Mitigation has been constituted consisting of experts in earthquake engineering and administrators. The Core Group has been assigned with the responsibility of drawing up a strategy and plan of action for mitigating the impact of earthquakes; providing advice and guidance to the States on various aspects of earthquake mitigation; developing/organizing the preparation of handbooks/pamphlets/type designs for earthquake resistant construction; working out systems for assisting the States in the seismically vulnerable zones to adopt/integrate appropriate Bureau of Indian Standards codes in their building byelaws; evolving systems for training of municipal Disaster Management in India engineers as also practicing architects and engineers in the private sector in the salient features of Bureau of Indian Standards codes and the amended byelaws; evolving a system of certification of architects/engineers for testing their knowledge of earthquake resistant construction; evolving systems for training of masons and carry out intensive awareness generation campaigns.

Review of building byelaws and their adoption: Most casualties during earthquakes are caused by the collapse of structures. Therefore structural mitigation measures are the key to make a significant impact towards earthquake safety in our country. In view of this the States in earthquake prone zones have been requested to review, and if necessary, amend their building byelaws to incorporate the BIS seismic codes for construction in the concerned zones. Many States have initiated necessary action in this regard. An Expert Committee appointed by the Core Group on Earthquake Risk Mitigation has already

submitted its report covering appropriate amendments to the existing Town & Country Planning Acts, Land Use Zoning Regulation, Development Control Regulations & Building Bylaws, which could be used by the State Governments & the local bodies there-under to upgrade the existing legal instruments. The Model Building Bylaws also cover the aspect of ensuring technical implementation of the safety aspects in all new constructions & upgrading the strength of existing structurally vulnerable constructions. To facilitate the review of existing building byelaws and adoption of the proposed amendments by the State Governments & UT administrations, discussion workshops at regional level in the country are being organized. It is expected that all planning authorities and local bodies will soon have development control regulations and building bye laws which would include multi-hazard safety provisions.

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Development and Revision of Codes: There is Bureau of Indian Standard (BIS) codes which are relevant for multi-hazard resistant design and construction. Some of the codes need to be updated. There are some areas for which codes do not exist. An action plan has been drawn up for revision of existing codes, development of new codes and documents/commentaries, and making these codes and documents available all over the country including on-line access to these codes. An Apex committee consisting of representatives of Ministry of Consumer Affairs, BIS and MHA has been constituted to review the mechanism and process of development of codes relevant to earthquake risk mitigation and establish a protocol for revision by BIS.

Hazard Safety Cells in States: The States have been advised to constitute Hazard Safety Cells (HSC) headed by the Chief Engineer, State PWD with necessary engineering staff so as to establish mechanism for proper implementation of the building codes in all future Govt. constructions, and to ensures the safety of

buildings and structures from various hazards. The HSCs will also be responsible for carrying out appropriate design review of all Government buildings to be constructed in the State, act as an advisory cell to the State Government on the different aspects of building safety against hazards and act as a consultant to the State Government for retrofitting of the lifeline buildings. Rajasthan, West Bengal, Delhi and Chhatisgarh have already constituted these cells and other States are in the process.

National Programme for Capacity Building of Engineers and

Architects in Earthquake Risk Mitigation: Two National Programmes for Capacity Building in Earthquake Risk Mitigation for Engineers and Architects respectively, has been approved to assist the State Govts in building up capacities for earthquake mitigation. Under these two programmes 10,000 engineers and 10,000 architects in the States will be given training in seismically safe building Disaster Management in India designs and related techno-legal requirements. Assistance is being provided to the State/UTs to build the capacities of more than 125 State Engineering Colleges and 110 Architecture Colleges to be able to provide advisory services to the State Government to put in place appropriate techno-legal regime, assessment of building and infrastructures and their retrofitting. These institutions will function as State Resource Institutions. Twenty-one Engineering and Architecture Institutions have been designated as National Resource Institutes to train the faculty members of selected State Engineering and Architecture colleges. 450 engineering faculty members and 250 architecture faculty members of these State Resource Institutions will be trained during the current year.

Training of rural masons: A programme to assist the States/UTs in training and certification of 50000 masons has been formulated in consultation with Housing and Urban Development Corporation (HUDCO) and the Ministry of Rural

Development. The training module for masons to include multi-hazard resistant construction has also been prepared by an expert committee, and revised curriculum will be introduced in the vocational training programme of Ministry of Human Resource Development.

Earthquake Engineering in Undergraduate Engineering/Architecture Curricula: The role of engineers and architects is crucial in reducing earthquake risks by ensuring that the construction adheres to the norms of seismic safety. In view of this, the elements of earthquake engineering are being integrated into the undergraduate engineering and architecture courses. Model course curricula have been developed for adoption by various technical institutions and universities. And circulated to the Universities and Technical Institutions for integration into the under graduate curriculum. Ministry of Home Affairs is working with All India Council of Technical Education (AICTE) and Council of Architecture (COA) for Disaster Management in India introduction of revised curricula for engineering and architecture course from 2005-2006.

Retrofitting of Lifeline buildings: While these mitigation measures will take care of the new constructions, the problem of unsafe existing building stock would still remain. It will not be possible to address the entire existing building stock, therefore the lifeline buildings like hospitals, schools or buildings where people congregate like cinema halls, multi-storied apartments are being focused on. The States have been advised to have these buildings assessed and where necessary retrofitted. The Ministries of Civil Aviation, Railways, Telecommunication, Power and Health and Family Welfare have been advised to take necessary action for detailed evaluation and retrofitting of lifeline buildings located in seismically vulnerable zones so as to ensure that they comply with BIS norms, Action plan have been drawn up by these Ministries for detailed vulnerability analysis and retrofitting/ strengthening of buildings and structures.

The Ministry of Finance has been requested to advise the financial institutions to give loans for retrofitting on easy terms. Accordingly the Ministry of Finance had advised Reserve Bank of India to issue suitable instructions to all the Banks and Financial Institutions to see that BIS codes/bye laws are scrupulously followed while financing/refinancing construction activities in seismically vulnerable zones.

National Earthquake Risk Mitigation Project: An Earthquake Mitigation Project has been drawn up, with an estimated cost of Rs.1132 crore. The project has been given in-principle clearance by the Planning Commission. The programme includes detailed evaluation and retrofitting of lifeline buildings such as hospitals, schools, water and power supply units, telecommunication buildings, airports/airport control towers, railway stations, bus stands and important administrative buildings in the States/UTs in seismic zones IV and V.

India Disaster Resource Network: A web-enabled centralized database for the India Disaster Resource Network has been operational. The IDRN is a nation-wide electronic inventory of essential and specialist resources for disaster response both specialist equipment and specialist manpower resources. The IDRN list out the equipments and the resources by type and by the functions it performs and it gives the contact address and telephone numbers of the controlling officers in-charge of the said resources. The IDRN is a live system providing for updating of inventory once in every quarter. Entries into the inventory are made at district and State level. The network ensures quick access to resources to minimize response time in emergencies. The list of resources to be updated in the system has been finalized. It has 226 items. About 69,329 records in 545 districts throughout the country have already been uploaded since September 1, 2003 when the India Disaster Resource Network was formally inaugurated. The system will give, at the touch of the button, location of specific equipments/specialist

resources as well as the Controlling authority for that resource so that it can be mobilized for response in the shortest possible time. The data base will be available simultaneously at the district, state and national levels.

Emergency Operation Centers: The States are being assisted to set up control rooms/emergency operations centers at the State and district level.

Assistance for this is being given under the GOI – UNDP project in the States covered by the project. Assistance under the Modernization of Police Scheme is also available for setting up EOCs. The control rooms, which will function round the clock, will be composite control rooms to look after law and order issues as well as disaster management. Equipments are also being provided for these control rooms under the disaster risk management programme. Hazard zone-wise standard layout, structural design and construction drawings have been developed for State and District EOCs and shared with all the States. Construction work has started for multi-hazard resistant EOCs in six States and 64 districts.

Disaster Management in India

National Emergency Operation Center: To coordinate the entire disaster/emergency operations effectively, the existing Control Room at the national level has been being upgraded as National Emergency Operations Center (NEOC). The National EOC is equipped with satellite phones, GPS, computers, emergency lights, GIS information system etc in five on-site emergency coordination kits in ready-to-use mode. Staffs in the NEOC have been trained. A State-of-the-art underground and all-hazard resistant, National EOC with superior structural features and communication facilities is being set up. A Committee of CPWD/BARC/DRDO has been constituted to finalize the design parameters. It is likely to be commissioned by 2006.

National Emergency Communication Network: The communication network between the national and the state EOCs and the site of the emergency/crises are

currently based on the DOT network. It has been observed that in a calamity/hazard, communication is the first casualty. It has therefore been decided to put in place multi-mode and multi-channel communication systems so that enough redundancy is available. It has been decided that the POLNET will also be used for disaster management; and for this the POLNET communication facility will be extended to SDMs and Collectors as well as the Emergency Operation Centers. For emergency communications, discussions have also been held with the Department of Space (ISRO). They will be making available alternate satellite communication units to connect with State EOCs and mobile units that can be transported to the site of a disaster. A Group had been set up for drawing up a communication plan for disaster management and the said; Group has submitted its report. This provides for a dedicated communication system for disaster management with built in redundancies. Phase I of the National Disaster Management Communication Plan to provide satellite based mobile voice/data/video communication between National EOC/State EOCs/ Disaster Management in India mobile EOCs and remote disaster/emergency sites is under implementation and is expected to be completed by October, 2004. Phase II of the communication plan to connect National/State/District EOCs with disaster/emergency sites are proposed to be completed by March, 2006. The communication backbone to be used will include terrestrial link (DOT), POLNET, NICNET, ISDN and SPACENET

Development of a GIS-based National Database for Disaster Management:

The Geographical Information System (GIS) database is an effective tool for emergency responders to access information in terms of crucial parameters for the disaster-affected areas. The crucial parameters include location of the public facilities, communication links and transportation network at national, state and

district levels. The GIS database already available with different agencies of the Government is being upgraded and the gap is proposed to be bridged. A project for this purpose is being drawn up with a view to institutionalize the arrangements. The database will provide multi layered maps on district wise basis. These maps taken in conjunction with the satellite images available for a particular area will enable the district administration as well as State Governments to carry out hazard zonation and vulnerability assessment, as well as coordinate response after a disaster. Recognizing the crucial importance of Geographical Information System (GIS) as a decision support tool for disaster management, the Ministry of Home Affairs proposes to establish a GIS database, 'National Database for Disaster Management (NDDM)', which will assist in hazard zonation, risk assessment, preparedness and emergency response management.

Strengthening of Fire Services: In order to further strengthen the capacity for response, the fire services are proposed to be developed into multi hazard response units as is the normal practice in several other countries. A project for this (with an estimated cost of Rs 2457 crore) has been drawn up. The Planning Commission for Disaster Management in India has given in-principle clearance to the project. The exercise for mobilization of resources is being undertaken. It is proposed to provide rescue tenders in addition to fire tenders to each fire unit and fill up all gaps up to sub divisional level. Hazmat vans will be provided to State capitals and metropolitan cities. This will necessitate recruitment of additional fire men and drivers and intensive training required to be provided to enable them to function as efficient of all purpose response units.

Strengthening of Civil Defense: India has a large network of Civil Defense and Home Guards volunteers. The existing strength is about 1.2 million. However, this organization has not so far been associated with disaster mitigation, preparedness and response functions. It is proposed to revamp the Civil Defense organization to

enable them to discharge a key responsibility in all the facets of disaster management including preparedness. A proposal in this regard has been finalized and is under consideration of the Government.

FROM THE MINISTRY OF HOME AFFAIRS

[NDM DIVISION]

The Government of India carried out a review of the disaster management mechanism after the Bhuj earthquake. It was noted that there was need for building up holistic capabilities for disaster management – so as to be able to handle both natural and man-made disasters. It was accordingly decided that the subject of Disaster Management be transferred from the Ministry of Agriculture to the Ministry of Home Affairs (excluding drought and epidemics and those emergencies/disasters which were specifically allotted to other Ministries). The Government (Allocation of Business) Rules, 1961 were accordingly amended in February, 2002. The actual transfer of work took place in June 2002.

India has been very vulnerable to natural hazards and calamities. The Bhuj earthquake accounted for 13805 deaths, the super cyclone in Orissa accounted for 9885 deaths. Government is of the view that if appropriate mitigation measures had been taken these casualties could have been reduced significantly.

3. Each year disasters also account for loss of thousands of crore in terms of social and community assets. It is clear that development cannot be sustainable without building in mitigation into the planning process. Keeping the above factors in view, the Government of India has brought about a change in policy which emphasizes mitigation, prevention and preparedness. With the approval of the Government, a strategic roadmap as given in the succeeding pages has been drawn up for reducing the country's vulnerability to disasters. Action for reducing our

vulnerabilities to disasters shall be taken in accordance with the roadmap. The roadmap will be reviewed every two years to see if any change in direction is necessary.

NATIONAL DISASTER MANAGEMENT FRAMEWORK

Disaster Prevention And Preparedness Measures Information and Research Network

Disaster prevention is intrinsically linked to preventive planning. Some of the important steps in this regard are:

- (a) Introduction of a comprehensive process of vulnerability analysis and objective risk assessment.
- (b) Building a robust and sound information database: A comprehensive database of the land use, demography, infrastructure developed at the national, state and local levels along with current information on climate, weather and man-made structures is crucial in planning, warning and assessment of disasters. In addition, resource inventories of governmental and non-governmental systems including personnel and equipment help in efficient mobilization and optimization of response measures.
- (c) Creating state-of-the-art infrastructure: The entire disaster mitigation game plan must necessarily be anchored to frontline research and development in a holistic mode. State-of-the art technologies available worldwide need to be made available in India for up gradation of the disaster management system; at the same time, dedicated research activities should be encouraged, in all frontier areas related to disasters like biological, space applications, information technology,

nuclear radiation etc., for a continuous flow of high quality basic information for sound disaster management planning,

(d) Establishing Linkages between all knowledge- based institutions: A National Disaster Knowledge Network, tuned to the felt needs of a multitude of users like disaster managers, decision makers, community etc., must be developed as the network of networks to cover natural, manmade and biological disasters in all their varied dimensions

Capacity Building, Training & Education

Personnel involved in the exercise have to draw upon knowledge of best practices and resources available to them. Information and training on ways to better respond to and mitigate disasters to the responders go a long way in building the capacity and resilience of the country to reduce and prevent disasters. Training is an integral part of capacity building as trained personnel respond much better to different disasters and appreciate the need for preventive measures. The directions in this regard are:

(a) The multi-sect oral and multi-hazard prevention based approach to disaster management requires specific professional inputs. Professional training in disaster management should be built into the existing pedagogic research and education. Universities and professional teaching institutions may develop specialized courses for disaster management, and disaster management should be treated as a distinct academic and professional discipline, something that the American education system has done successfully. In addition to separate diploma/degree courses in disaster management, the subject needs to be discussed and taught as a specific component in professional and specialized courses like medicine, nursing, Engineering, environmental sciences, architecture, and town and country planning.

(b) The focus towards preventive disaster management and development of a national ethos of prevention calls for an awareness generation at all levels. An appropriate component of disaster awareness at the school level will help increase awareness among children and, in many cases, parents and other family members through these children. Curriculum development with a focus towards dissemination of disaster related information on a sustained basis, covering junior, middle and high schools may be worked out by the different school boards in the country.

(c) Training facilities for government personnel involved in disaster management are conducted at the national level by the National Center for Disaster Management (NCDM) at the Indian Institute of Public Administration, in New Delhi which functions as the nodal institution in the country for training, research and documentation of disasters. At the State level, disaster management cells operating within the State Administrative Training Institutes (ATIs) provide the necessary training. Presently, 24 ATIs have dedicated faculties. There is a need for Disaster Management in India. Strengthening specialized training, including training of personnel in disaster response.

(d) Capacity building should not be limited to professionals and personnel involved in disaster management but should also focus on building the knowledge, attitude and skills of a community to cope with the effects of disasters. Identification and training of volunteers from the community towards first response measures as well as mitigation measures is an urgent imperative. A programme of periodic drills should be introduced in vulnerable areas to enable prompt and appropriate community response in the event of a disaster, which can help save valuable lives. Capacity building for effective disaster management therefore needs to be grounded and linked to the community and local level

responders on the one hand and also to the institutional mechanism of the State and the Nation on the other.

Community Level Initiatives

The goal of any disaster management initiative is to build a disaster resistant/resilient community equipped with safer living and sustainable livelihoods to serve its own development purposes. The community is also the first responder in any disaster situation, thereby emphasizing the need for community level initiatives in managing disasters. To encourage such initiatives, the following are required:

(a) Creating awareness through disaster education and training and information dissemination are necessary steps for empowering the community to cope with disasters.

(b) Community based approach followed by most NGOs and Community Based Organisations (CBOs) should be incorporated in the disaster management system as an effective vehicle of community participation.

Disaster Management in India

(c) Within a vulnerable community, there exist groups that are more vulnerable like women and children, aged and infirm and physically challenged people who need special care and attention especially during disaster situations. Efforts are required for identifying such vulnerable groups and providing special assistance in terms of evacuation, relief, aid and medical attention to them in disaster situations. Management of disasters should therefore be an interface between a community effort to mitigate and prevent disasters as also an effort from the government machinery to buttress and support popular initiatives.

THE PATH AHEAD

For addressing natural calamities such as floods and drought, there already exist a number of plan schemes under which a lot is being done and can be done. State Governments need to make full use of the existing plan schemes and give priority to implementation of such schemes that will help in overcoming the conditions created by the calamity. In some cases this implies possible diversion of the funds from other schemes to those schemes the implementation of which will help meeting the situation. There may also be need in a crisis situation for certain re-appropriations/reallocations among the different departments. The Planning Commission will aim at responding quickly to the needs of the Central Ministries/Departments/States in matters relating to the Plan for meeting situations arising out of natural disasters, by enabling adjustment of schemes to meet the requirements as far as possible. A mechanism will be evolved to take expeditious decisions on proposals that involve transfer of funds from one scheme to another, or any other change which involves departure from the existing schemes/ pattern of assistance, new schemes and relaxation in procedures, etc. in the case of natural disasters. As the first responder in any disaster situation, however, each State needs to build a team, skilled personnel, make provision for specialized equipments, efficient communication network, and relevant, intelligent and easily accessible database. There is also a need to consider creation of a plan scheme in each state basically to meet the minimum requirements for strengthening communications and emergency control rooms, thereby improving coordination and response to disasters. No new institutional structures need be created in such a scheme.

In particular, with regard to major disasters, it is also necessary for disaster mitigation components to be built into all development projects. In order to save larger outlays on reconstruction and rehabilitation subsequently, a mechanism

would need to be worked out for allowing components that specifically help projects coming up in highly disaster prone areas withstand the impact of natural disasters as part of approved project cost for projects financed under the Plan. The message for the Tenth Plan is that in order to move towards safer national development, development projects should be sensitive towards disaster mitigation. With the kind of economic losses and developmental setbacks that the country has been suffering year after year, it makes good economic sense to spend a little extra today in a planned way on steps and components that can help in prevention and mitigation of disasters, than be forced to spend many multiples more later on restoration and rehabilitation. The design of development projects and the process of development should take the aspect of disaster reduction and mitigation within its ambit; otherwise, the development ceases to be sustainable and eventually causes more hardship and loss to the nation.

CHAPTER III

PROJECT PROFILE

PROJECT PROFILE

3.1 TITLE OF THE PROJECT

“A study on strategy planning for community awareness on disaster management” (With particular reference to vulnerability of the community residing in the Kuppams of Thiruvallur district).

3.2 STATEMENT OF THE STUDY

“A study on strategy planning for community awareness on disaster management”, with particular reference to vulnerability of the community residing in the Kuppams of Thiruvallur district will lead to a proactive well planned approach in solving various issues related to capacity building and vulnerability assessment measures. To avoid the enormous losses from natural disasters, it is essential to shift from traditional post-disaster relief and reconstruction assistance toward supporting a culture of prevention, with the purpose of sustainable development. Women and Children are the most vulnerable segment who needs training to cope with the disasters.

3.3 NEED FOR THE STUDY

Statistics show that disasters cause the most significant and irreversible damage in developing countries, where the poorest and most vulnerable population groups, Women and Children are disproportionately impacted. By contrast, in the developed world, a considerable degree of protection against disasters has been achieved, as a result of effective prevention, mitigation and planning measures that reduce vulnerability. But even with these impressive results, damages in these countries have risen due to greater concentration and value of societal activities. It

is essential to understand the role community can play to mitigate and involve in the risk reduction measures.

The coastal community Protection Movement, Tamil Nadu & Pondicherry has requested the researcher to provide with a strategic planning for community awareness programs based on the need based requirements of the selected Kuppams so as to produce a compiled list to the Government of India for preparedness and precautionary measures.

3.4 OBJECTIVES OF THE STUDY

- To study the strategy planning process for community awareness on disaster management
- To examine the community awareness on risk reduction measures of the most affected coastal regions of Thiruvallur District.
- To analyze the Literacy and training level among community to cope with disaster
- To identify factors that contribute to the initiatives to reduce vulnerability
- To find and list out the safety kit and loss reduction measures in disaster management
- To analyze the challenges encountered by community during and after disaster
- To conceptualize the relationship between hazard/disaster assessment, risk management, and actions for Disaster Management.
- To evolve a cyber infrastructure for disaster Management.

3.5 SCOPE FOR THE STUDY

In order to facilitate a pro-active rather than reactive approach to disaster preparation with respect to human lives, an attempt has been made to understand the perception of residents of Kuppams in Thiruvallur district for community awareness on disaster management. Six regions, which are most vulnerable, are taken for research study. They are TVT Kuppam, Sudhandeeradina Kuppam, Pudhu Nagar Kuppam, and Nalla thani Odi Kuppam, Lakshmipuram, Ondi Kuppam. Out of the six regions, four Kuppams which are adversely affected was considered for survey. The thesis aims to provide sound introductory information to private individuals, residents of the community, women at the domestic level and public institutions in preparing for either small or large-scale events. The thesis presents guidelines for general facilities preparation and response to a variety of events. The research study addresses small-scale events and procedures for the general public and women at the domestic level to be used for the immediate response action for any disaster forecasted. The thesis will have an insight of problems encountered by direct victims with special reference to residents of coastal region and precautionary measures to be taken in future to face the challenges put forth by way of natural calamities.

The proposed research recommendations and analysis will serve as a lead to study the following topics in length.

1. Real Events / Lessons Learned

Real incidents/events that have occurred within the last 36 months

2. Designing curriculum for students in schools and colleges on Disaster preparedness and Crisis management

3. Emerging Trends in Disaster Management

Nuclear, Biological, Radiological & Chemical threats (NBRC), Infectious diseases (Flu Pandemic, SARS, Avian Flu, and Virus), Global Climate Change, Community Emergency Response Programs, Emergency Risk Management, Critical Infrastructure Assurance Programs etc.

4. The Human Element in Disaster Management

Crisis Communications, Biggest PR Issues of 2006/2007/08/09, HR Policies, Stress Reduction, Trauma Risk Management

5. Technical Issues/Threats

Emergency Communications (Interoperability, Communication Systems Options, Emergency Management

6. Disaster Management Principles & Practices

Emergency Operations Centers, Emergency Site Management, Incident Command System, Business Continuity & Disaster Recovery, Critical Infrastructure Protection, Managing the Media, Major Event Contingency Planning, Public Awareness and Education Campaigns, Evacuation Planning, Exercise and Training Programs, Hazard Identification and Risk Assessment.

7. Research & Development

Development of multi-organizational strategies for managing incidents, recommendations for amendments to current disaster management legislation, disaster management / business continuity pilot projects, results of research contributing to loss reduction strategies; etc.

A disaster safety kit and action plan for the family members will be designed for a coordinated effort in the family after due consideration and interview with those directly affected in respective situations. The research study will focus on the role of woman in Disaster Management with particular reference to Disaster preparedness at the domestic level. It has been observed from the past experience that the women and children are more vulnerable to disaster events. This research study highlights the roles that can be initiated and played by women to overcome, avoid or lessen the impact of catastrophic events. The research study will also lead to designing of curriculum, guidelines for do's and don'ts during crisis for all age groups to be implemented in schools and colleges.

CHAPTER IV
RESEARCH
METHODOLOGY

RESEARCH METHODOLOGY

4.1 RESEARCH DESIGN

The study is undertaken to understand the strategic planning process for community awareness in Disaster Management. The research is descriptive research in nature which describes the current status of the community with regard to the community awareness on disaster management. Descriptive research, also known as statistical research, describes data and characteristics about the population or phenomenon being studied. Descriptive research answers the questions *who, what, where, when* and *how...* The term descriptive research refers to the type of research question, design, and data analysis that will be applied to a given topic. Descriptive statistics tell what is, while inferential statistics try to determine cause and effect.

The sampling design adopted in this research is Convenience Sampling. Convenience sampling is a non-probability sampling technique where subjects are selected because of their convenient accessibility and proximity to the researcher. Convenience sampling (sometimes known as grab or opportunity sampling) is a type of non probability sampling which involves the sample being drawn from that part of the population which is close to hand. That is, a sample population selected because it is readily available and convenient. It may be through meeting the person or including a person in the sample when one meets them or chosen by finding them through technological means such as the internet or through phone. The sampling design used in the survey is non probability convenience sampling.

Among the total population of the affected area in the coastal region of Thiruvallur, six Kuppams was affected. They are as follows:

1. T.V.T Kuppam
2. Pudhunagar Kuppam
3. Sudhandheerapuram Kuppam
4. Nalla Thani Odi Kuppam
5. Lakshmipuram
6. Ondi Kuppam

There are around 960 families residing in these six Kuppams according to the secondary data provided by the Coastal Community Protection Movement. Among them, the most affected four Kuppams (T.V.T. Kuppam, Pudhunagar Kuppam, Sudhandheerapuram Kuppam, and Nalla Thani Odi Kuppam.) have been selected for the study. Out of these 960, around 640 members were surveyed from four Kuppams.

The samples size is 640. The sample size 640 is taken from the most affected area in the coastal region of Thiruvallur district. Extensive use of analytical tools like weighted average, Chi square, Factor analysis-test, ANOVA etc is used in this research study.

Use of Factor Analysis was done to identify prime safety kits to prepare/plan for the disaster event. There are 7 activities for loss reduction, which are reduced into fewer factors by analyzing correlation between variables (activity). In this case 7 variables are reduced in to 2 factors which explain the much of the original data. From the cumulative percentage column, the two factors extracted together accounts for 74.31 % of the total variance (information contained in 7 variables). Capacity and vulnerability assessment are some of the variables that were tested. Priorities given to the safety kits like Children's basic needs, First aid & medication, Water cans, Food for three days, basic needs for elders, documents

like ration card, important papers to prove identity, Torch lights, batteries, blankets,whistle,candle etc. were analyzed.

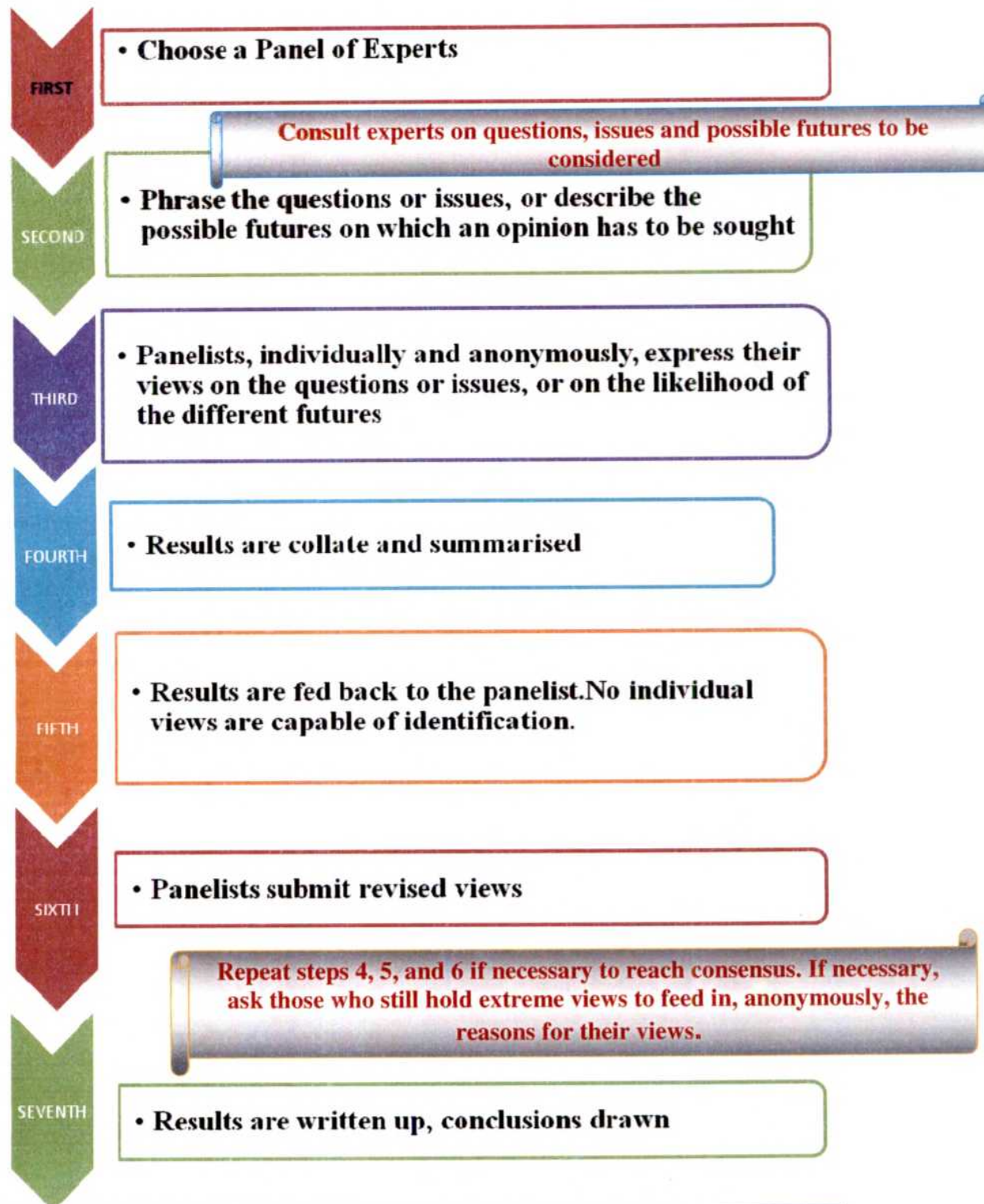
4.2 DATA COLLECTION METHOD

Primary data is collected for the study through survey in the form of questionnaire. Around six local women heads familiar in the region helped in coordination work for the survey and interview purpose. Secondary data was collected from various sources like National Institute of Disaster Management New Delhi, The World Bank Institute, United Nations Report and Canadian Disaster Recovery Center, and the Coastal Community Protection Movement. Delphi Technique was used to gather expert opinion on the strategy planning.

4.3 RESEARCH INSTRUMENT: Questionnaire, Delphi Technique Questions

The Delphi technique was initially used to gather expert opinion on the existing strategic planning process and further it had helped to reframe important questions for the survey to be taken. The Delphi technique was useful in gathering and compiling certain important information on the strategy planning for community awareness on disaster management.

The Delphi Technique Process Figure 4.2.8



4.4. SAMPLING PLAN: The sample size was decided to get the most accurate outcome from the population. Primary data is collected for the study through survey in the form of questionnaire.

In the first phase, Thiruvallur district was selected from three districts namely Chengalpattu, Thiruvallur, and Kanchipuram.

In the second phase, six Kuppams in Thiruvallur district that were affected by natural calamities was chosen based on judgment. They are T.V.T Kuppam, Pudhunagar Kuppam, Sudhandheerapuram Kuppam, Nalla Thani Odi Kuppam, Lakshmipuram and Ondi Kuppam.

The third phase, involved selection of four most affected Kuppam out of the six Kuppams that were chosen based on judgment.

The most affected Kuppams out of the six Kuppams which had a population of around 960 families was selected for the research study.

1. T.V.T. Kuppam,
2. Pudhunagar Kuppam,
3. Sudhandheerapuram Kuppam, and
4. Nalla Thani Odi Kuppam.

Around six local women heads familiar in the region helped in coordination work for the survey and interview purpose. A sample of 640 members was surveyed for the research study. The sample was tested for reliability with the help of a statistical consultant and was proved to be reliable. The overall reliability is 0.901 as per the Cronbach's Alpha. The report will also help the future researchers in finding out more solutions to the problems and this will prove that planning at the community level will serve as an integrated effort to save the nation at large.

4.5 PERIOD OF STUDY: Three years since 2007 February until 2010

4.6 ANALYSIS OF TOOLS

The information collected for the survey through a questionnaire is analyzed and presented in tabular and graphical form. The quantitative techniques such as percentage method, chi-square, ANNOVA and graphical tools like bar diagram, pie charts, factor analysis are used for analyzing and interpretation of the data. Based on the analysis and interpretation the findings, suggestion, and conclusion are drawn. The research study involves various analysis and hypothesis testing like Chi square test, percentage analysis, t- test, weighted average method, factor analysis etc.

ANALYSIS OF VARIANCE (ANOVA)

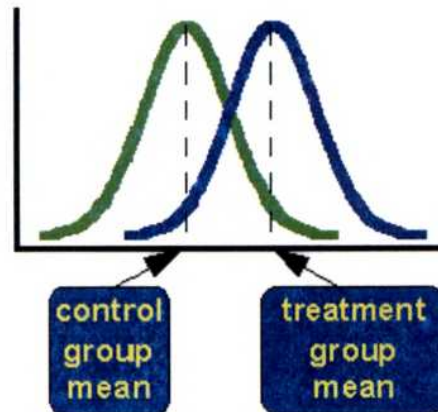
In statistics, **analysis of variance (ANOVA)** is a collection of statistical models, and their associated procedures, in which the observed variance is partitioned into components due to different sources of variation. In its simplest form ANOVA provides a statistical test of whether or not the means of several groups are all equal, and therefore generalizes Student's two-sample *t*-test to more than two groups. ANOVAs are helpful because they possess a certain advantage over a two-sample *t*-test. Doing multiple two-sample *t*-tests would result in a largely increased chance of committing a type I error. For this reason, ANOVAs are useful in comparing three or more means.

The T-Test

The *t*-test assesses whether the means of two groups are *statistically* different from each other. This analysis is appropriate whenever one wants to compare the means

of two groups, and especially appropriate as the analysis for the post test-only two-group randomized experimental design.

Figure: 4.2.9



Idealized distributions for treated and comparison group post test values.

Figure above shows the distributions for the treated (blue) and control (green) groups in a study. Actually, the figure shows the idealized distribution -- the actual distribution would usually be depicted with a histogram or bar graph. The figure indicates where the control and treatment group means are located. The question the t-test addresses is whether the means are statistically different.

PEARSON'S CHI-SQUARE

Pearson's chi-square test is the best-known of several chi-square tests – statistical procedures whose results are evaluated by reference to the chi-square distribution. Its properties were first investigated by Karl Pearson. In contexts where it is important to make a distinction between the test statistic and its distribution, names similar to **Pearson X-squared** test or statistic are used. It tests a null hypothesis stating that the frequency distribution of certain events observed in a

sample is consistent with a particular theoretical distribution. The events considered must be mutually exclusive and have total probability 1. A common case for this is where the events each cover an outcome of a categorical variable. A simple example is the hypothesis that an ordinary six-sided die is "fair", i.e., all six outcomes are equally likely to occur. Pearson's chi-square is used to assess two types of comparison: tests of goodness of fit and tests of independence. A test of goodness of fit establishes whether or not an observed frequency distribution differs from a theoretical distribution. A test of independence assesses whether paired observations on two variables, expressed in a contingency table, are independent of each other – for example, whether people from different regions differ in the frequency with which they report that they support a political candidate. The first step in the chi-square test is to calculate the chi-square statistic. In order to avoid ambiguity, the value of the test-statistic is denoted by X^2 rather than χ^2 (i.e. uppercase chi instead of lowercase); this also serves as a reminder that the distribution of the test statistic is not exactly that of a chi-square random variable. However some authors do use the χ^2 notation for the test statistic. An exact test which does not rely on using the approximate χ^2 distribution is Fisher's exact test: this is significantly more accurate in evaluating the significance level of the test, especially with small numbers of observation. The chi-square statistic is calculated by finding the difference between each observed and theoretical frequency for each possible outcome, squaring them, dividing each by the theoretical frequency, and taking the sum of the results. A second important part of determining the test statistic is to define the degrees of freedom of the test: this is essentially the number of observed frequencies adjusted for the effect of using some of those observations to define the "theoretical frequencies"

FACTOR ANALYSIS:

Factor analysis includes both component analysis and common factor analysis.

Factor analysis is a statistical method used to describe variability among observed variables in terms of a potentially lower number of unobserved variables called **factors**. In other words, it is possible, for example, that variations in three or four **observed** variables mainly reflect the variations in a single unobserved variable, or in a **reduced** number of unobserved variables. Factor analysis searches for such joint variations in response to unobserved latent variables. The observed variables are modeled as linear combinations of the potential factors, plus "error" terms. The information gained about the interdependencies between observed variables can be used later to reduce the set of variables in a dataset. Factor analysis originated in psychometrics, and is used in behavioral sciences, social sciences, marketing, product management, operations research, and other applied sciences that deal with large quantities of data.

4.7 PILOT STUDY / PRE TESTING

The questionnaire which was prepared in English was translated to Tamil for the convenience and understanding of the coastal community. Initially for a pilot study, a sample size of 204 was collected personally by meeting the respondent. After collecting the responses from the respondents the validity of the questionnaire was tested. The necessary changes were made in terminology. There were additions and deletions made based on the validity test.

4.8 RELIABILITY TEST

Reliability has to do with the quality of measurement. In its everyday sense, reliability is the "consistency" or "repeatability" of your measures. Before one can define reliability precisely one has to lay the groundwork. First, one should learn about the foundation of reliability, the true score theory of measurement. Along with that, one needs to understand the different types of measurement error

because errors in measures play a key role in degrading reliability. With this foundation, one can consider the basic theory of reliability, including a precise definition of reliability. There we can find out that we cannot calculate reliability - - we can only estimate it. Because of this, there a variety of different types of reliability that each has multiple ways to estimate reliability for that type. In the end, it's important to integrate the idea of reliability with the other major criteria for the quality of measurement -- validity -- and develop an understanding of measurement. Reliability test has been conducted and the outcome is as follows: The overall reliability is 0.901 as per the Cronbach's Alpha. The reliability test for the question no; 16 (b) the importance given to activities according to their priority is 0.934. For the question on activities for loss reduction (Question no: 20) the reliability test outcome is 0.967. The 21st question regarding the opinion on safety kit has a reliability test result of 0.952. The factor analysis on question 39 which deals with the importance of initiatives to reduce the vulnerability of community has resulted in a reliability test with an outcome of 0.952.

4.9 LIMITATIONS OF STUDY

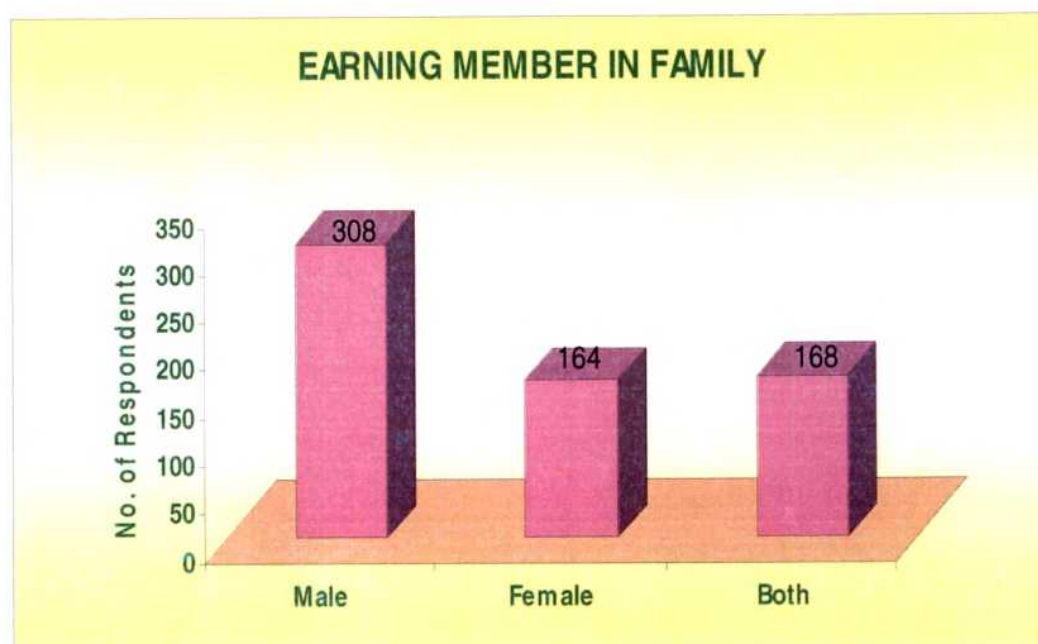
The study is limited to just four Kuppams. The response received from respondents is 4 years after the occurrence of a major event like Tsunami. The data was collected only from respondents who were willing to share their information. As the respondents were mostly illiterate, it was challenging to explain the entire purpose of the question and collect relevant response from them. Though the research study has its own limitations, it is evident that it can contribute to the development of the coastal community zone by understanding them better and plan well in advance on the strategy to be implemented for community awareness on disaster management.

CHAPTER V
DATA ANALYSIS &
INTERPRETATION

TABLE 5.1.1
EARNING MEMBER IN THE FAMILY

	No. of Respondents	Percentage
Male Only	308	48.1
Female Only	164	25.6
Both are earning members	168	26.2
Total	640	100.0

CHART 5.2.1
EARNING MEMBER IN THE FAMILY



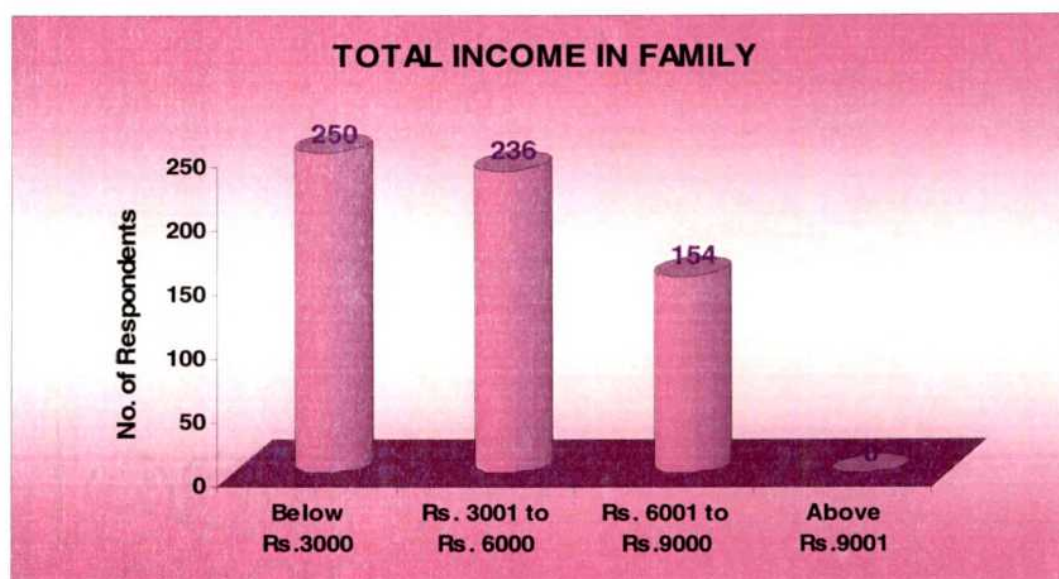
INFERENCE: EARNING MEMBER IN THE FAMILY

Table 5.1.1 clearly depicts that out of 640 respondents, 48.1% are Male earning members, and 25.6 % of the earning members in the family are female. 26.2% of the respondents have both Male and Female members who earn in the family. Most of the respondents are fishermen and women who reside in the coastal region. It was observed from the interactive session that the respondents were finding it difficult to manage the day to day expenses as the occupation was highly dependent on the weather conditions.

TABLE 5.1.2
TOTAL INCOME IN THE FAMILY

	No. of Respondents	Percentage
Below Rs.3000	250	39.1
Rs. 3001 to Rs. 6000	236	36.9
Rs. 6001 to Rs.9000	154	24.1
Above Rs.9001	0	0.0
Total	640	100.0

CHART 5.2.2
TOTAL INCOME IN THE FAMILY



INFERENCE: TOTAL INCOME IN THE FAMILY

It is inferred from Table 5.1.2 that out of 640 respondents, 39.1% earn below Rupees 3000/- per month, 36.9% of the respondents earn between Rs.3001 to Rs.6000/- and 24.1% earn between Rs.6001/- to Rs.9000/- and none of them earn above Rs.9001/- . Most of the respondents earn very less and find it challenging to meet the expenses. There is barely any surplus to be saved. Therefore, they have to find alternative source of income for extra revenue to meet the day to day expenses. Some of them undertake domestic work and manage to have one square meal from the place where they work.

TABLE 5.1.3
AGE OF THE RESPONDENTS

	No. of Respondents	Percentage
21 to 30 yrs	138	21.6
31 to 40 yrs	232	36.2
41 to 50 yrs	202	31.6
Above 51 yrs	68	10.6
Total	640	100.0

CHARTT 5.2.3

AGE OF THE RESPONDENTS



INFERENCE: AGE OF THE RESPONDENTS

Table 5.1.3 reflects the age of the respondents. Out of the 640 respondents, 21.6% of the respondents are growing population and are between the age group of 21 to 30 years, 36.2% are between 31 to 40 years of age. 31.6% fall between 41 to 50 years and 10.6% are above 51 years of age. It is inferred from the data analysis that the majority of the respondents are matured adults who are above 31 years of age and have the ability to be trained and educated on the various community awareness programs.

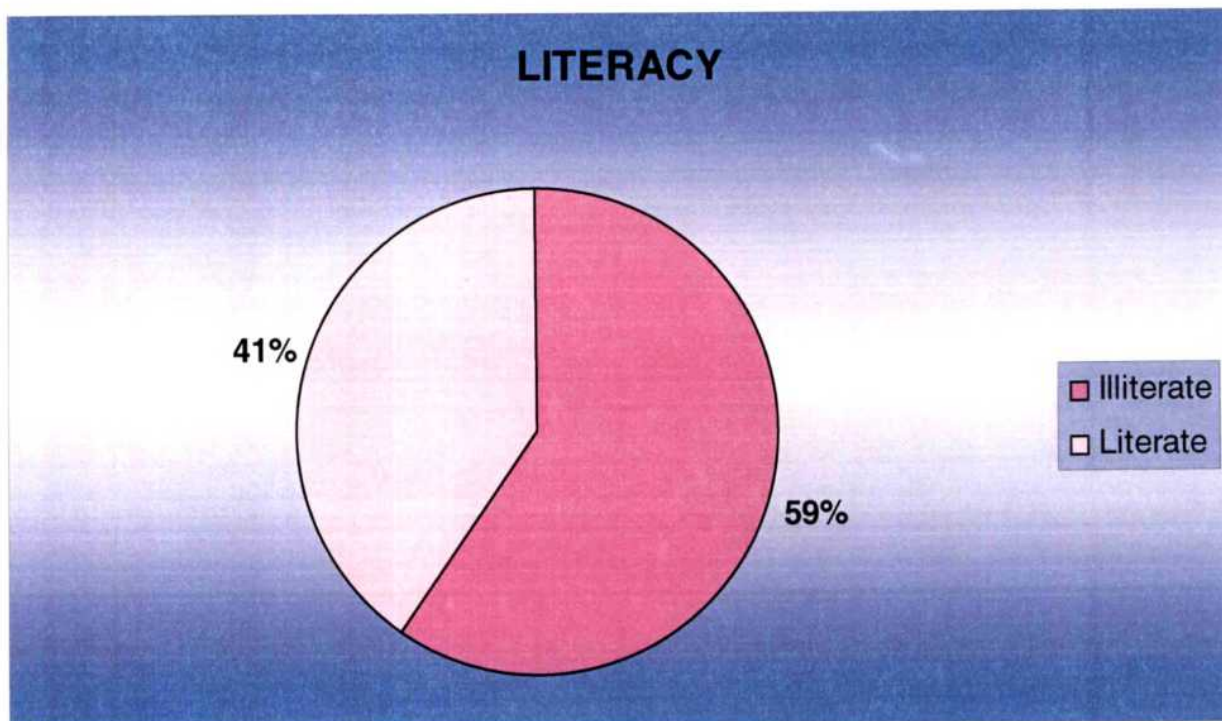
TABLE 5.1.4

LITERACY

	No. of Respondents	Percentage
Illiterate	380	59.4
Literate	260	40.6
Total	640	100.0

CHART 5.2.4

LITERACY



INFERENCE: LITERACY

From the aforesaid Table 5.1.4, it is inferred that the majority of the respondents constituting 59.4% are illiterate and 40.6% are literate. Majority of the respondents are not literate. Though almost all of them are good in spoken language, they are not in a position to read or write in the regional language Tamil.

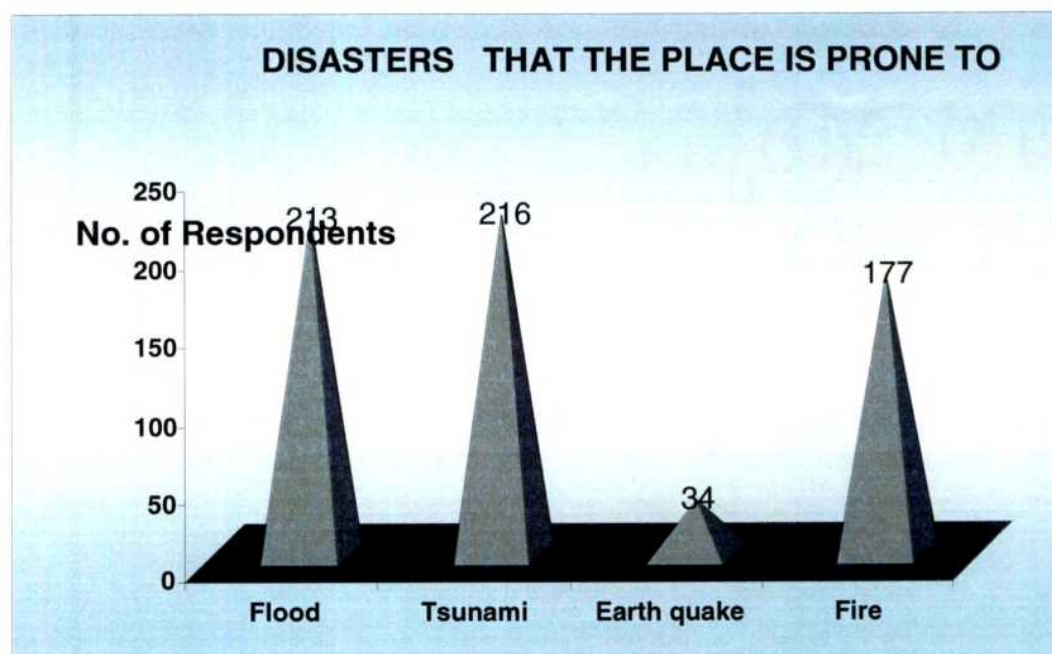
Essential points to be considered during Strategic Planning:

As most of them have difficulty in reading and writing it becomes more challenging to provide training materials for community awareness programmes in disaster management. Non verbal sign boards or non verbal cues have to be introduced for better understanding of the training materials for community awareness in disaster management. Or immediate steps have to be taken to make it compulsory for everyone to learn how to read and write the regional language. This will be more time consuming and very challenging. A coordinated effort from the Ministry of Human Resources and Social Justice is required. A better option in this case would be to introduce sign boards in **pictorial form** in the regional style that is easy to relate and understand like Boards that depicts picture of "Safe Zone", "Evacuation Routes", "Danger of Swamp", "and Open pit-Caution". "Help for the physically challenged available here" etc

TABLE 5.1.5
RESPONDENT'S VIEW ON DISASTERS THE PLACE IS PRONE TO

	No. of Respondents	Percentage
Flood	213	33.3
Tsunami	216	33.8
Earth quake	34	5.3
Fire	177	27.7
Total	640	100.0

CHART 5.2.5
RESPONDENT'S VIEW ON DISASTERS THE PLACE IS PRONE TO



INFERENCE: DISASTERS THAT THE PLACE IS PRONE TO

From the Table 5.1.5, it is understood that 33.3% of the respondents have an opinion that the place is prone to Flood and 33.8% have felt that the place is prone to Tsunami while 5.3% have an opinion that there may be earth quake and 27.7% have an opinion that the place is prone to fire accidents. Majority of the respondents have responded that the place is prone to the Tsunami disaster. This indicates that the region is highly vulnerable and requires to be reconstructed to withstand the calamity.

Essential point to be considered during Strategic Planning:

As the respondents have an opinion that the place is prone to tsunami. A detailed report on the various challenges to be faced by them during this event was noted for further recommendations for capacity building and mitigation measures. As the response is from peasants and common man memory and intuition, it requires more of technical assessment from government authorities. The fear of occurrence exists. Equally, the respondents also fear that there would be flooding and stagnation of water due to heavy rains as there is no proper sewage or drainage system. Moreover, they are not sure about the evacuation and relocation plan. It is essential for the authorities to undertake a vulnerability assessment along with capacity and resource availability assessment. The region should be tested for any occurrence of the disaster. **Disaster history** should be recorded both historical as well as from memory of occupants. It is essential to conduct a **scientific analysis** based on meteorological, geological, hydrological, environmental, and epidemiological aspects.

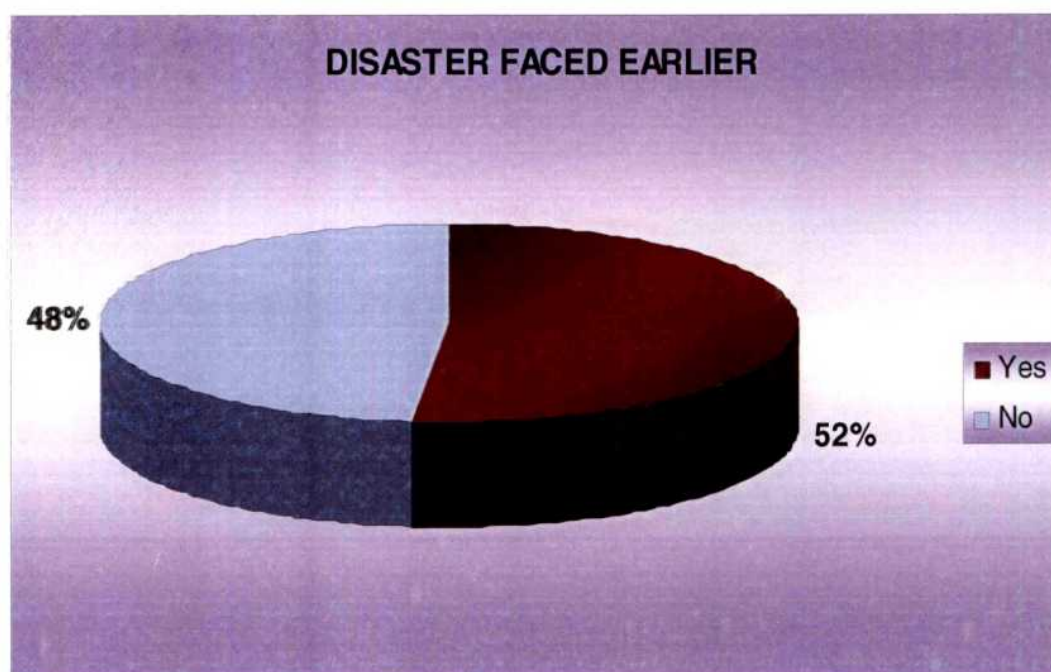
TABLE 5.1.6

EXPERIENCE OF DISASTER FACED EARLIER

	No. of Respondents	Percentage
Yes	331	51.7
No	309	48.3
Total	640	100.0

CHART 5.2.6

EXPERIENCE OF DISASTER FACED EARLIER



INFERENCE: DISASTER FACED EARLIER

Table 5.1.6 clearly reveals that 51.7% of the respondents have experienced disaster while 48.3% have not experienced disaster. Majority of the respondents have experienced disaster earlier. Most of the respondents are victims of Tsunami. They have been affected by the Tsunami and have experienced the trauma of the after effects of the event. Most of the respondents are fishermen community and have been able to recover from the event. They have indeed lost everything including their kith and kin. Destruction of structural and nonstructural properties has caused many to loose their belongings and valuables. Such community experience can indeed be used as a very strong base to build a strategy and learn from the past experience on the shortcomings.

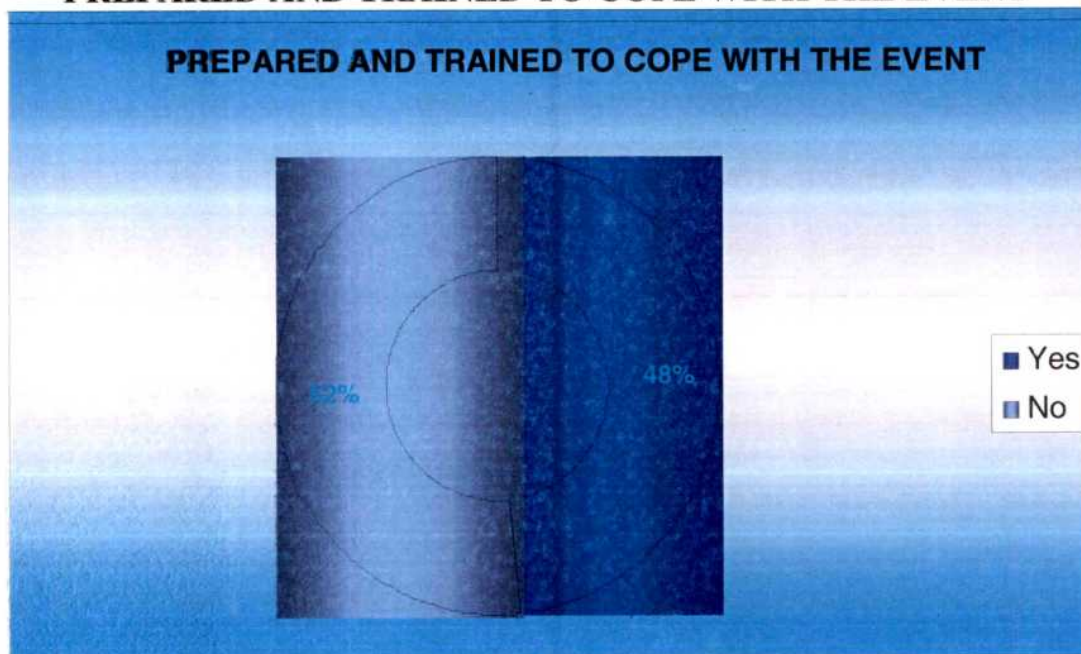
Essential point to be considered during Strategic Planning:

Structural and Non structural asset value should be evaluated to make further arrangements for precautionary measures, preparedness, and mitigation of losses etc.

**TABLE 5.1.7
PREPARED AND TRAINED TO COPE WITH THE EVENT**

	No. of Respondents	Percentage
Yes	309	48.3
No	331	51.7
Total	640	100.0

**CHART 5.2.7
PREPARED AND TRAINED TO COPE WITH THE EVENT**



INFERENCE: PREPARED AND TRAINED TO COPE WITH THE EVENT

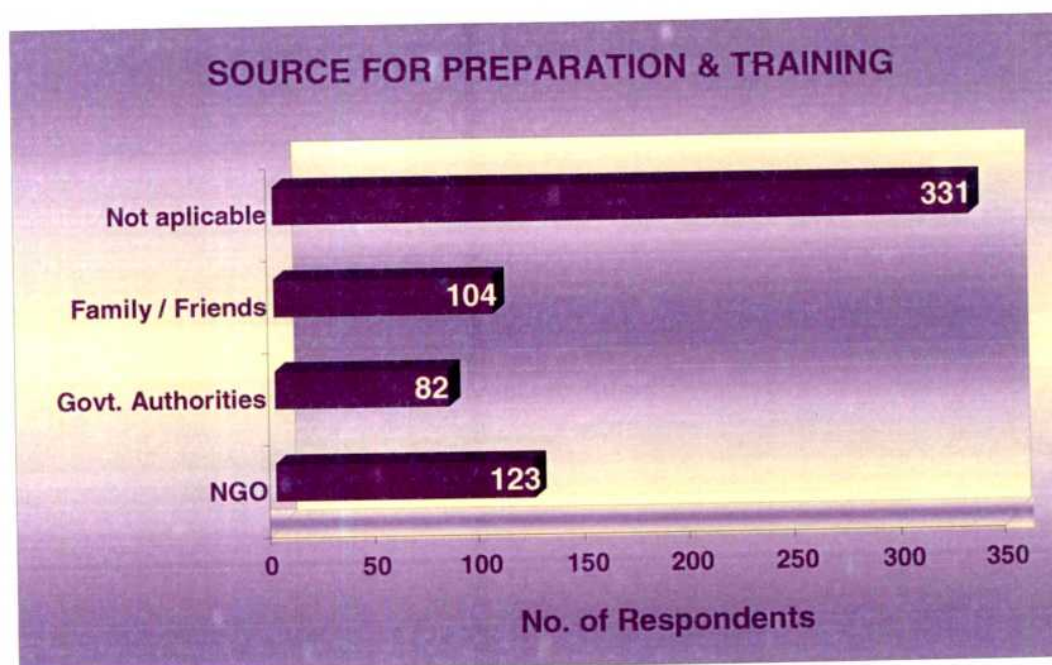
Table 5.1.7 depicts that out of 640 respondents only 48.3% are prepared to cope with disasters while 51.7% are not prepared and trained to cope with disasters.

Essential Points to be considered during Strategic Planning: It is to be noted that the respondents are prepared and trained only in certain aspects of disaster preparedness. Though a clear understanding on evacuation plan, communication to family members, Emergency contact details, emergency needs for children and elderly etc are still to be worked out. Only a few of them have been trained for artificial respiration in case of emergency. First aid training needs to be imparted.

TABLE 5.1.8
SOURCE FOR PREPARATION & TRAINING

	No. of Respondents	Percentage
NGO	123	19.2
Govt. Authorities	82	12.8
Family / Friends	104	16.2
Not applicable	331	51.7
Total	640	100.0

CHART 5.2.8
SOURCE FOR PREPARATION & TRAINING



INFERENCE: SOURCE FOR PREPARATION & TRAINING

From the Table 5.1.8, it is inferred that 51.7% of respondents are not prepared to cope with disaster and hence this question is not applicable to them. Out of the balance of 48.3% who have been trained, 19.2% are trained by NGO's, 12.8% by Government authorities, 16.2% by family and friends. Majority of the respondents who are trained and prepared to cope with the disaster agree that they are prepared and trained to cope with disasters from NGO's

Essential points to be considered during Strategic planning for community awareness in disaster Management: Though the initiative of the NGO's are much appreciated, it is to be noted that there is no standardized plan for the disaster preparedness activity. Each organization may have its own delivery mode and service delivery style which may not have one single direction for the masses which may end up in chaos and confusion during the actual mishap. Hence, if there is coordinated effort from all ends and stake holders without overlapping activities then, the initiatives from all quarters may be very productive.

TABLE 5.1.9
RESIDENCE BUILT TO WITHSTAND CATASTROPIC EVENT

	No. of Respondents	Percentage
Yes	479	74.8
No	161	25.2
Total	640	100.0

CHART 5.2.9
RESIDENCE BUILT TO WITHSTAND CATASTROPIC EVENT

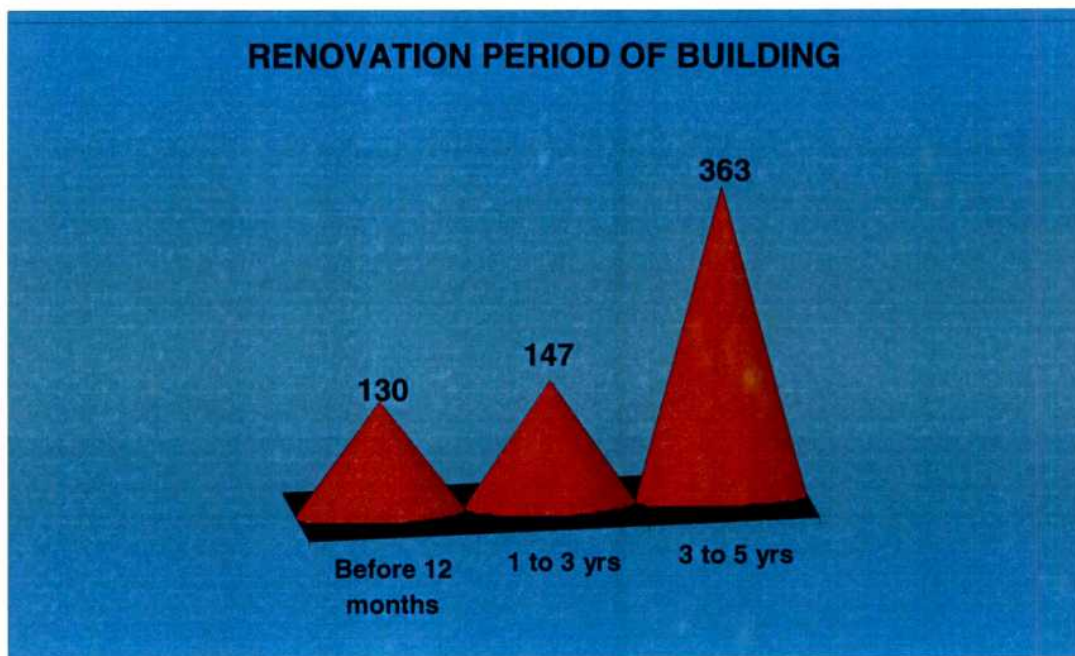


INFERENCE: RESIDENCE BUILT TO WITHSTAND CATASTROPIC EVENT From the Table 5.1.9, it is evident that 74.8% of respondents have residence which is system built to withstand any catastrophic event. 25.2% have residents that are not built to withstand any catastrophic event. **Essential points to be considered for Strategic planning for community awareness in disaster Management:** The constraints and challenges to be faced by the residents should be emphasized during community awareness program. Moreover, it is essential to take a note on the mitigation process, loss in case the disaster occurs, the total damage that might cause adverse effect on lives; property, livestock etc should be emphasized.

TABLE 5.1.10
RENOVATION PERIOD OF HOUSE

	No. of Respondents	Percentage
Before 12 months	130	20.3
1 to 3 yrs	147	23
3 to 5 yrs	363	56.7
Total	640	100.0

CHART 5.2.10
RENOVATION PERIOD OF HOUSE



INFERENCE: RENOVATION PERIOD OF HOUSE

From the Table 5.1.10, it is evident that 20.3% of the respondents have renovated their residence within the last 12 months, while 23% have renovated within one to three years. 56.7% of the respondents have renovated between three to five years.

Essential points to be considered during Strategic planning for community awareness in Disaster Management: It is known fact that the victims or the people who are affected will definitely need a place to move for safety and security. They may be so dearly attached to their own locality and may not like to shift to other places allocated by the authorities as temporary shelter. Hence they will make immediate arrangement to cope with limited resources to build a shelter again without much precautionary measures. The intention will be to build a safe place for the members of the family to come back to their well known area or locality. Community awareness program should focus on the importance of the structural changes to be made to withstand any kind of disaster.

TABLE 5.1.11

KNOWLEDGE TO ANALYZE THE LOSS IF DISASTER STRIKES

	No. of Respondents	Percentage
Yes	312	48.8
No	328	51.2
Total	640	100.0

TABLE 5.2.11

KNOWLEDGE TO ANALYZE THE LOSS IF DISASTER STRIKES

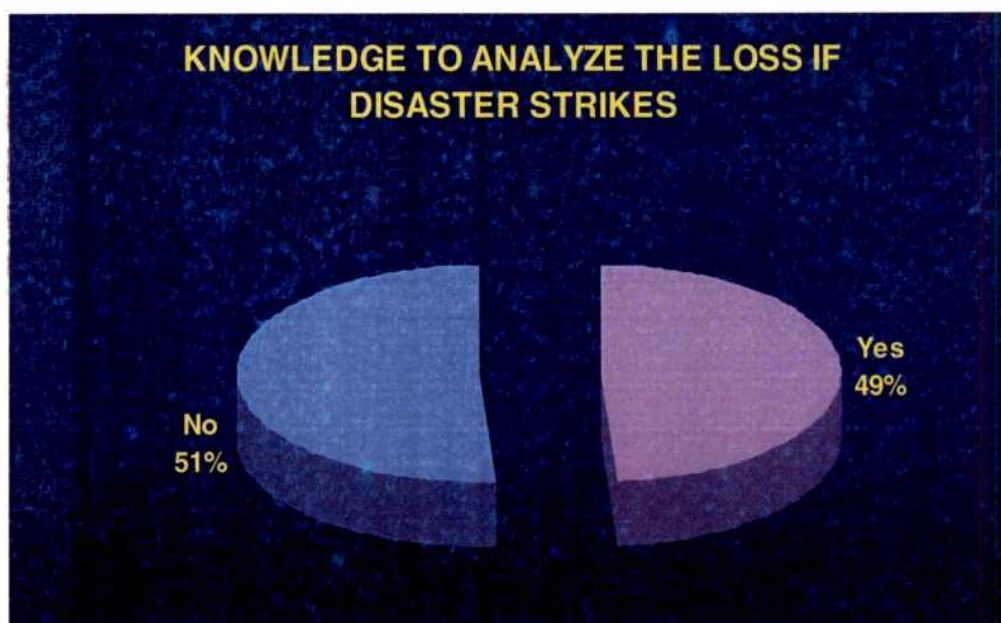
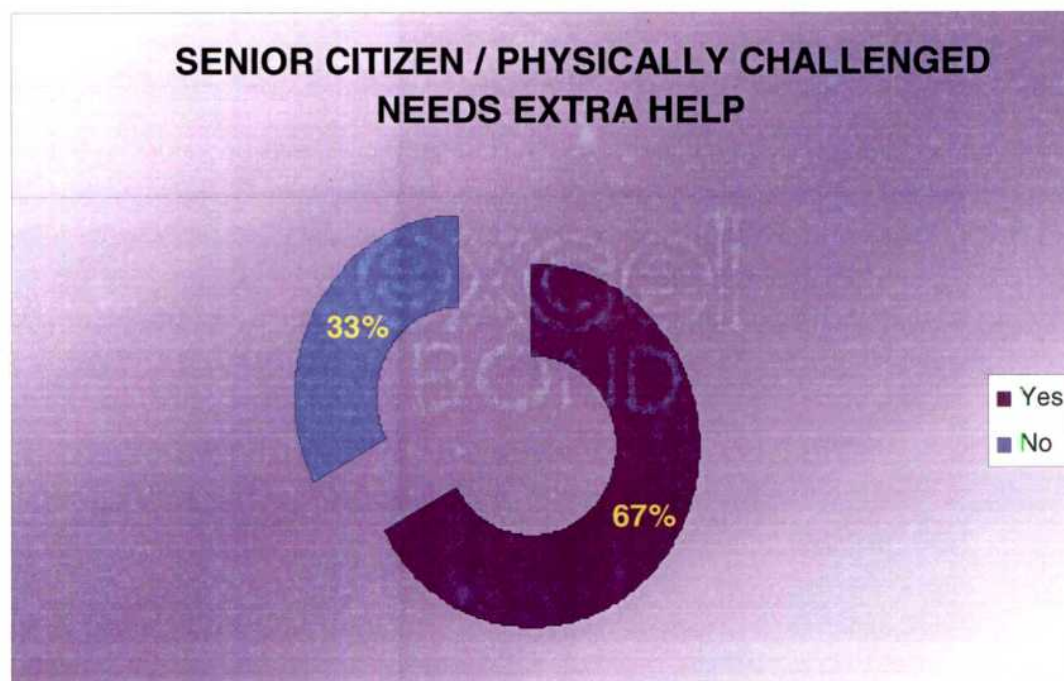
**INFERENCE: KNOWLEDGE TO ANALYZE THE LOSS IF DISASTER STRIKES**

Table 5.1.11 brings out that 48.8% of 640 respondents have got the knowledge to analyze the loss if Disaster strikes while 51.2% do not have the knowledge to analyze the loss. **Essential points to be considered for community awareness on disaster management:** As most of them are not aware of the loss if disaster strikes, they may not be prepared for mitigation and recovery measures. When planning a community awareness program it is essential to cover up the financial strategies for managing the economic impact of natural disasters.

TABLE 5.1.12
SENIOR CITIZEN / PHYSICALLY CHALLENGED NEEDING HELP IN
THE FAMILY.

	No. of Respondents	Percentage
Yes	430	67.2
No	210	32.8
Total	640	100.0

CHART 5.2.12
SENIOR CITIZEN / PHYSICALLY CHALLENGED NEEDING HELP IN
THE FAMILY.



INFERENCE: SENIOR CITIZEN / PHYSICALLY CHALLENGED NEEDING HELP IN THE FAMILY. Table 5.1.12 shows that 67.2% of 640 respondents have senior citizens at home who need help while 32.8% do not have senior citizens at home. **Essential points to be considered during strategic planning for community awareness on disaster management:** Training needs to be imparted to voluntary groups and disaster recovery personnel to handle elderly senior citizens during disaster. Medical help along with comfortable evacuation plan for senior citizens needs to be considered.

TABLE 5.1.13
ALTERNATIVE ARRANGEMENTS FOR FACING CRISIS SITUATION

	No. of Respondents	Percentage
Yes	204	31.9
No	436	68.1
Total	640	100.0

CHART 5.2.13
ALTERNATIVE ARRANGEMENTS FOR FACING CRISIS SITUATION

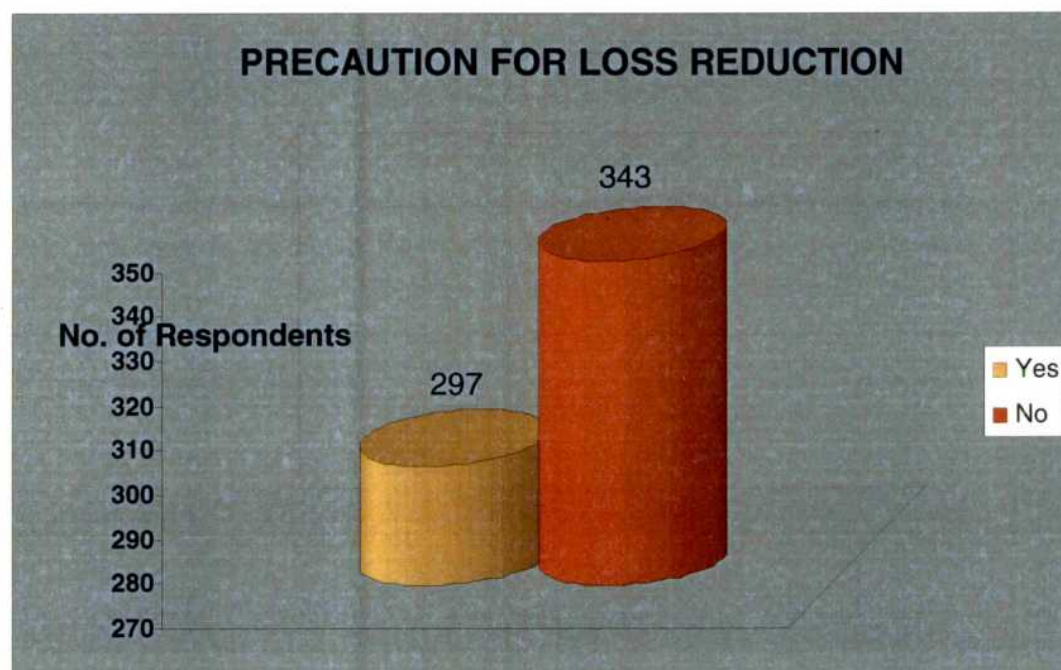


INFERNCE: ALTERNATIVE ARRANGEMENTS FOR FACING CRISIS SITUATION Table 5.1.13 clearly reflects that 31.9% of respondents have made alternative arrangements to face crisis situation while 68.1% have not made any arrangements. **Essential points to be considered during strategic planning for community awareness on disaster management:** It is to be noted that most of the respondents have no basic idea for alternative plans to rescue the senior citizens. They will be dealt with in a similar way like any other person. Hence, it is very essential to impart training to deal with senior citizens during community awareness programs.

TABLE 5.1.14 (a)
PRECAUTION FOR LOSS REDUCTION

	No. of Respondents	Percentage
Yes	297	46.4
No	343	53.6
Total	640	100.0

CHART 5.2.14
PRECAUTION FOR LOSS REDUCTION



INFERENCE: PRECAUTION FOR LOSS REDUCTION

From the **Table 5.1.14 (a)**, it is understood that 46.4% have taken precaution for loss reduction while 53.6% have not taken any precaution to reduce the loss.

Essential points to be considered during strategic planning for community awareness on disaster management: The importance of mitigation and insurance should be emphasized during the awareness program. Hazard mapping and the mitigation process should also be highlighted in a community awareness programme.

TABLE 5.1.14 (b)**IF YES, RANKING THE PRIORITIES FOR LOSS REDUCTION**

	Mean	Rank
Early warning system	4.47	1
Vulnerability Assessment for mitigation of losses	4.36	2
Communication system in place	4.22	3
Trained voluntary groups for rescue operations	4.13	4
Evacuation plan	4.12	5
Hazard mapping to find the probability of occurrence	3.99	6
Capacity building to cope with disaster	3.85	7

INFERENCE: RANKING THE PRIORITIES FOR LOSS REDUCTION

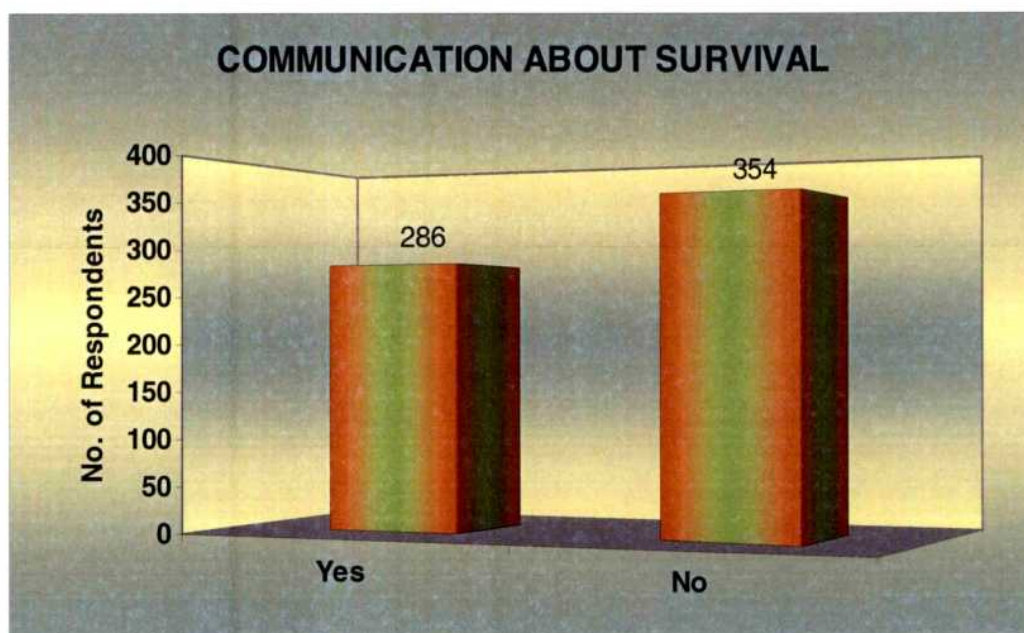
Table 5.1.14 (b) indicates that the respondents have given a high priority to Early warning system with a Mean of 4.47, with second highest priority to Vulnerability assessment for mitigation of losses which has obtained a mean of 4.36. The third importance is given to the communication system with a mean of 4.22. The respondents have given fourth ranking to trained voluntary groups for rescue operations. The fifth priority ranking goes to Evacuation plan with a mean of 4.12. The respondents have prioritized the Hazard mapping to find the probability of occurrence in the sixth position with a mean of 3.99 and the last ranking to Capacity building to cope with disaster with a mean of 3.85.

Essential points to be considered during strategic planning for community awareness on disaster management: The importance of various loss reduction measures should be emphasized in the community awareness program and a check list of Gaps has to be identified. The gap between need of precautionary measures and the availability should be listed and emphasized.

TABLE 5.1.15 (a)
COMMUNICATION WITHIN FAMILY ABOUT SURVIVAL

	No. of Respondents	Percentage
Yes	286	44.7
No	354	55.3
Total	640	100.0

CHART 5.2.15
COMMUNICATION WITHIN FAMILY ABOUT SURVIVAL



INFERENCE: COMMUNICATION ABOUT SURVIVAL

Table 5.1.15 clearly depicts that 44.7% have planned their communication about survival to other family members while 55.3% have not planned the communication of survival to other family members. **Essential points to be considered during strategic planning for community awareness in disaster management:** The most essential aspect in disaster preparedness is the communication plan. The importance of such systematic communication plan within the family as well as the communication required externally should be emphasized in the community awareness program. The strategic planning should include policies required for a strong communication plan.

TABLE 5.1.15 (b)
PREFERED CONTACT PERSON FOR COMMUNICATION ABOUT SURVIVAL

	Mean	Rank
Close relative living within state limits	6	1
Friends	5.2	2
Close relative living in distant place	5.12	3
Neighbors	4.31	4
Distant relative	3.61	5
Nearby hospitals	2.98	6
I have no contact person	1.42	7

INFERENCE: PREFERED CONTACT PERSON FOR COMMUNICATION ABOUT SURVIVAL

Table 5.1.15 (b) reveals the ranking of respondents for preferred contacts for communication about survival. The highest priority is given to close relative living within state limits with a mean of 6. The second preferred contact is Friends with a mean of 5.2. The third priority is given to close relative living in distant place with a mean of 5.12. The neighbors are preferred contacts with a mean of 4.31 and a ranking of 4th position. Distant relative, nearby hospitals have been prioritized as 5th and 6th ranking with a mean of 3.61 and 2.98 respectively. There are a few who are not willing or do not have a preferred contacts for communication about survival and it has the least mean of 1.42.

Essential points to be considered during strategic planning for community awareness in disaster management: The community including children and senior citizens must be made aware of the national /state level initiative for helping them to communicate the news of their survival and the place they are relocated due to the mishap to the rest of the family members through arrangement of hotline.

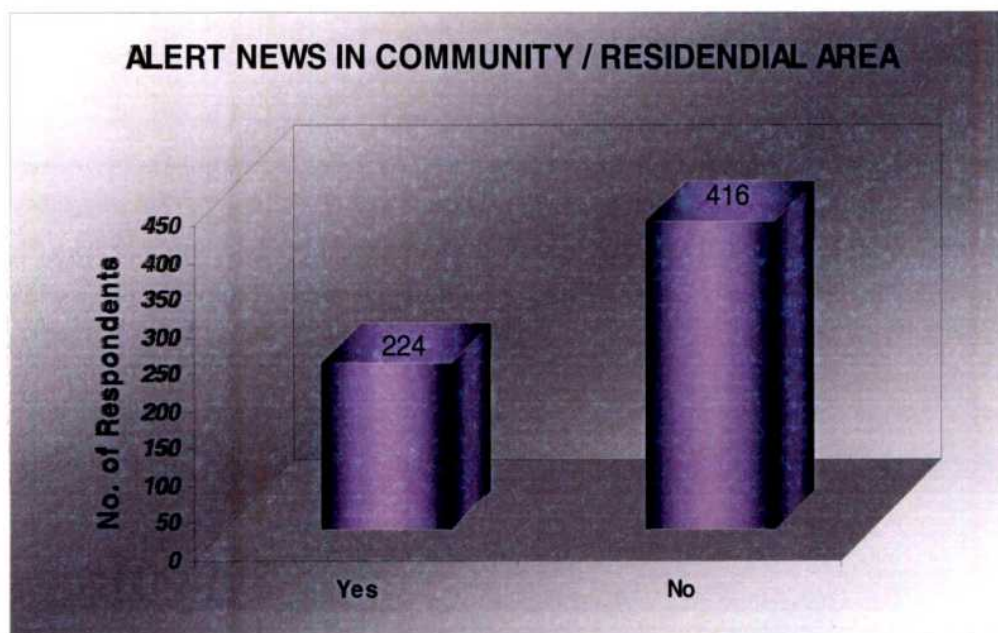
TABLE 5.1.16 (a)

EARLY WARNING SYSTEM /ALERT NEWS IN COMMUNITY

	No. of Respondents	Percentage
Yes	224	35
No	416	65
Total	640	100.0

CHART 5.2.16

EARLY WARNING SYSTEM /ALERT NEWS IN COMMUNITY



INFERENCE: EARLY WARNING SYSTEM /ALERT NEWS IN COMMUNITY From the Table 5.1.16, it is inferred that 35% of the respondents have made arrangements and are aware of the Early warning system while 65% are not aware of the Early warning system. **Essential points to be considered during strategic planning for community awareness on disaster management:** Currently radio and loud speaker announcement by the rescue workers/ authorities/ police personnel to fishermen community are the only method of EWS adopted. It is important that the early warning system is quick, reliable and economical to reach the entire city.

TABLE 5.1.16 (b)
PREFERED SOURCE FOR EARLY WARNING SYSTEM /ALERT NEWS
IN COMMUNITY

	Mean	Rank
Govt. Authorities	7.36	1
Radio	6.97	2
T.V	6.55	3
Family members	4.4	4
Friends	3.68	5
Neighbors	2.52	6
Charity / Voluntary Organizations	2.32	7
NGO	2.24	8

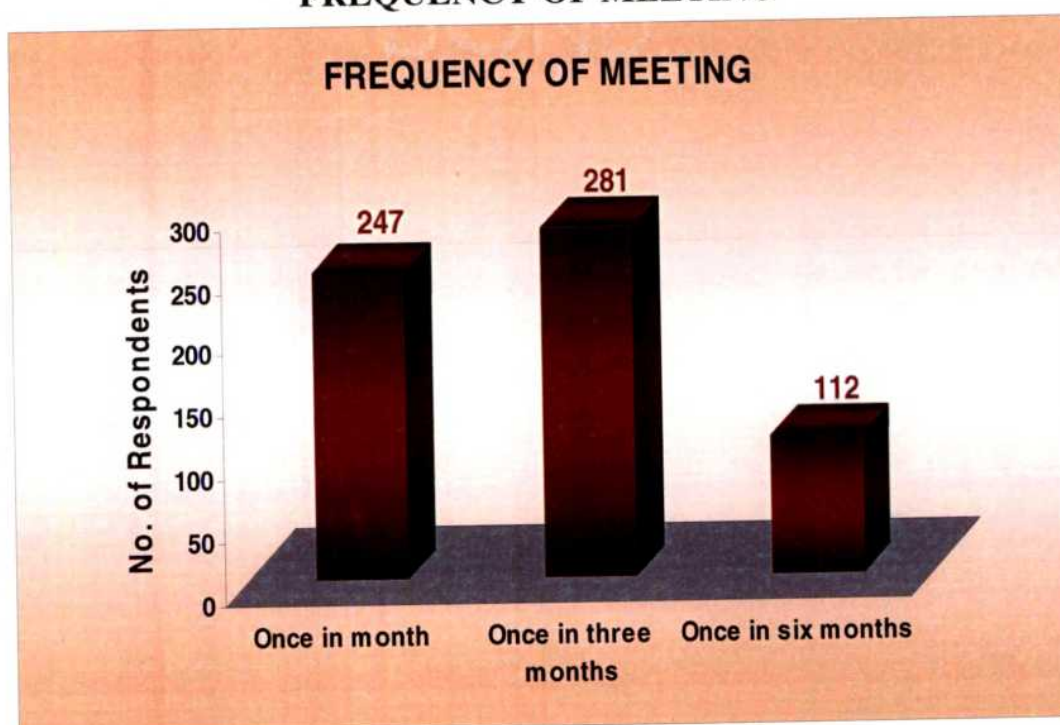
INFERENCE: PREFERED SOURCE FOR EARLY WARNING SYSTEM /ALERT NEWS IN COMMUNITY

From the table 5.1.16 (b), it is given to understand that the respondents have prioritized the Government as the highest ranked / preferred source for Early Warning system with a mean of 7.36. Radio is ranked second by the respondents having a mean of 6.97. The T.V., Family members and Friends are prioritized as 3rd, 4th, and 5th rank with a mean of 6.55, 4.4, and 3.68 respectively. A mean of 2.52, 2.32, and 2.24 were given to Neighbors, Voluntary organization and the NGO's with a 6th, 7th and 8th rank respectively. **Essential points to be considered during strategic planning for community awareness on disaster management:** Though the preference were ranked by the respondents on the source of Early warning system, it is essential to analyze the feasibility and access, authenticity and reliability of the source of information dissemination during the disaster.

TABLE 5.1.17
FREQUENCY OF MEETING

	No. of Respondents	Percentage
Once in month	247	38.6
Once in three months	281	43.9
Once in six months	112	17.5
Total	640	100.0

CHART 5.2.17
FREQUENCY OF MEETING



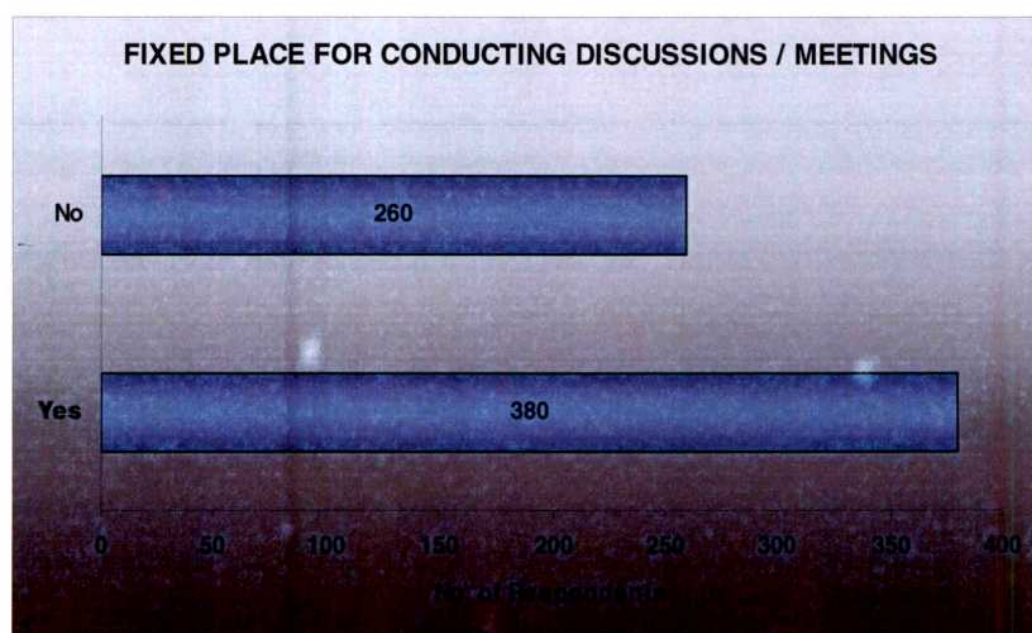
INFERENCE: FREQUENCY OF MEETING

Table 5.1.17, shows that the 38.6% of the respondents attend the community meeting once in a month while 43.9% attend the meeting once in three months and 17.5% attend meeting once in six months. **Essential points to be considered during strategic planning for community awareness on disaster management:** The community must be motivated to participate in meetings and training camps.

TABLE 5.1.18
AVAILABILITY OF PLACE FOR CONDUCTING
MEETINGS/DISCUSSIONS

	No. of Respondents	Percentage
Yes	380	59.4
No	260	40.6
Total	640	100.0

CHART 5.2.18
AVAILABILITY OF PLACE FOR CONDUCTING
MEETINGS/DISCUSSIONS



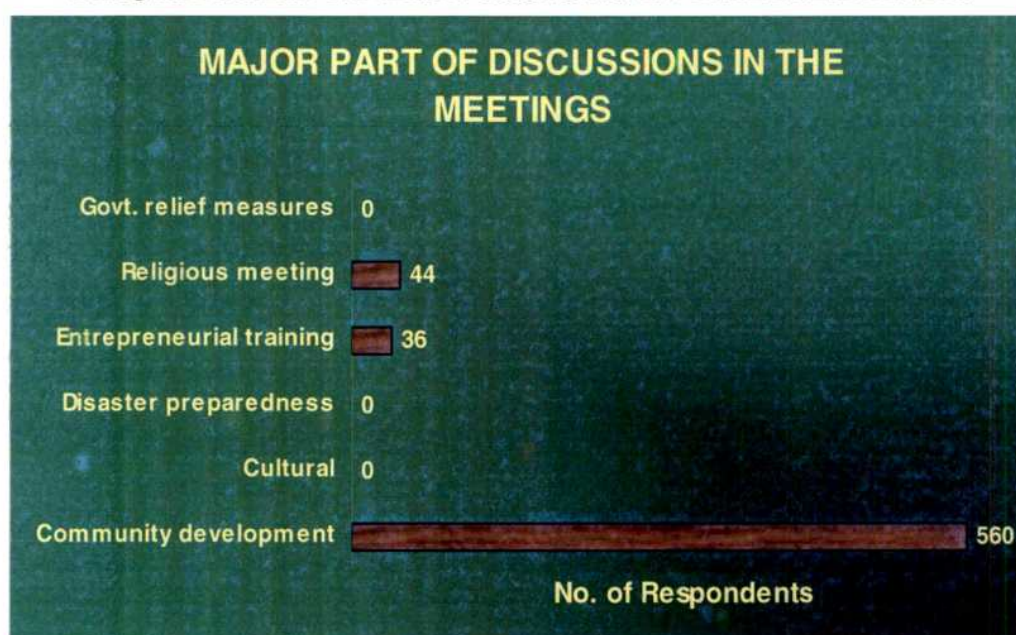
INFERENCE: PLACE FOR CONDUCTING MEETINGS/DISCUSSIONS

From the Table 5.1.18 it is inferred that 59.4% agree that there is appropriate place for conducting meeting and discussion while 40.6% do not agree that there is appropriate place for discussion or conducting the meeting. **Essential point to be considered during strategic planning for community awareness on disaster management:** The place of meeting and discussion selected should be free of any religious /community background.

TABLE 5.1.19
MAJOR PART OF DISCUSSIONS IN THE MEETINGS

	No. of Respondents	Percentage
Community development	560	87.5
Cultural	0	0.0
Disaster preparedness	0	0.0
Entrepreneurial training	36	5.6
Religious meeting	44	6.9
Govt. relief measures	0	0.0
Total	640	100.0

CHART 5.2.19
MAJOR PART OF DISCUSSIONS IN THE MEETINGS



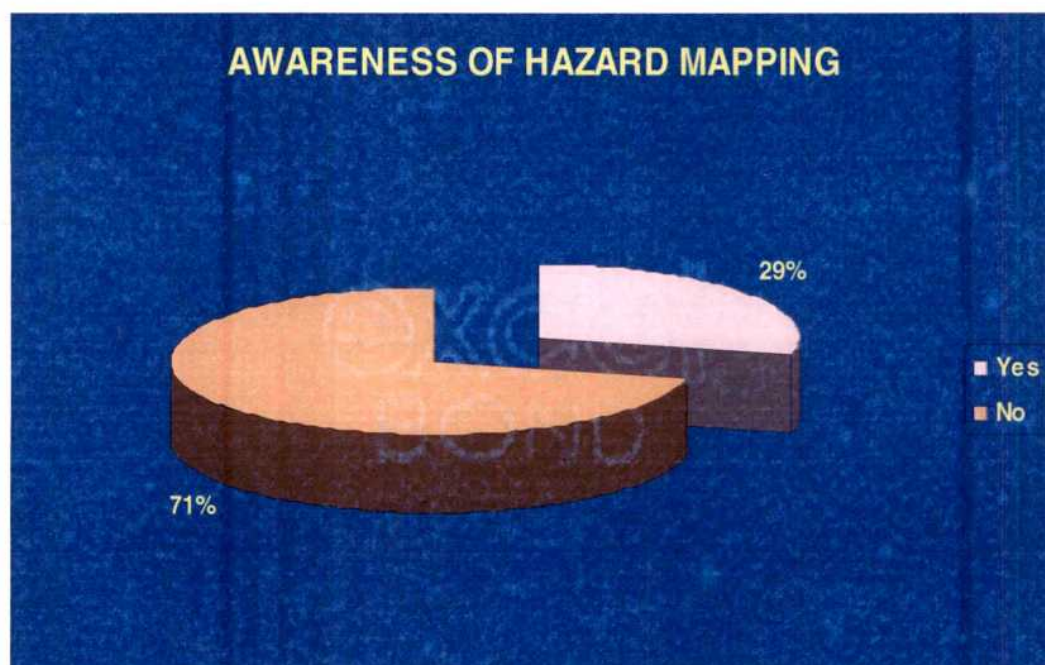
INFERENCE: MAJOR PART OF DISCUSSIONS IN THE MEETINGS

Table 5.1.19, depicts that 87.5% of the respondents agree that the major part of most of the meetings will revolve around community development issues while 6.9% will be religious gathering and 5.6% on entrepreneurial training programs. **Essential point to be considered during strategic planning for community awareness on disaster management:** The community awareness programme should be well programmed.

TABLE 5.1.20
AWARENESS OF HAZARD MAPPING

	No. of Respondents	Percentage
Yes	185	28.9
No	455	71.1
Total	640	100.0

CHART 5.2.20
AWARENESS OF HAZARD MAPPING



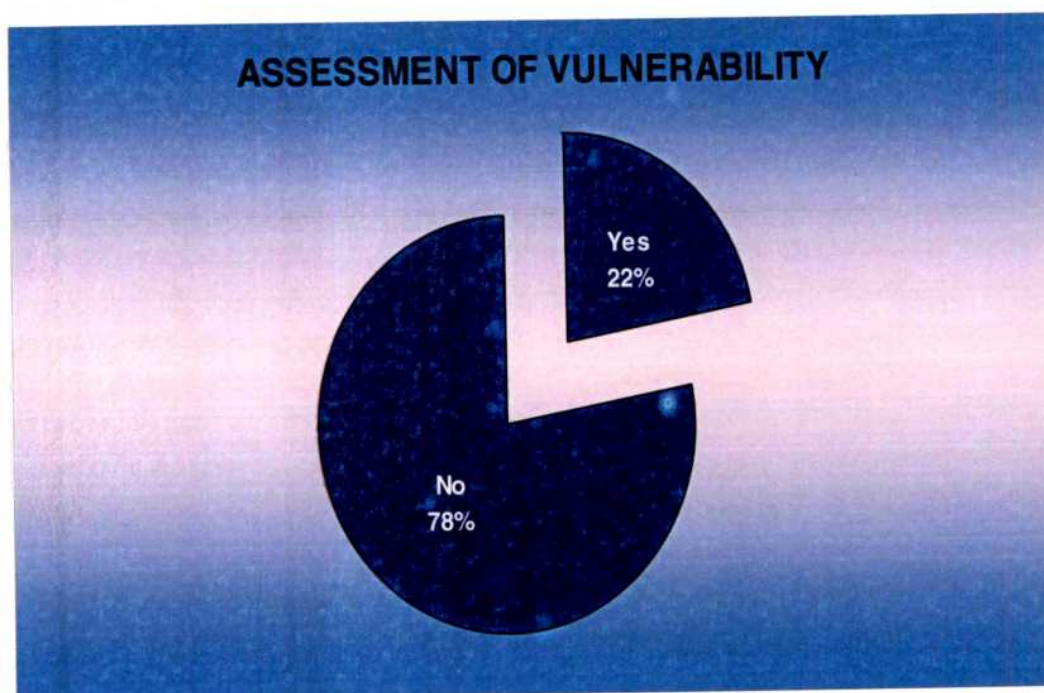
INFERENCE: AWARENESS OF HAZARD MAPPING

Table 5.1.20 shows that 28.9% of respondents are aware of Hazard mapping while 71.1% are not aware of the Hazard mapping. **Essential point to be considered during strategic planning for community awareness on disaster management:** The community must be aware of the various hazards and the likeliness of its occurrence. The probability and severity of its occurrence must be transparently discussed with all stake holders for proactive approach to disaster management.

**TABLE 5.1.21
ASSESSMENT OF VULNERABILITY**

	No. of Respondents	Percentage
Yes	143	22.3
No	497	77.7
Total	640	100.0

**CHART 5.2.21
ASSESSMENT OF VULNERABILITY**



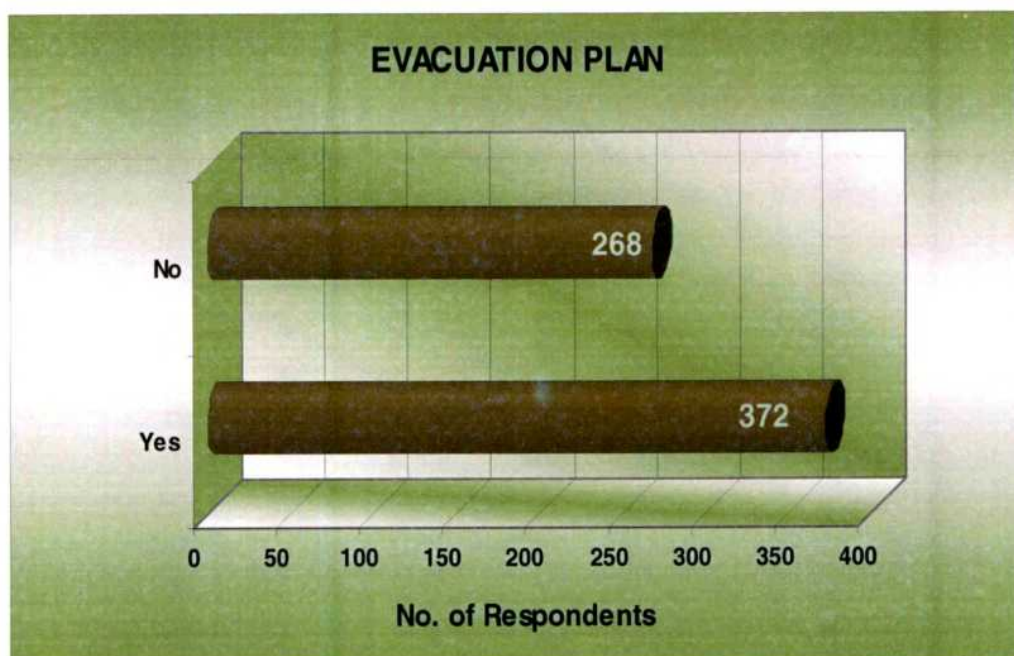
INFERENCE: ASSESSMENT OF VULNERABILITY

Table 5.1.21 depicts that 22.3% of 640 respondents are aware of the assessment of vulnerability while a majority of 77.7% are not aware of the assessment of vulnerability. **Essential point to be considered during strategic planning for community awareness on disaster management:** The community must be trained to do the Physical, Social, Economic and Environmental assessment of vulnerability.

TABLE 5.1.22
EVACUATION PLAN

	No. of Respondents	Percentage
Yes	372	58.1
No	268	41.9
Total	640	100.0

CHART 5.2.22
EVACUATION PLAN



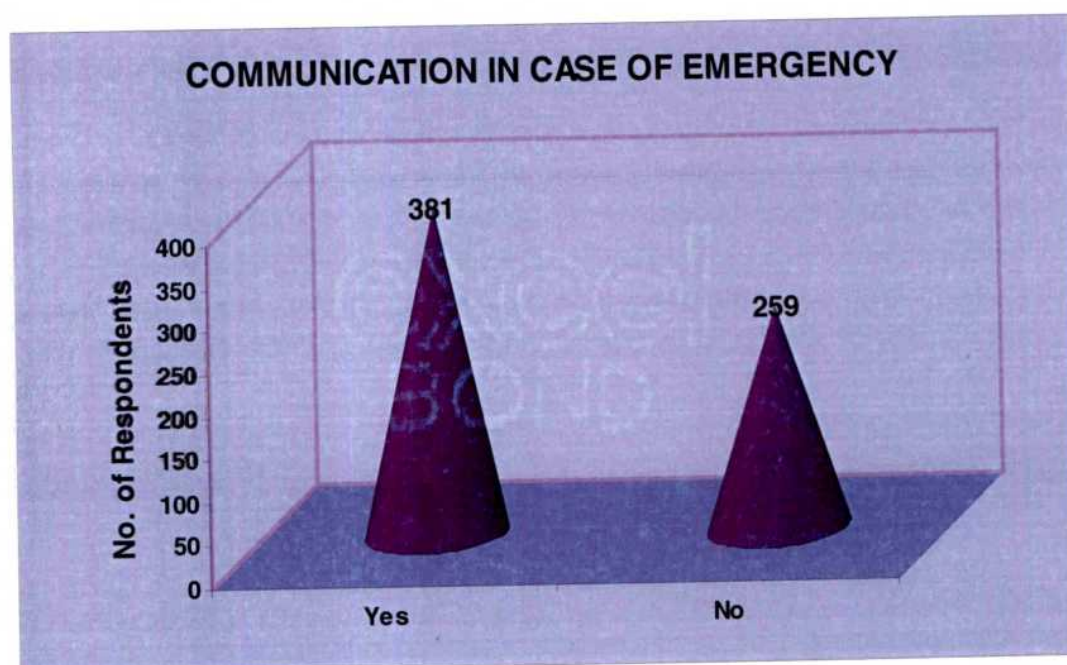
INFERENCE: EVACUATION PLAN

From the Table 5.1.22, it is inferred that 58.1% of the respondents are aware of the evacuation plan while 41.9% are not aware of the evacuation plan. **Essential point to be considered during strategic planning for community awareness on disaster management:** It is observed that each have their own evacuation plan, it is not a coordinated effort. This will create more chaos if it is not channelized properly, hence it is essential to clearly define and draft a single plan with alternative action plan.

TABLE 5.1.23
COMMUNICATION IN CASE OF EMERGENCY

	No. of Respondents	Percentage
Yes	381	59.5
No	259	40.5
Total	640	100.0

CHART 5.2.23
COMMUNICATION IN CASE OF EMERGENCY



INFERENCE: COMMUNICATION IN CASE OF EMERGENCY

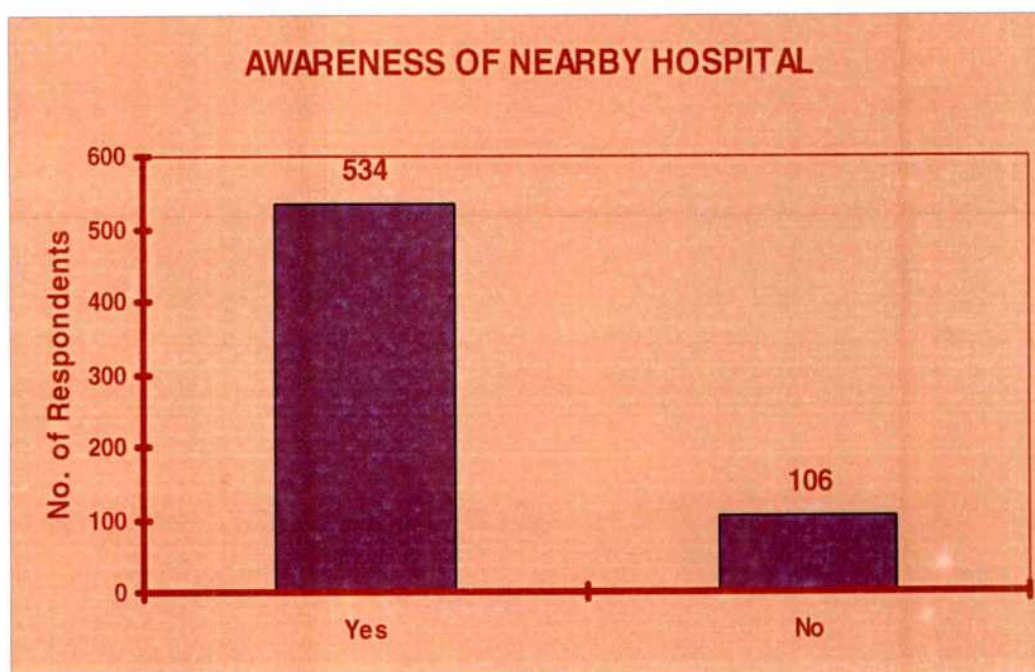
The Table 5.1.23 reflects that 59.5% of the respondents have communication plan in case of Emergency while 40.5% of them do not have a communication plan.

Essential point to be considered during strategic planning for community awareness on disaster management: A check list to ensure that the community is really aware of the communication plan must be done. If majority of them are dependent on telephone lines, then a telephone line jam may cause disruption of communication.

TABLE 5.1.24 (a)
AWARENESS OF NEARBY HOSPITAL

	No. of Respondents	Percentage
Yes	534	83.4
No	106	16.6
Total	640	100.0

CHART 5.2.24(a)
AWARENESS OF NEARBY HOSPITAL



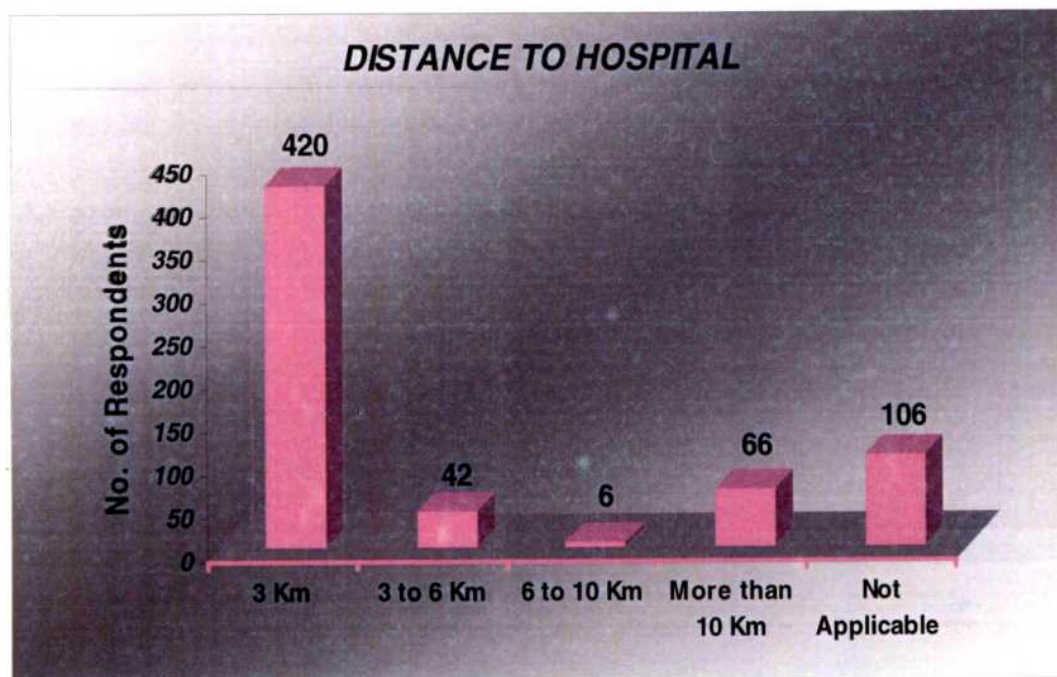
INFERENCE: AWARENESS OF NEARBY HOSPITAL

Table 5.1.24 indicates that 83.4% of the total 640 respondents are aware of the location of the nearby hospital which can be approached in case of emergency during disaster. A percentage of 16.6 of the respondents are not aware of the nearby hospital. **Essential point to be considered during strategic planning for community awareness on disaster management:** It is essential to record every data with a local hospital for immediate reference during emergency.

TABLE 5.1.24 (b)
AWARENESS OF LOCATION OF NEARBY HOSPITAL

	No. of Respondents	Percentage
3 Km	420	65.6
3 to 6 Km	42	6.6
6 to 10 Km	6	0.9
More than 10 Km	66	10.3
Not Applicable	106	16.6
Total	640	100.0

CHART 5.2.24 (b)
AWARENESS OF LOCATION OF NEARBY HOSPITAL



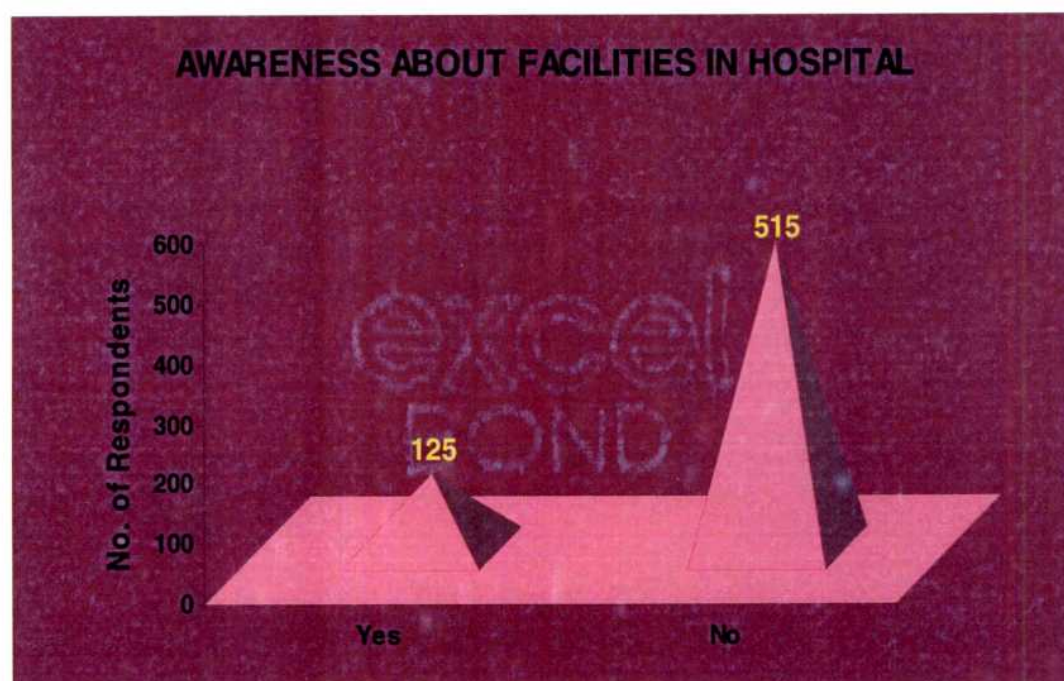
INFERENCE: AWARENESS OF LOCATION OF NEARBY HOSPITAL

Table 5.1.24 (b) indicates that 65.6% of the respondents prefer hospital that is located in 3 km from the residential area. 6.6% prefer a hospital that is within 6 km and .90% prefers a hospital that is within 10 km. 10.3% prefer a hospital that is located above 10 km from the residential area.

TABLE 5.1.25
AWARENESS OF FACILITIES IN HOSPITAL

	No. of Respondents	Percentage
Yes	125	19.5
No	515	80.5
Total	640	100.0

CHART 5.2.25
AWARENESS OF FACILITIES IN HOSPITAL



INFERENCE: AWARENESS OF FACILITIES IN HOSPITAL

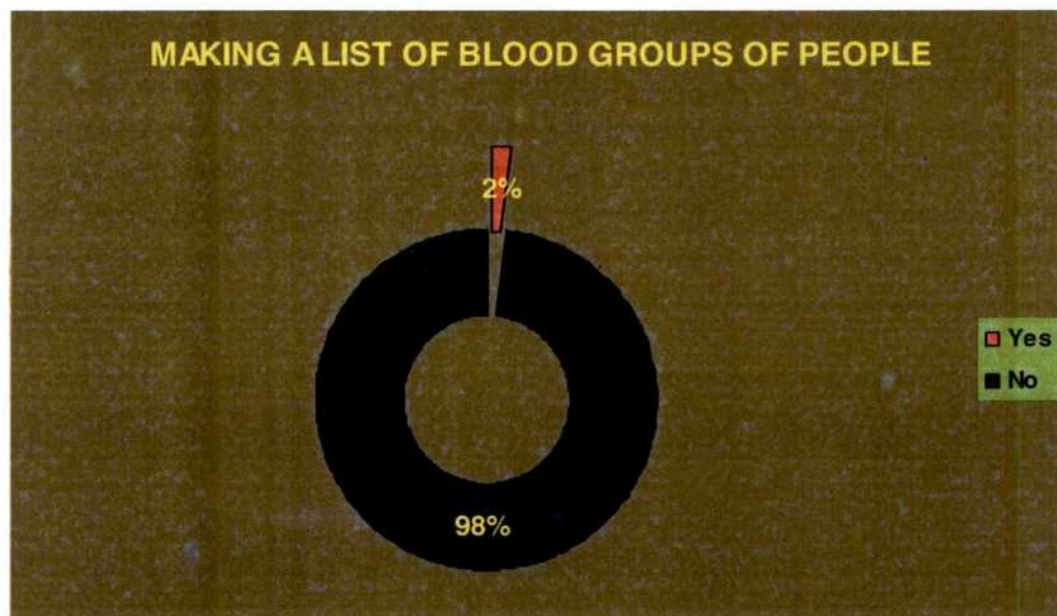
Table 5.1.25 denotes that only 19.5% of the respondents are aware of the facilities and services available in the hospital whereas 80.5% of the respondents are not aware of the facilities and services offered by the hospital. **Essential point to be considered during strategic planning for community awareness on disaster management:** It is essential to include the information regarding readily available specialty services offered at nearby hospitals during training program.

TABLE 5.1.26
AWARENESS OF BLOOD GROUP OF PEOPLE IN THE COMMUNITY

	No. of Respondents	Percentage
Yes	13	2
No	627	98
Total	640	100.0

CHART 5.2.26

AWARENESS OF BLOOD GROUP OF PEOPLE IN THE COMMUNITY



INFERENCE: AWARENESS OF BLOOD GROUP OF PEOPLE IN THE COMMUNITY Table 5.1.26 indicates clearly that only 2% of the total respondents are aware of the blood group of the people residing in the area as they regularly organize blood donation camp where as 98% are not aware of the blood group of the community. **Essential point to be considered during strategic planning for community awareness on disaster management:** Emphasis on record of blood group list must be made available at the community development office for emergency purpose.

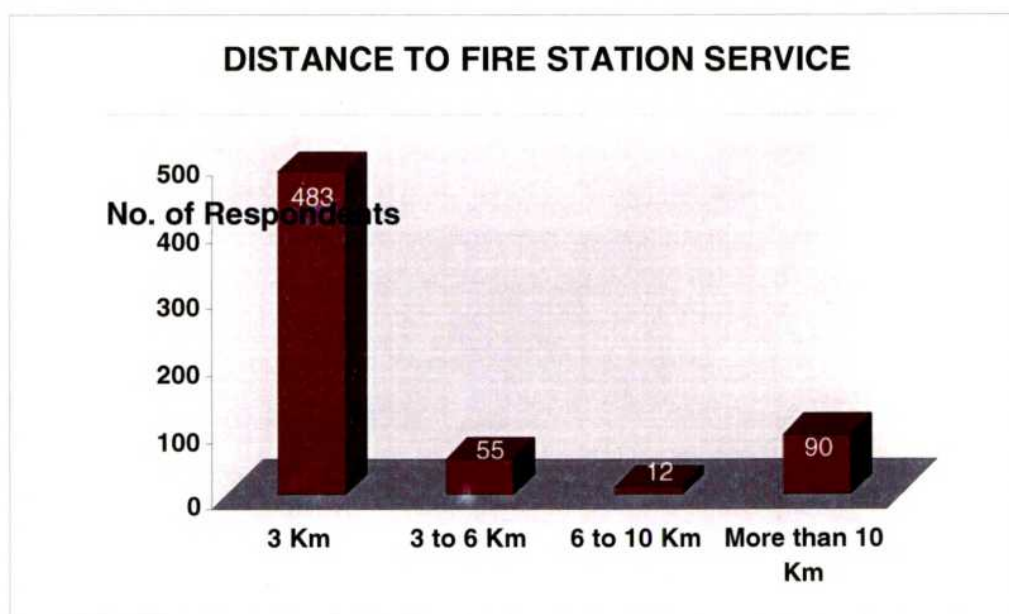
TABLE 5.1.27

LOCATION OF FIRE SERVICE STATION FROM RESIDENCE

	No. of Respondents	Percentage
3 Km	483	75.5
3 to 6 Km	55	8.6
6 to 10 Km	12	1.9
More than 10 Km	90	14.1
Total	640	100.0

CHART 5.2.27

LOCATION OF FIRE SERVICE STATION FROM RESIDENCE

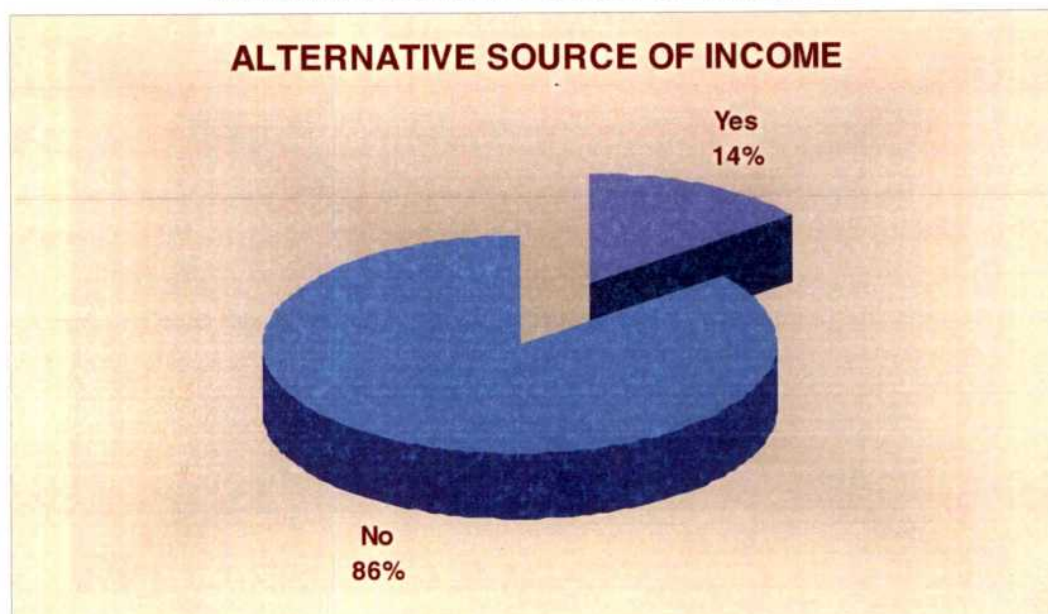


INFERENCE: LOCATION OF FIRE SERVICE STATION FROM RESIDENCE Table 5.1.27 indicates the distance of the fire station service from the place of the residence. 75.5% of the respondents say that the fire station is around 3 km from their homes, while 8.6% say it is within 6 km. 1.9% say that it is within 6 to 10 km and 14.1% indicate that the fire station is located more than 10 km away.

TABLE 5.1.28
ALTERNATIVE SOURCE OF INCOME

	No. of Respondents	Percentage
Yes	92	14.4
No	548	85.6
Total	640	100.0

CHART 5.2.28
ALTERNATIVE SOURCE OF INCOME

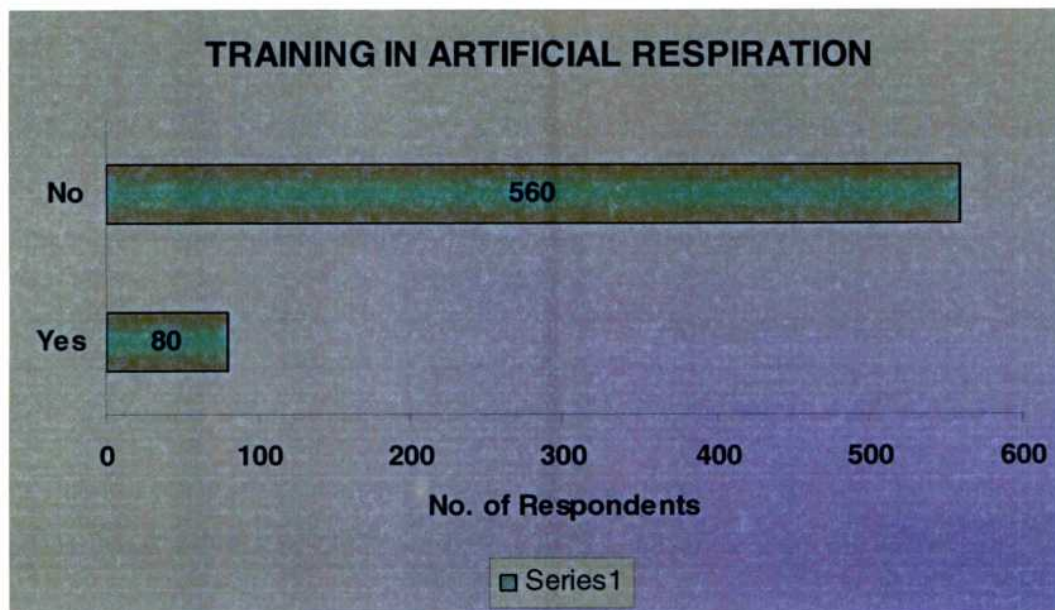


INFERENCE: ALTERNATIVE SOURCE OF INCOME: It is evident from the Table 5.1.28, that 14.4% of the respondents have made arrangements of alternative source of income and 85.6% have not made any arrangements for alternative source of income. **Essential point to be considered during strategic planning for community awareness on disaster management:** Fishermen Community members must be taught important skills that can support them as an alternative source of income in case they may not be allowed to go to the sea due to bad weather conditions. This will help them to earn a decent living without being dependent on relief measures or other indigenous money lenders. Plan must include capacity building measures

TABLE 5.1.29
TRAINING IN ARTIFICIAL RESPIRATION-CPR

	No. of Respondents	Percentage
Yes	80	12.5
No	560	87.5
Total	640	100.0

CHART 5.2.29
TRAINING IN ARTIFICIAL RESPIRATION-CPR



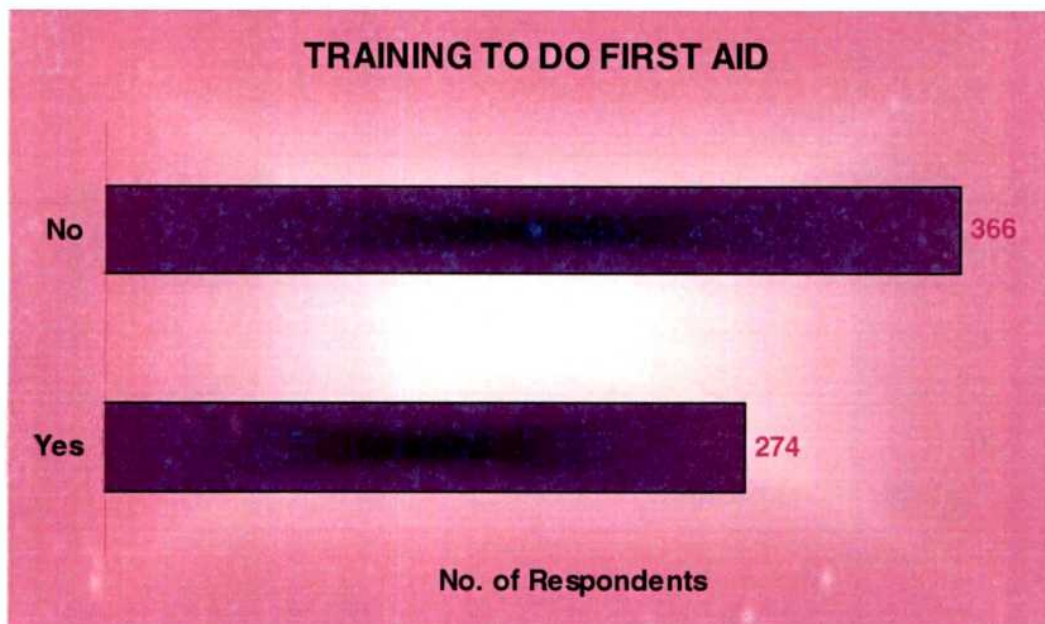
INFERENCE: TRAINING IN ARTIFICIAL RESPIRATION

From the **Table 5.1.29**, we can infer that only 12.5% of the respondents are trained to help people in need of artificial respiration -CPR, while 87.5% are not trained to treat people in need of artificial respiration. **Essential point to be considered during strategic planning for community awareness on disaster management:** More such activities have to be included during the community awareness program so that people within the community help each other during emergency before professional help can arrive.

**TABLE 5.1.30
TRAINING ON FIRST AID**

	No. of Respondents	Percentage
Yes	274	42.8
No	366	57.2
Total	640	100.0

**CHART 5.2.30
TRAINING ON FIRST AID**



INFERENCE: TRAINING ON FIRST AID.

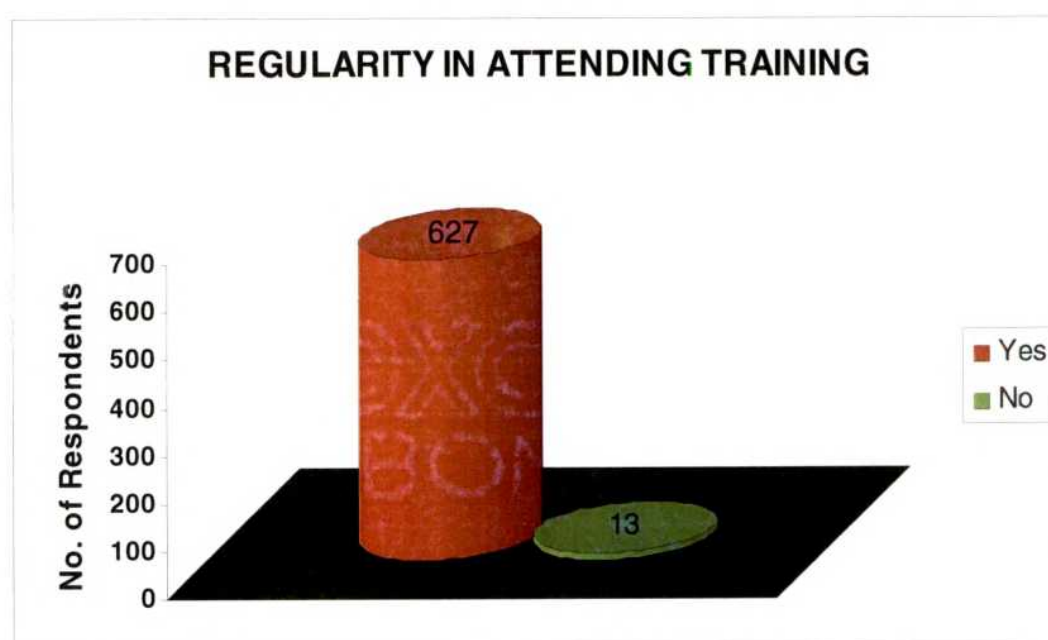
Table 5.1.30 reveals that 42.8% of the respondents are trained to provide first aid while 57.2% are not trained to provide help on first aid to injured people.

Essential point to be considered during strategic planning for community awareness on disaster management: During the strategic planning of community awareness program, activities like mock drills, first aid, do's and don'ts guidelines must be included according to the need of the stake holders.

TABLE 5.1.31
REGULARITY IN ATTENDING TRAINING

	No. of Respondents	Percentage
Yes	627	98
No	13	2
Total	640	100.0

CHART 5.2.31
REGULARITY IN ATTENDING TRAINING



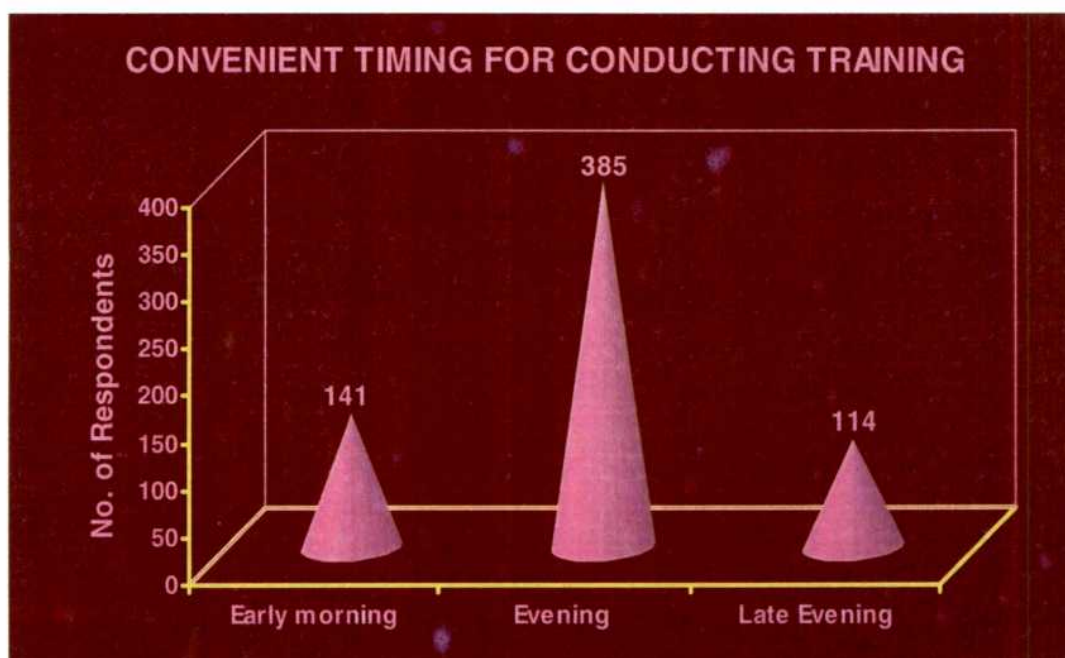
INFERENCE: REGULARITY IN ATTENDING TRAINING

From the above **Table 5.1.31**, it is understood that 98% of the respondents are willing to attend training programs if offered to them regularly while 13 of them constituting 2% are not willing to attend the training program as they fear of losing their daily wages due to this. **Essential point to be considered during strategic planning for community awareness on disaster management:** It is essential to consider the convenience of the participants and their availability for the programs.

TABLE 5.1.32
CONVINIENT TIMING FOR CONDUCTING TRAINING

	No. of Respondents	Percentage
Early morning	141	22
Evening	385	60.2
Late Evening	114	17.8
Total	640	100.0

CHART 5.2.32
CONVINIENT TIMING FOR CONDUCTING TRAINING



INFERENCE: CONVINIENT TIMING FOR CONDUCTING THE TRAINING The Table 5.1.32 indicates that 22% of the respondents out of 640 prefer early morning sessions while 60.2% prefer evening sessions for the training program. 17.8% expressed their wish to attend a late evening session as the most convenient time for conducting training program. **Essential point to be considered during strategic planning for community awareness on disaster management:** One must take into consideration the convenient preferred time for such programs and split the activities to suit requirements.

TABLE 5.1.33
DATA OF FAMILY MEMBERS IN EACH HOUSE

	No. of Respondents	Percentage
Records available	485	75.8
No records available	155	24.2
Total	640	100.0

CHART 5.2.33
DATA OF FAMILY MEMBERS IN EACH HOUSE



INFERENCE: DATA OF FAMILY MEMBERS IN EACH HOUSE

It is given to understand from **Table 5.1.33**, that 75.8% agree that there is record available on the number of members in each family, while 24.2% do not know about the number of members in each family. It is observed that the majority of the respondents rely on the religious records maintained in their respective place of worship than the data sheet available by the government authorities.

STATISTICAL ANALYSIS

TABLE 5.1.34
INITIATIVES TO REDUCE THE VULNERABILITY

	Mean	Rank
Entrepreneurial ventures	4.95	1
Skills Enhancement	4.77	2
Training and development	4.62	3
Capacity building to cope with disaster	4.4	4
Vulnerability assessment for mitigation of losses	3.23	5
Psychology and moral boosting to cope with disasters	3.07	6
Resistance & resilience	3.03	7

INFERENCE: INITIATIVES TO REDUCE THE VULNERABILITY

The **Table 5.1.34** clearly reveals the importance given by the respondents to the initiatives to reduce the vulnerability. Majority of the respondents have ranked the entrepreneurial ventures as the first and most important initiative to reduce the vulnerability with a mean of 4.95. Skills enhancement and Training & Development occupies the second and third preferred initiative with a mean of 4.77 and 4.62 respectively. The 4th and the 5th position is given to Capacity building to cope with disaster and Vulnerability assessment for mitigation of losses with a mean of 4.4 and 3.23 respectively. Psychological /moral boosting and resistance & Resilience have been the 6th and 7th preferred initiatives with a mean of 3.07 and 3.03 respectively.

TABLE 5.1.35**INTENSITY OF PROBLEMS ENCOUNTERED AFTER DISASTER**

	Mean	Rank
Basic amenities and hygiene	8.04	1
Source of income	7.7	2
Rehabilitation problems	7.38	3
Food and water for family	6.86	4
Availability of safe shelter	5.96	5
Safety for women and children	5.64	6
Relocation issues	5.33	7
Communication to family	3.49	8
Education for children	3.1	9
Torture by counterparts	1.32	10

Table 5.1.35 clearly reveals the ranking list of intense problems encountered commonly among community after disaster. Majority of the respondents express an opinion that the Basic amenities and hygiene is the most intense problem that is ranked first with a mean of 8.04. They have expressed concern about the Source of Income which is the second major problem with a mean of 7.7. The third and fourth important problems that are commonly encountered by community are Rehabilitation and Food/water for family with a mean of 7.38 and 6.86. The fifth, sixth and seventh problems that disturb the community are Availability of safe shelter, Safety for women and Children and Relocation issues with a mean of 5.96, 5.64 and 5.33 respectively. Other problems that the community encounters are ranked eighth, ninth and tenth and they are Communication to family, with a mean of 3.49, Education for Children with a mean of 3.1 and Torture by counterparts with a mean of 1.32.

ANOVA TEST
ANALYSIS OF VARIANCE TO FIND IF THERE IS SIGNIFICANT
DIFFERENCE BETWEEN AGE GROUPS WITH RESPECT TO
IMPORTANCE OF INITIATIVES TO REDUCE THE
VULNERABILITY

Null hypothesis Ho:

There is no significant difference between age groups with respect to importance of initiatives to reduce the vulnerability.

Alternative Hypothesis H1

There is significant difference between age groups with respect to importance of initiatives to reduce the vulnerability

TABLE 5.1.36

	N	Mean	Std. Deviation
21 to 30 yrs	138	27.8261	1.58420
31 to 40 yrs	232	28.9138	1.01136
41 to 50 yrs	202	27.2178	2.08574
Above 51 yrs	68	28.1176	1.15293
Total	640	28.0594	1.70782

ANOVA					
	Sum of Squares	Degrees of freedom	Mean Square	F	p-value
Between Groups	320.167	3	106.722	43.973	.000
Within Groups	1543.577	636	2.427		
Total	1863.744	639			

Multiple comparisons Table:

(I) Age	(J) Age	p-value
21 to 30 yrs	31 to 40 yrs	.000
	41 to 50 yrs	.006
	Above 51 yrs	.661
31 to 40 yrs	21 to 30 yrs	.000
	41 to 50 yrs	.000
	Above 51 yrs	.004
41 to 50 yrs	21 to 30 yrs	.006
	31 to 40 yrs	.000
	Above 51 yrs	.001
Above 51 yrs	21 to 30 yrs	.661
	31 to 40 yrs	.004
	41 to 50 yrs	.001

Interpretation: Since $p < 0.05$, the null hypothesis is rejected at 5% level of significance. The alternative Hypothesis is accepted. Hence there is significant difference between age groups with respect to importance of initiatives to reduce the vulnerability. Multiple comparison tables show the significant differences between the age groups.

ANALYSIS OF VARIANCE TO TEST IF FREQUENCY OF MEETINGS MAKES THE COMMUNITY TO TAKE INITIATIVE TO REDUCE THE VULNERABILITY

Null hypothesis Ho:

Frequency of meetings does not make the community to take initiatives to reduce the vulnerability.

Alternative Hypothesis H1:

Frequency of meetings makes the community to take initiatives to reduce the vulnerability.

TABLE 5.1.37

	N	Mean	Std. Deviation
Once in month	247	28.9757	1.68428
Once in three months	281	27.9388	1.87234
Once in six months	112	26.4462	1.27617
Total	640	28.0594	1.70782

ANOVA					
	Sum of Squares	Degrees of freedom	Mean Square	F	p-value
Between Groups	220.167	2	106.722	34.973	.045
Within Groups	1660.218	637	2.920		
Total	1863.744	639			

(I) Age	(J) Age	p-value
Once in month	Once in three months	.012
	Once in six months	.002
Once in three months	Once in month	.012
	Once in six months	.034
Once in six months	Once in month	.002
	Once in three months	.034

Interpretation:

Since $p < 0.05$, the null hypothesis is rejected at 5% level of significance. Frequency of meetings makes the community to take initiatives to reduce the vulnerability.

T-TEST

T-TEST TO FIND IF THERE IS SIGNIFICANT DIFFERENCE BETWEEN LITERACY WITH RESPECT TO IMPORTANCE OF INITIATIVES TO REDUCE THE VULNERABILITY

T-test

Null hypothesis Ho: There is no significant difference between literacy with respect to importance of initiatives to reduce the vulnerability.

Alternative hypothesis H1: There is significant difference between literacy with respect to importance of initiatives to reduce the vulnerability

TABLE 5.1.38

	Literacy	N	Mean	Std. Deviation
Importance of initiatives to reduce the vulnerability	Illiterate	380	28.2421	1.78215
	Literate	260	27.7923	1.55812

t- value	Degrees of freedom	p-value
3.298	638	.001

Interpretation:

Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. The alternative hypothesis is accepted. Hence there is significant difference between literacy with respect to importance of initiatives to reduce the vulnerability.

**T-TEST TO FIND IF THERE IS SIGNIFICANT DIFFERENCE
BETWEEN PREPARATION & TRAINING WITH RESPECT
TO IMPORTANCE OF INITIATIVES TO REDUCE THE
VULNERABILITY**

Null hypothesis Ho: There is no significant difference between Preparation & Training with respect to importance of initiatives to reduce the vulnerability.

Alternative hypothesis H1: There is significant difference between Preparation & Training with respect to importance of initiatives to reduce the vulnerability.

TABLE 5.1.39

	Preparation & Training	N	Mean	Std. Deviation
Importance of initiatives to reduce the vulnerability	Yes	309	28.5372	1.27516
	No	331	27.6133	1.92787

t- value	Degrees of freedom	p-value
7.098	638	.000

Interpretation:

Since $p < 0.05$, null hypothesis is rejected at 5% level of significance.

Alternative hypothesis is accepted. Hence there is significant difference between Preparation & Training with respect to importance of initiatives to reduce the vulnerability.

**T-TEST TO FIND IF DISASTER FACED EARLIER HAS
IMPACT ON IMPORTANCE OF INITIATIVES TO REDUCE
VULNERABILITY**

Null hypothesis Ho: Disaster faced earlier does not have impact on importance of initiatives to reduce the vulnerability.

Alternative hypothesis H1: Disaster faced earlier has impact on importance of initiatives to reduce the vulnerability.

TABLE 5.1.40

	Disaster faced earlier	N	Mean	Std. Deviation
Importance of initiatives to reduce the vulnerability	Yes	331	27.6133	1.92787
	No	309	28.5372	1.27516

t- value	Degrees of freedom	p-value
-7.098	638	.000

Interpretation:

Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Alternative hypothesis is accepted. Hence disaster faced earlier has impact on importance of initiatives to reduce the vulnerability.

**T-TEST TO FIND IF AWARENESS OF HAZARD MAPPING
HELPS TO TAKE INITIATIVES TO REDUCE THE
VULNERABILITY**

Null hypothesis Ho: Awareness of Hazard mapping does not help to take initiatives to reduce the vulnerability.

Alternative hypothesis H1: Awareness of Hazard mapping helps to take initiatives to reduce the vulnerability.

TABLE 5.1.41

	Awareness of Hazard mapping	N	Mean	Std. Deviation
Importance of initiatives to reduce the vulnerability	Yes	185	27.3135	1.74115
	No	455	28.3626	1.59926

t- value	Degrees of freedom	p-value
-7.330	638	.000

Interpretation:

Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Alternative hypothesis is accepted. Hence awareness of Hazard mapping helps to take initiatives to reduce the vulnerability.

**T-TEST TO FIND IF TRAINING IN ARTIFICIAL
RESPIRATION HELPS TO TAKE INITIATIVES TO REDUCE
THE VULNERABILITY**

Null hypothesis Ho: Training in artificial respiration does not help to take initiatives to reduce the vulnerability.

Alternative hypothesis H1: Training in artificial respiration helps to take initiatives to reduce the vulnerability.

TABLE 5.1.42

	Training in artificial respiration	N	Mean	Std. Deviation
Importance of initiatives to reduce the vulnerability	Yes	80	28.7875	1.31874
	No	560	27.9554	1.73251

t- value	Degrees of freedom	p-value
4.127	638	.000

Interpretation:

Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Alternative Hypothesis is accepted. Hence training in artificial respiration helps to take initiatives to reduce the vulnerability.

CHI SQUARE TEST

CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN LITERACY AND PREPARATION & TRAINING TO COPE WITH THE EVENT

Null Hypothesis Ho: There is no association between Literacy and preparation & training to cope up with the event

Alternative Hypothesis H1: There is association between Literacy and preparation & training to cope up with the event

TABLE 5.1.43

		Preparation & Training			Total
			No	Yes	
Literacy	Illiterate	Count	161	219	380
		%	25.2%	34.2%	59.4%
	Literate	Count	170	90	260
		%	26.6%	14.1%	40.6%
Total		Count	331	309	640
		%	51.7%	48.3%	100.0%

Chi-Square Test			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	32.750	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Alternative Hypothesis is accepted. Hence there is association between Literacy and preparation & training to cope up with the event.

**CHI - SQUARE TEST TO FIND IF THERE IS
ASSOCIATION BETWEEN LITERACY AND
ALTERNATIVE SOURCE OF INCOME**

Null Hypothesis Ho: There is no association between literacy and alternative source of income

Alternative Hypothesis H1: There is association between literacy and alternative source of income

TABLE 5.1.44

		Alternative source of income			Total
			No	Yes	
Literacy	Illiterate	Count	325	55	380
		%	50.8%	8.6%	59.4%
	Literate	Count	223	37	260
		%	34.8%	5.8%	40.6%
Total		Count	548	92	640
		%	85.6%	14.4%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	.007	1	.931

Interpretation: Since $p > 0.05$, null hypothesis is accepted at 5% level of significance, Hence there is no association between literacy and alternative source of income.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
FAMILY INCOME AND PRECAUTIONS FOR LOSS REDUCTION**

Null Hypothesis Ho: There is no association between family income and precautions for loss reduction

Alternative Hypothesis H1: There is association between family income and precautions for loss reduction

TABLE 5.1.45

		Precautions for loss reduction			Total
			No	Yes	
Family Income	Below Rs.3000	Count	138	112	250
		%	21.6%	17.5%	39.1%
	Rs. 3001 to Rs. 6000	Count	72	164	236
		%	11.2%	25.6%	36.9%
	Rs. 6000 to Rs.9000	Count	133	21	154
		%	20.8%	3.3%	24.1%
Total		Count	343	297	640
		%	53.6%	46.4%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	117.45	2	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between family income and precautions for loss reduction. The alternative hypothesis is accepted.

**CHI-SQAURE TEST TO FIND THERE IS ASSOCIATION BETWEEN
AGE AND CONVENIENT TIMING TO CONDUCT TRAINING**

Null Hypothesis Ho: There is no association between age and convenient timing to conduct training

Alternative Hypothesis H1: There is association between age and convenient timing to conduct training

TABLE 5.1.46

		Convenient timing to conduct training				Total
			Early morning	Evening	Late Evening	
Age	21 to 30 yrs	Count	60	42	36	138
		%	9.4%	6.6%	5.6%	21.6%
	31 to 40 yrs	Count	37	165	30	232
		%	5.8%	25.8%	4.7%	36.2%
	41 to 50 yrs	Count	44	116	42	202
		%	6.9%	18.1%	6.6%	31.6%
	Above 51 yrs	Count	10	52	6	68
		%	1.5%	8.1%	.9%	10.6%
Total		Count	151	375	114	640
		%	23.59%	58.59%	17.8%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	96.223	6	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between age and convenient timing to conduct training. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
AGE AND PREPARATION & TRAINING TO COPE UP WITH THE
EVENT**

Null Hypothesis Ho: There is no association between age and preparation & training to cope up with the event

Alternative Hypothesis H1: There is association between age and preparation & training to cope up with the event

TABLE 5.1.47

		Preparation & Training			Total
			No	Yes	
Age	21 to 30 yrs	Count	128	10	138
		%	20%	1.6%	21.6%
	31 to 40 yrs	Count	82	150	232
		%	12.8%	23.4%	36.2%
	41 to 50 yrs	Count	111	91	202
		%	17.3%	14.2%	31.6%
	Above 51 yrs	Count	10	58	68
		%	1.6%	9%	10.6%
Total		Count	331	309	640
		%	51.7%	48.3%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	227.42	3	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between age and preparation & training to cope up with the event. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
AGE AND KNOWLEDGE TO ANALYZE THE LOSS IF DISASTER
STRIKES**

Null Hypothesis Ho: There is no association between age and knowledge to analyze the loss if disaster strikes.

Alternative Hypothesis H1: There is association between age and knowledge to analyze the loss if disaster strikes

TABLE 5.1.48

		Knowledge to analyze the loss if disaster strikes			Total
			No	Yes	
Age	21 to 30 yrs	Count	128	10	138
		%	20%	1.6%	21.6%
	31 to 40 yrs	Count	61	171	232
		%	9.5%	26.7%	36.2%
	41 to 50 yrs	Count	129	73	202
		%	20.2%	11.4%	31.6%
	Above 51 yrs	Count	10	58	68
		%	1.6%	9%	10.6%
Total		Count	328	312	640
		%	51.2%	48.8%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	273.54	3	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between age and knowledge to analyze the loss if disaster strikes. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
LITERACY AND KNOWLEDGE TO ANALYZE THE LOSS IF
DISASTER STRIKES**

Null Hypothesis Ho: There is no association between literacy and knowledge to analyze the loss if disaster strikes.

Alternative Hypothesis H1: There is association between literacy and knowledge to analyze the loss if disaster strikes.

TABLE 5.1.49

		Knowledge to analyze the loss if disaster strikes			Total
			No	Yes	
Literacy	Illiterate	Count	147	233	380
		% of Total	23.0%	36.4%	59.4%
	Literate	Count	181	79	260
		% of Total	28.3%	12.3%	40.6%
Total		Count	328	312	640
		% of Total	51.2%	48.8%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	59.12	1	0.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between literacy and knowledge to analyze the loss if disaster strikes. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
DISASTER FACED AND RENOVATION OF BUILDING**

Null Hypothesis Ho: There is no association between disaster faced earlier and renovation of building.

Alternative Hypothesis H1: There is association between disaster faced earlier and renovation of building

TABLE 5.1.50

		Renovation of building				Total
			Before 12 months	1 to 3 yrs	3 to 5 yrs	
Disaster faced earlier	No	Count	116	147	46	309
		%	18.1%	23.0%	7.2%	48.3%
	Yes	Count	14	20	297	331
		%	2.2%	3.1%	46.4%	51.7%
Total		Count	130	147	363	640
		%	20.3%	23.0%	56.7%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	429.63	2	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between disaster faced earlier and renovation of building. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS AN ASSOCIATION
BETWEEN LITERACY AND ALTERNATIVE ARRANGEMENTS FOR
LOSS REDUCTION**

Null Hypothesis Ho: There is no association between literacy and alternative arrangements for loss reduction

Alternative Hypothesis H1: There is association between literacy and alternative arrangements for loss reduction.

TABLE 5.1.51

		Alternative arrangements			Total
			No	Yes	
Literacy	Illiterate	Count	190	190	380
		%	29.7%	29.7%	59.4%
	Literate	Count	246	14	260
		%	38.4%	2.2%	40.6%
Total		Count	436	204	640
		%	68.1%	31.9%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	141.52	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between literacy and alternative arrangements for loss reduction. The alternative hypothesis is accepted.

CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN LITERACY AND PRECAUTION FOR LOSS REDUCTION

Null Hypothesis Ho: There is no association between literacy and precaution for loss reduction

Alternative Hypothesis H1: There is association between literacy and precaution for loss reduction

TABLE 5.1.52

		Precautions for loss reduction			Total
			No	Yes	
Literacy	Illiterate	Count	132	248	380
		%	20.6%	38.8%	59.4%
	Literate	Count	211	49	260
		%	33.0%	7.7%	40.6%
Total		Count	343	297	640
		%	53.6%	46.4%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	133.24	1	0.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between literacy and precaution for loss reduction. The alternative hypothesis is accepted.

CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN AGE AND PRECAUTIONS FOR LOSS REDUCTION.

Null Hypothesis Ho: There is no association between age and precautions for loss reduction.

Alternative Hypothesis H1: There is association between age and precautions for loss reduction.

TABLE 5.1.53

		Precautions for loss reduction			Total
			No	Yes	
Age	21 to 30 yrs	Count	128	10	138
		%	20%	1.6%	21.6%
	31 to 40 yrs	Count	54	178	232
		%	8.4%	27.8%	36.2%
	41 to 50 yrs	Count	139	63	202
		%	21.7%	9.8%	31.6%
	Above 51 yrs	Count	12	56	68
		%	1.9%	8.8%	10.6%
Total		Count	343	297	640
		%	53.6%	46.4%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	259.63	3	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between age and precautions for loss reduction. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
LITERACY AND COMMUNICATION ABOUT SURVIVAL**

Null Hypothesis Ho: There is no association between literacy and communication about survival

Alternative Hypothesis H1: There is association between literacy and communication about survival

TABLE 5.1.54

		communication about survival			Total
			No	Yes	
Literacy	Illiterate	Count	150	230	380
		%	23.4%	35.9%	59.4%
	Literate	Count	204	56	260
		%	31.9%	8.8%	40.6%
Total		Count	354	286	640
		%	55.3%	44.7%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	94.93	1	0.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between literacy and communication about survival. The alternative hypothesis is accepted.

CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN LITERACY AND ASSESSMENT OF VULNERABILITY

Null Hypothesis Ho: There is no association between literacy and assessment of vulnerability

Alternative Hypothesis H1: There is association between literacy and assessment of vulnerability

TABLE 5.1.55

		Assessment of vulnerability			Total
			No	Yes	
Literacy	Illiterate	Count	279	101	380
		%	43.6%	15.8%	59.4%
	Literate	Count	218	42	260
		%	34.1%	6.6%	40.6%
Total		Count	497	143	640
		%	77.7%	22.3%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	9.67	1	0.001

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between literacy and assessment of vulnerability. The alternative hypothesis is accepted.

CHI-SQARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN LITERACY AND COMMUNICATION IN CASE OF EMERGENCY

Null Hypothesis Ho: There is no association between literacy and communication in case of emergency

Alternative Hypothesis H1: There is association between literacy and communication in case of emergency

TABLE 5.1.56

		Communication in case of emergency			Total
			No	Yes	
Literacy	Illiterate	Count	114	266	380
		%	17.8%	41.6%	59.4%
	Literate	Count	145	115	260
		%	22.7%	18.0%	40.6%
Total		Count	259	381	640
		%	40.5%	59.5%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	42.552	1	0.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between literacy and communication in case of emergency. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
AWARENESS OF HAZARD MAPPING AND COMMUNICATION
ABOUT SURVIVAL**

Null Hypothesis Ho: There is no association between awareness of hazard mapping and communication about survival

Alternative Hypothesis H1: There is association between awareness of hazard mapping and communication about survival

TABLE 5.1.57

		communication about survival			Total
			No	Yes	
Awareness of Hazard mapping	No	Count	210	245	455
		%	32.8%	38.3%	71.1%
	Yes	Count	144	41	185
		%	22.5%	6.4%	28.9%
Total		Count	354	286	640
		%	55.3%	44.7%	100.0%

Chi-Square Tests			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	53.41	1	0.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance, hence there is association between awareness of hazard mapping and communication about survival. The alternative hypothesis is accepted.

**CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN
THE EXPERIENCE OF DISASTER AND THE RESIDENCE WHICH IS
SYSTEM-BUILT**

Null Hypothesis Ho: There is no association between the experience of disaster and the residence which is system-built

Alternative Hypothesis H1: There is association between the experience of disaster and the residence which is system-built

TABLE 5.1.58

		System based house			Total
			No	Yes	
Disaster faced earlier	No	Count	168	141	309
		%	26.2%	22.0%	48.3%
	Yes	Count	311	20	331
		%	48.6%	3.1%	51.7%
Total		Count	479	161	640
		%	74.8%	25.2%	100.0%

Chi-Square Test			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	133.750	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Hence there is association between experience of disaster and the residence which is system built. The alternative hypothesis is accepted.

CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN THE TYPE OF DISASTER FACED AND THE SYSTEM BUILT HOUSE.

Null Hypothesis Ho: There is no association between the type of disaster faced and the system based house.

Alternative Hypothesis H1: There is association between the type of disaster faced and the system based house

TABLE 5.1.59

		System based house			Total
			No	Yes	
Disaster	Flood	Count	130	83	213
		%	20.3%	13.0%	33.3%
	Tsunami	Count	210	6	216
		%	32.8%	.9%	33.8%
	Earth quake	Count	27	7	34
		%	4.2%	1.1%	5.3%
	Fire	Count	112	65	177
		%	17.5%	10.2%	27.7%
Total		Count	479	161	640
		%	74.8%	25.2%	100.0%

Chi-Square Test			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	91.98	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Hence there is association between the type of disaster faced and the system based house. The alternative hypothesis is accepted.

CHI-SQUARE TEST TO FIND IF THERE IS ASSOCIATION BETWEEN THE TYPE OF DISASTER FACED AND TRAINING RECEIVED

Null Hypothesis Ho: There is no association between the type of disaster faced and training received

Alternative Hypothesis H1: There is association between the type of disaster faced and training received

TABLE 5.1.60

		System based house			Total
			No	Yes	
Disaster	Flood	Count	130	83	213
		%	20.3%	13.0%	33.3%
	Tsunami	Count	210	6	216
		%	32.8%	.9%	33.8%
	Earth quake	Count	27	7	34
		%	4.2%	1.1%	5.3%
	Fire	Count	112	65	177
		%	17.5%	10.2%	27.7%
Total		Count	479	161	640
		%	74.8%	25.2%	100.0%

Chi-Square Test			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	338.01	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Hence there is association between the type of disaster faced and training received. The alternative hypothesis is accepted.

**CHI-SQARE TEST TO FIND IF THERE IS RELATIONSHIP
BETWEEN TRAINING AND ANALYZE THE LOSS IF DISASTER
STRIKES**

Null Hypothesis Ho: There is no relationship between training and analyze the loss if disaster strikes

Alternative Hypothesis H1: There is relationship between training and analyze the loss if disaster strikes

TABLE 5.1.61

		Analyze the loss if disaster strikes			Total
			No	Yes	
Training	No	Count	310	21	331
		%	48.4%	3.3%	51.7%
	Yes	Count	18	291	309
		%	2.8%	45.5%	48.3%
Total		Count	328	312	640
		%	51.2%	48.8%	100.0%

Chi-Square Test			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	493.4	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Hence there is association between training and analyze the loss if disaster strikes. The alternative hypothesis is accepted.

**CHI –SQUARE TEST TO FIND IF THERE IS RELATIONSHIP
BETWEEN TRAINING RECEIVED AND AWARENESS OF EARLY
WARNING SYSTEM**

Null Hypothesis Ho: There is no relationship between training received and awareness of early warning system

Alternative Hypothesis H1: There is relationship between training received and awareness of early warning system

TABLE 5.1.62

		Awareness of early warning system			Total
			No	Yes	
Training	No	Count	260	71	331
		%	40.6%	11.1%	51.7%
	Yes	Count	156	153	309
		%	24.4%	23.9%	48.3%
Total		Count	416	224	640
		%	65.0%	35.0%	100.0%

Chi-Square Test			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	55.32	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Hence there is association between training received and awareness of early warning system. The alternative hypothesis is accepted.

CHI-SQUARE TEST TO FIND IF THERE IS SIGNIFICANT DIFFERENCE BETWEEN FREQUENCY OF MEETING AND AWARENESS OF EARLY WARNING SYSTEM

Null Hypothesis Ho: There is no significant difference between frequency of meeting and awareness of early warning system.

Alternative Hypothesis H1: There is significant difference between frequency of meeting and awareness of early warning system.

TABLE 5.1.63

		Frequency of meeting				Total
			Once in month	Once in three months	Once in six months	
Awareness	No	Count	168	157	91	416
		% of Total	26.2%	24.5%	14.2%	65.0%
	Yes	Count	79	124	21	224
		% of Total	12.3%	19.4%	3.3%	35.0%
Total		Count	247	281	112	640
		% of Total	38.6%	43.9%	17.5%	100.0%

Chi-Square Test			
	Value	Degrees of freedom	P-value
Pearson Chi-Square	24.27	1	.000

Interpretation: Since $p < 0.05$, null hypothesis is rejected at 5% level of significance. Hence there is association between frequency of meeting and awareness of early warning system. The alternative hypothesis is accepted.

FACTOR ANALYSIS
FACTOR ANALYSIS TO IDENTIFY THE GROUP OF
FACTORS FOR LOSS REDUCTION
EIGEN VALUES

Aim: To identify the group of factors for loss reduction.

TABLE 5.1.64

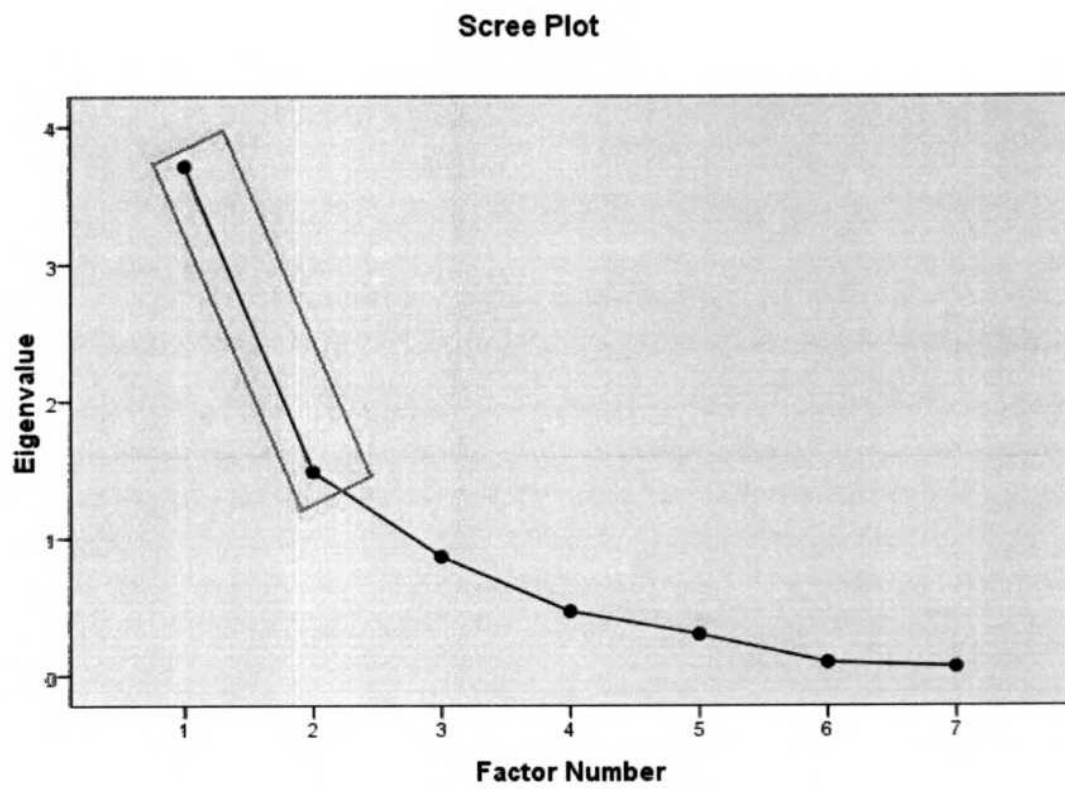
Factors	Initial Eigen values		
	Eigen Value	Percentage of Variance	Cumulative Percentage
1 Activities With intense Community Participation	3.715	53.066	53.066
2 Activities with intense Expert participation	1.487	21.239	74.305

GROUP FACTORS FOR LOSS REDUCTION ACTIVITIES

There are 7 activities for loss reduction, which are reduced into fewer factors by analyzing correlation between variables (activity). In this case 7 variables are reduced in to 2 factors which explain the much of the original data. From the cumulative percentage column, the two factors extracted together accounts for 74.31 % of the total variance (information contained in 7 variables).

Figure 5.2.34

Pictorial representation of reduced factors:



Factor	Activities for loss reduction	Factor score
1 Activities With intense Community Participation	Capacity building to cope with disaster	0.791
	Trained voluntary groups for rescue operations	0.767
	Early warning system	0.761
	Evacuation plan	0.693
2 Activities with intense Expert participation	Vulnerability Assessment for mitigation of losses	0.950
	Communication system in place	0.842
	Hazard mapping to find the probability of occurrence	0.840

Inference:

From the above table it is inferred that factor 1 that is, Activities With intense Community Participation is a combination of 4 original variables such as Capacity building to cope with disaster, trained voluntary groups for rescue operations, Early warning system and Evacuation plan.

Factor 2 that is, Activities with intense Expert participation is a combination of 3 original variables Vulnerability Assessment for mitigation of losses, Communication system in place and Hazard mapping to find the probability of occurrence.

FACTOR ANALYSIS TO IDENTIFY THE GROUP OF SAFETY KITS TO PREPARE FOR THE DISASTER EVENT

EIGEN VALUES

Aim: To identify group of safety kits to prepare/plan for the disaster event.

TABLE 5.1.65

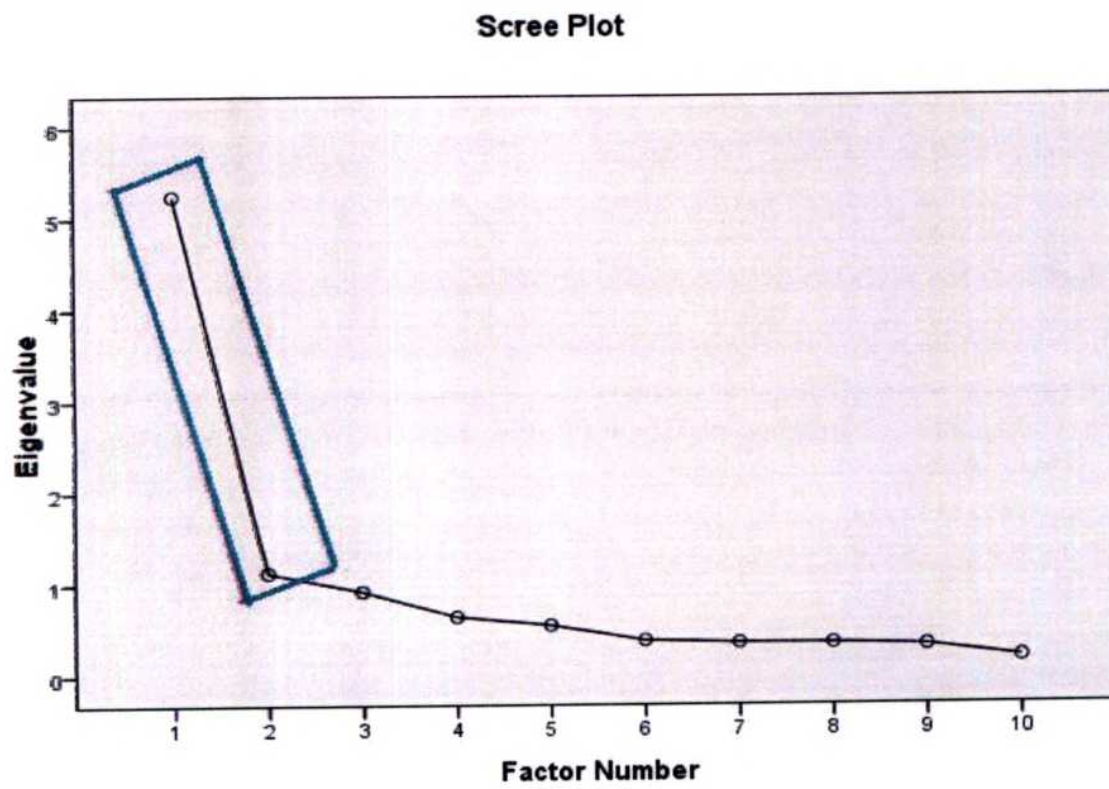
Factors	Initial Eigen values		
	Eigen values	Percentage of Variance	Cumulative percentage
1 Safety kit for survival	5.74	52.417	52.417
2 Safety kit for identification and convenience	1.117	11.172	63.588

SAFETY KITS FOR DISASTER PREPARATION

There are 10 safety kits to prepare/plan for the disaster event, which are reduced into fewer factors by analyzing correlation between variables (safety kits). In this case 10 variables are reduced in to 2 factors which explain much of the original data. From the cumulative percentage column, the three factors extracted together accounts for 63.58 % of the total variance (information contained in 10variables).

Figure 5.2.35

Pictorial representation of reduced factors:



Factor	Safety kit	Factor Score
1 Safety kit for survival	Children's basic needs	0.915
	First aid & medication	0.817
	Water cans / bottles	0.710
	Food for three days	0.693
	Clothes for change	0.603
	Basic needs for elders	0.601
2 Safety kit for identification and convenience	Documents like ration card	0.884
	Important papers to prove identity	0.820
	Torch lights / Batteries	0.741
	Blankets, Whistle, Candle	0.592

Inference:

From the above table it is inferred that factor 1, Safety kit for survival is a combination of six original variables such as Children's basic needs, First aid & medication, Water cans / bottles, Food for three days, Clothes for change and Basic needs for elders.

Factor 2, Safety kit for identification and convenience is a combination of 4 original variables Documents like ration card, important papers to prove identity, Torch lights / Batteries and Blankets, Whistle, Candle.

**FACTOR ANALYSIS TO IDENTIFY THE GROUP OF
FACTORS FOR THE INITIATIVE TO REDUCE THE
VULNERABILITY OF THE COMMUNITY**

EIGEN VALUES

Aim: To identify the group of factors for the initiatives to reduce the vulnerability of the community.

TABLE 5.1.66

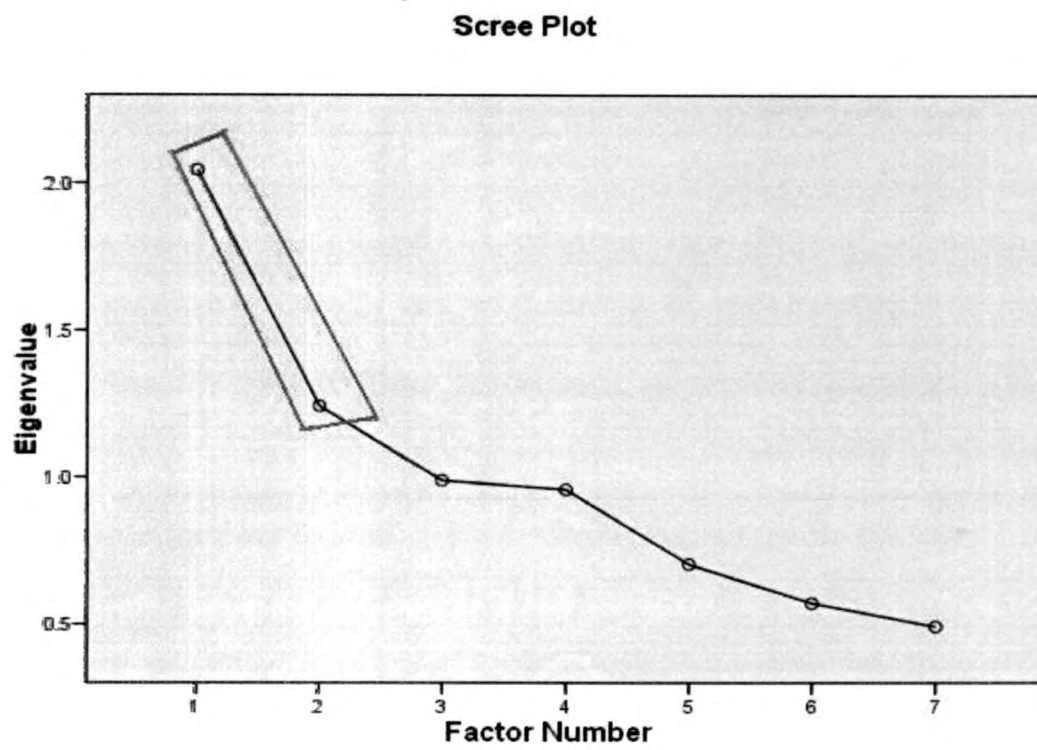
Factors	Initial Eigen values		
	Eigen values	Percentage of Variance	Cumulative percentage
1 Initiative for reducing vulnerability based on individual needs	3.741	40.213	40.213
2 Initiative for reducing vulnerability based on Group needs	1.242	17.749	57.962

INITIATIVE TO REDUCE THE VULNERABILTY OF THE COMMUNITY

There are 7 initiatives to reduce the vulnerability, which are reduced into fewer factors by analyzing correlation between variables (initiatives). In this case 7 variables are reduced in to 2 factors which explain the much of the original data. From the cumulative percentage column, the three factors extracted together accounts for 57.96 % of the total variance (information contained in 7 variables).

Figure 5.2.36

Pictorial representation of reduced factors:



Factor	Initiatives	Factor Score
1 Initiative for reducing vulnerability based on individual needs	Skills enhancement	0.685
	Capacity building cope with disaster	0.669
	Psychology and moral boosting to cope with disasters	0.633
	Vulnerability assessment for mitigation of losses	0.583
2 Initiative for reducing vulnerability based on Group needs	Training and development	0.676
	Entrepreneurial ventures	0.602
	Resistance & resilience	0.585

Inference: From the above table it is inferred that factor 1, Initiative for reducing vulnerability based on individual needs is a combination of 4 original variables such as Skills enhancement, Capacity building cope with disaster, Psychology and moral boosting to cope with disasters and Vulnerability assessment for mitigation of losses.

Factor 2, Initiative for reducing vulnerability based on Group needs is a combination of 3 original variables Training and development, Entrepreneurial ventures and Resistance & resilience.

**FACTOR ANALYSIS TO IDENTIFY THE GROUP OF
FACTORS FOR IMPORTANT MEASURES TO REDUCE THE
LOSS INCURRED DURING DISASTER.
EIGEN VALUES**

Aim: To identify the group of factors for important measures to reduce the loss incurred during disaster.

TABLE 5.1.67

Factors	Initial Eigen values		
	Eigen values	Percentage of Variance	Cumulative percentage
1 Measures required for survival	1.907	23.839	23.839
2 Measures required for safety & preparedness	1.545	19.313	43.151
3 Measures required for established infrastructur e & reliable support	1.123	14.039	57.190

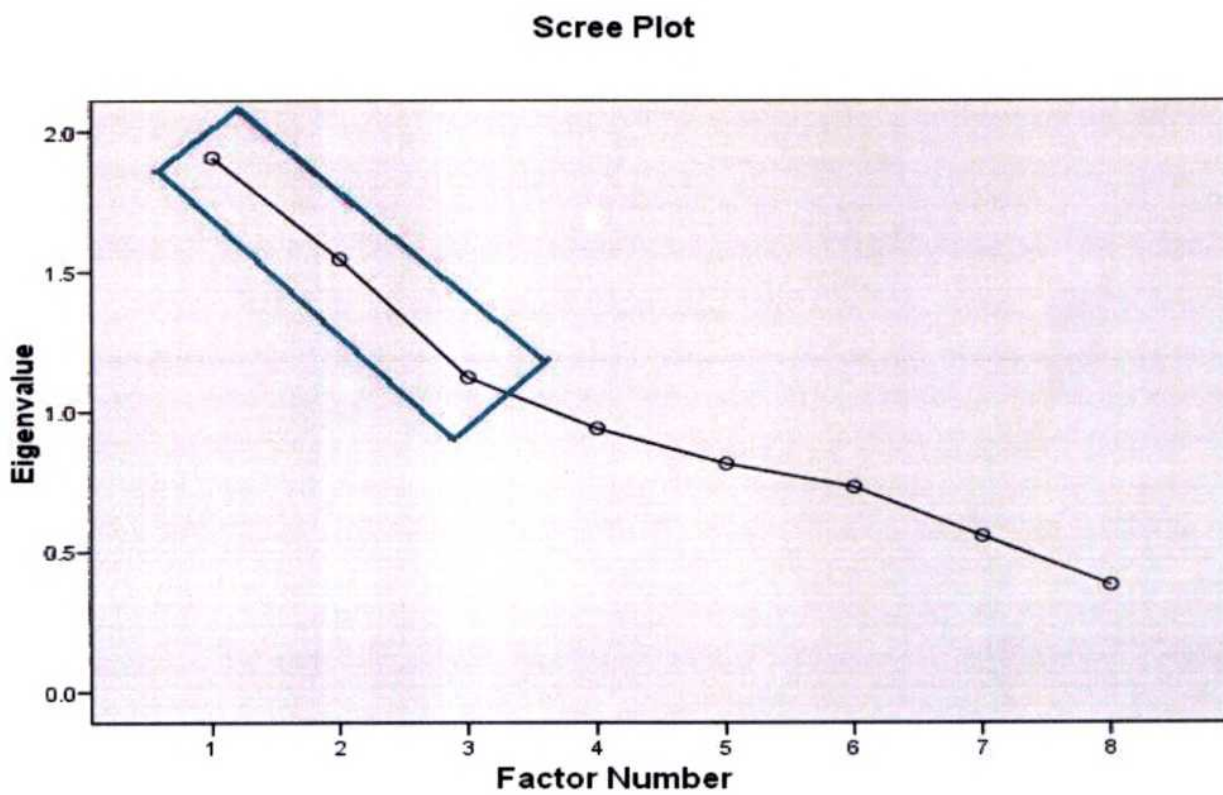
MEASURES TO REDUCE THE LOSS INCURRED DURING DISASTER.

There are 8 measures to reduce the loss incurred during disaster, which are reduced into fewer factors by analyzing correlation between variables (measures). In this case 8 variables are reduced in to 3 factors which explain the much of the

original data. From the cumulative percentage column, the three factors extracted together accounts for 57.19 % of the total variance (information contained in 8 variables).

Figure No: 5.2.37

Pictorial representation of reduced factors:



Factor	Activities	Factor Score
1 Measures required for survival	Availability of basic needs	0.685
	Availability of survival kit	0.674
	Safe shelter and rescue	0.600
	Proper medication	0.563
2 Measures required for safety & preparedness	Training to cope	0.807
	Pre- planned evacuation	0.792
3 Measures required for established infrastructure & reliable support	Early warning system	0.737
	Timely help from Government / authorities	0.702

Inference:

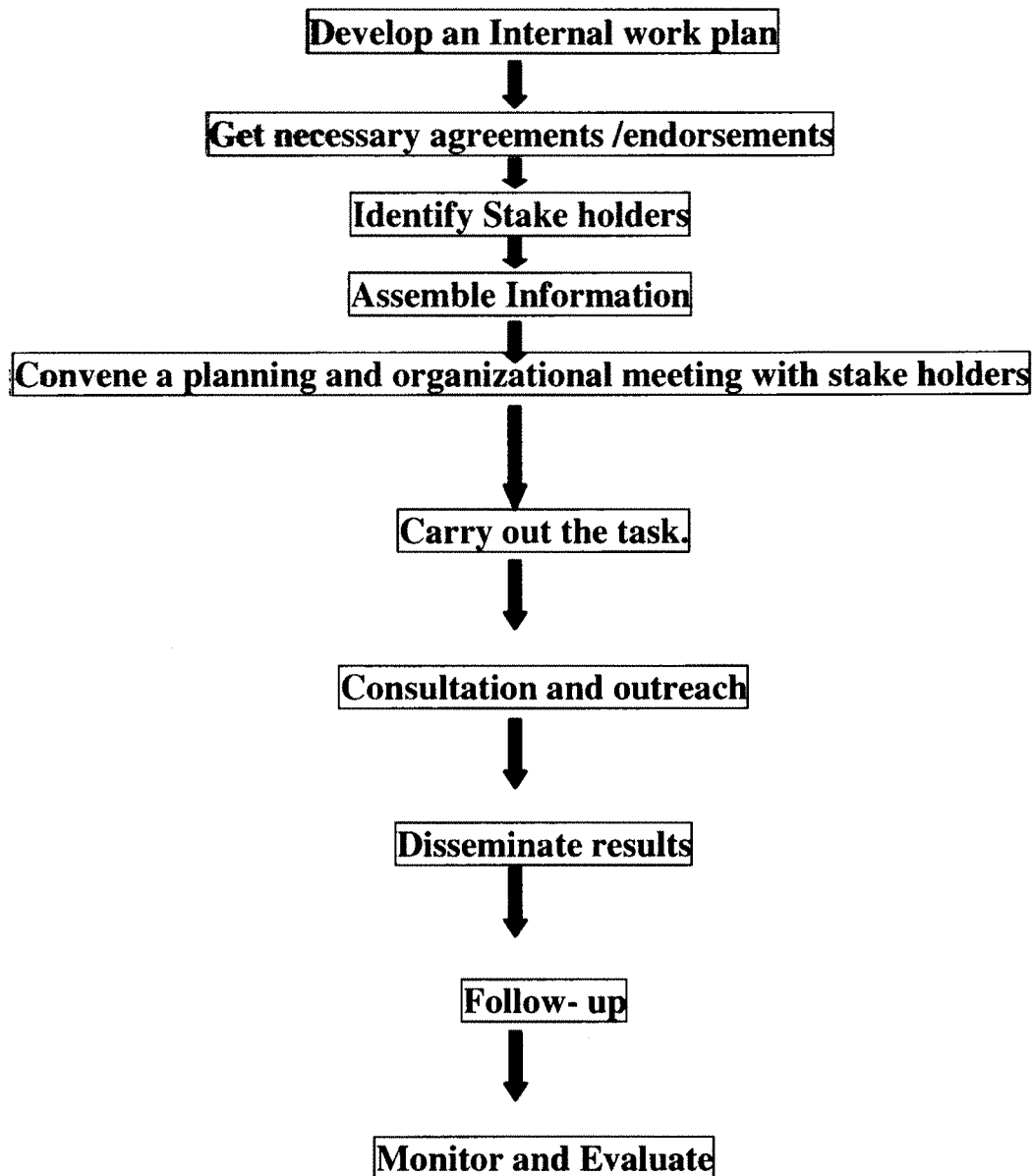
From the above table it is inferred that factor 1, Measures required for survival is a combination of 4 original variables such as Availability of basic needs, Availability of safety kit, Safe shelter and rescue and Proper medication.

Factor 2, Measures required for safety & preparedness is a combination of 2 original variables Training to cope and Pre- planned evacuation.

Factor 3, Measures required for established infrastructure & reliable support is a combination of 2 original variables Early warning system and Timely help from Government / authorities.

**CONTRIBUTIONS BASED ON THE
RESEARCH STUDY**

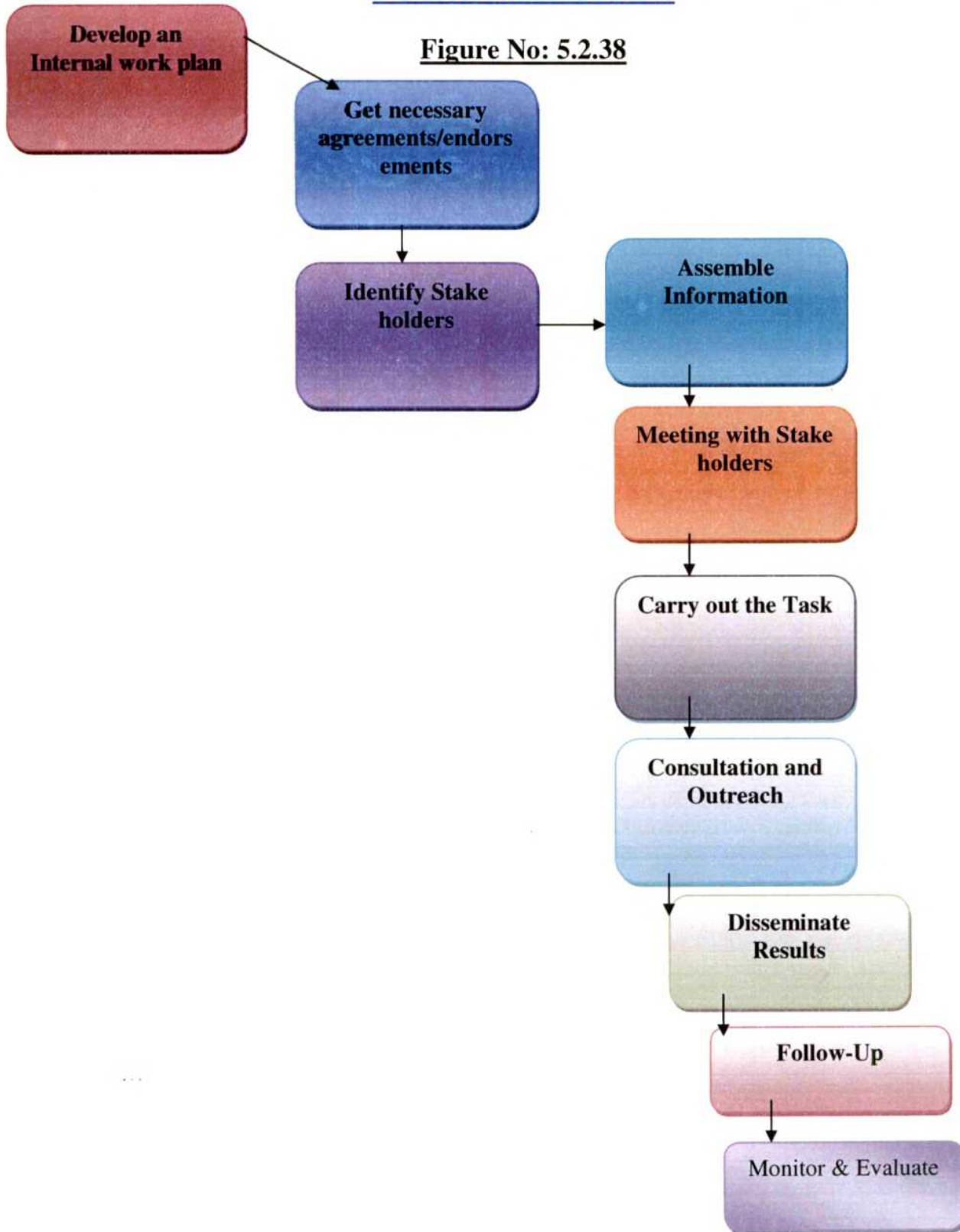
**CONTRIBUTIONS AND CONCEPTS DERIVED FROM THE
STUDY ON THE STRATEGY PLANNING PROCESS FOR
COMMUNITY AWARENESS ON DISASTER MANAGEMENT**



The above figure signifies the action plan for tasks generally involved in a strategy planning for community awareness on disaster management for individual need based training activity.

STRATEGY PLANNING PROCESS FOR COMMUNITY AWARENESS ON DISASTER MANAGEMENT

Figure No: 5.2.38



CONDITIONS THAT FACILITATE THE TASK

- ✓ Strong political commitment from top leadership
- ✓ An explicit work program, administered or overseen from an administrative capacity
- ✓ Technical activities such as developing knowledge bases on disaster risk reduction and developing a methodological framework for the national platform that includes a set of disaster reduction indicators
- ✓ A participatory process with the full involvement of relevant groups including government, private sector, NGOs and academic organization.
- ✓ Resources available for both development of national platform and its planned activities.

INDICATORS THAT ASSESS THE PROGRESS OF THE ABOVE TASK

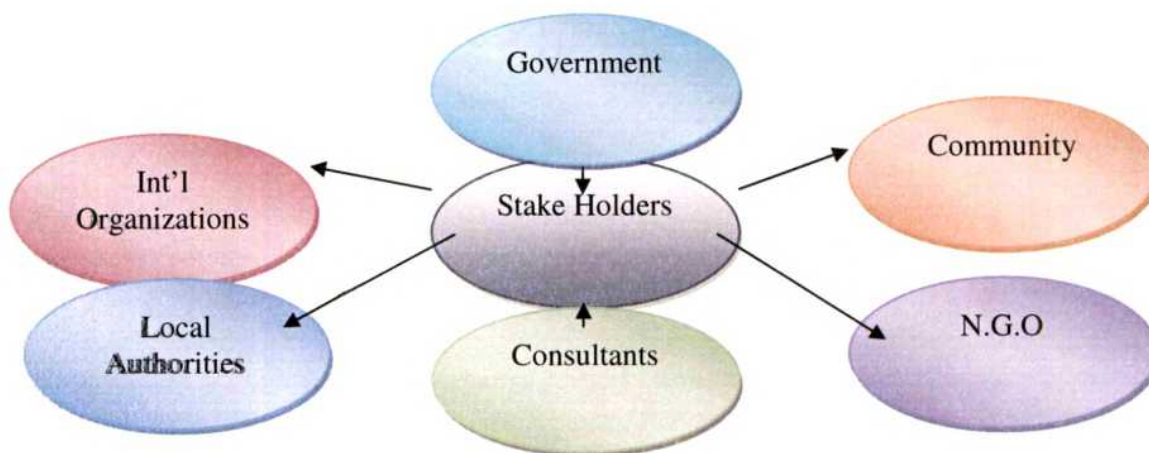
- ✓ National risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors
- ✓ Systems are in place to monitor, archive and disseminate data on key hazards and vulnerabilities
- ✓ Early warning systems are in place for all major hazards
- ✓ Early warning system reaches and serves people at all community level.

THE CHALLENGE OF STRATEGY PROCESS RESEARCH

Enduring scholarly interest in the process of strategy-making stems from an abiding assumption that some ways of strategizing are more efficacious than others, and thus lead to higher performance in the long run. Expressions of interest in and endorsements of the strategy process are abundant in the academic literature. As Pettigrew (1992) points out, Hofer and Schendel's pioneering definition of strategic management is process in character emphasizing the development and utilization of strategy. Rumelt, Schendel, and Teece (1994) list the policy process question – how does policy process matter? – As a fundamental question of the strategic management field. Porter (1996) expresses preoccupation with the leadership and organizational challenges of managing the process. And, Hamel (1988) exhorts the field to devote as much attention to the conduct of strategy, i.e., the task of strategy making, as they have to its content. For senior Disaster managers and leaders, the question of how to make effective strategies stands usually at the top of their agenda. Not surprisingly then, the quest to uncover stable principles of good strategy making has attracted much support and interest over the years. Researchers who responded to the strategy process challenge had known many moments of exhilaration and disillusion, the exhilaration of discovery, and the disillusion from the often-grotesque ratio of effort to outcome and the indifference of a scholarly community heavily reliant on a large sample variance approach. Indeed, empirical research in strategy process has often required large, often heroic and invariably idiosyncratic, longitudinal data collection efforts aimed at exploring the link between the strategy process and the quality of decisions, and ultimately the performance of firms. Such quests, potentially revealing and insightful but often risky from the researcher's career

perspective, presented formidable, methodological, and practical hurdles. Moreover, the theory yielded by such ambitious quests, while comprehensive, was often complex, messy, and notoriously fragile. The accumulation of scientific evidence in strategy process thus progressed slowly because of the relative paucity of studies and also because of their idiosyncratic nature. Scholarly insights took longer to accumulate, perhaps too long to serve as the sole basis for helping the eager practitioner in search of simpler but applicable advice.

STAKE HOLDERS Figure No: 5.2.39



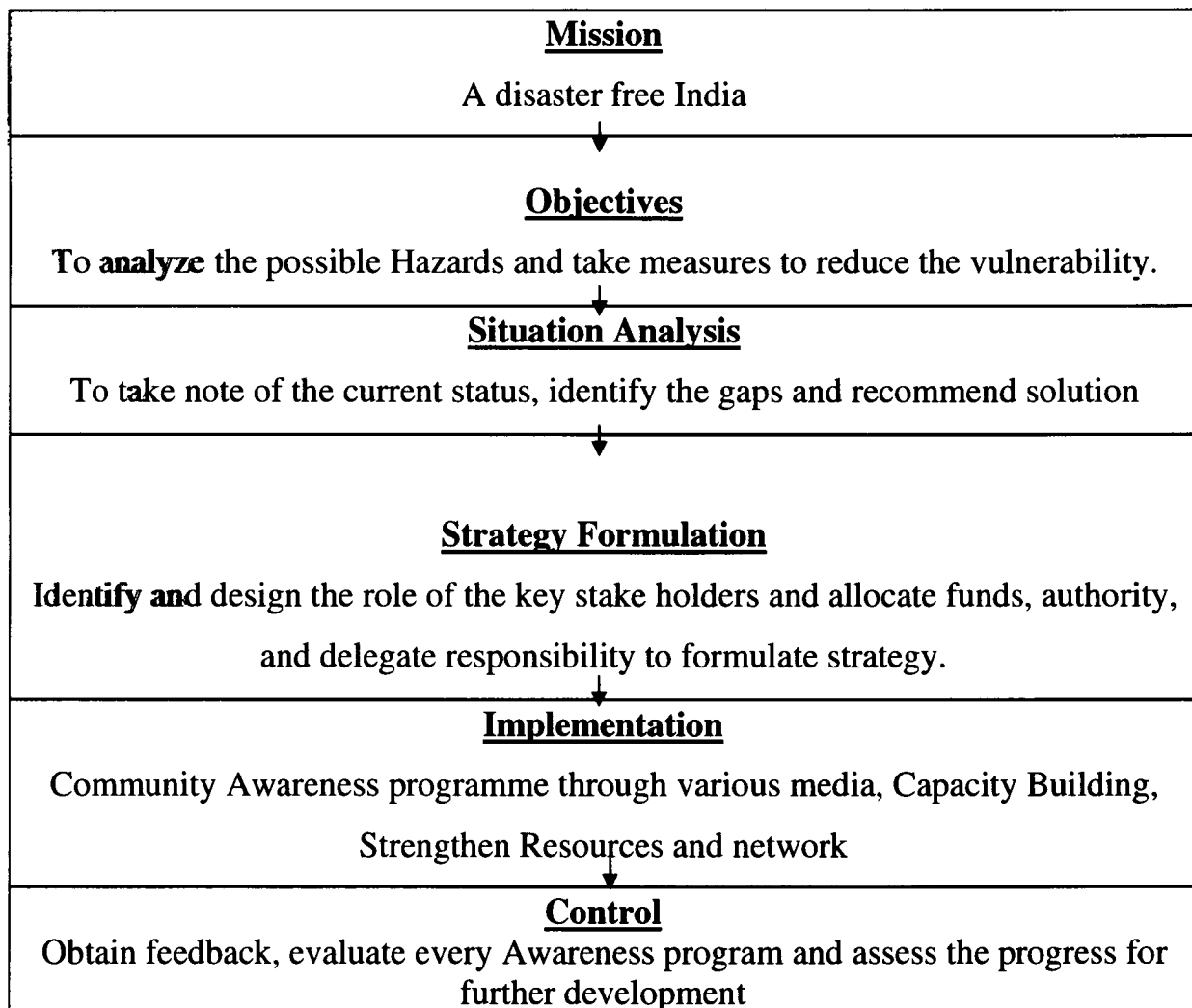
The above figure 5.2.39 clearly brings out the stake holders involved in the disaster management activity

PROCESS FOR DEVELOPING STRATEGY

The process described below is derived from several sources. Since Strategy has been much worked on over the last 50 years, it makes sense to collect together the best of what we have found and at the same time keep it in the background until it is needed.

THE STRATEGIC PLANNING PROCESS

Figure No: 5.2.40



The above figure 5.2.40 shows an outline of overall strategic planning process for each region.

ROLE OF GOVERNMENT IN IMPROVING RISK INFORMATION AND EARLY WARNING.

- Establish an initiative for countrywide risk assessment
- Review the availability of risk related information and capacities for data collection and use.
- Assess capacities and strengthen early warning system
- Develop communication and dissemination mechanism for disaster risk information and early warning.

ELEMENTS OF COMMUNITY CENTERED EARLY WARNING

KNOWLEDGE OF RISK INVOLVED

Systematically collect data and undertake risk assessment

Are the hazards and vulnerability well known?

What are the patterns and trends in these factors?

Are risk maps and data widely available?

MONITORING AND WARNING SERVICE

Develop hazard monitoring and early warning services

Are the right parameters being monitored?

Is there a sound scientific, basis for making forecasts?

Can accurate and timely warnings be generated?

DISSEMINATION & COMMUNICATION

Communicate risk information and early warnings

Do warnings reach all of those at risk?

Are the risks and warnings understood?

Is the warning information clear and usable?

RESPONSE CAPABILITY

Build national and community response capabilities

Are response plans up to date and tested?

Are local capacities and knowledge made use of?

Are people prepared and ready to react to warnings?

EFFECTIVE EARLY WARNING COMMUNICATION

For effective communication of warnings, alerts should be short simple and precise; provide timely information about the hazardous situation; state what action should be taken to reduce loss of life; injury and property damage; explain the consequences of not heeding the warning; cite a credible authority; provide feedback to operational decision makers on the extent of public compliance and repeat important information regularly.

MAKING A PLAN FOR COMMUNICATION WITHIN FAMILY

All family may not be together when disaster strikes, so it is important to plan in advance: how one will contact one another; how one will get back together; and what one should do in different situations must be planned.

BUILDING A CULTURE OF SAFETY AND RESILIENCE

The following strategies will enable to build a culture of safety and resilience:

- ✓ Develop a programme to raise awareness of disaster risk reduction.
- ✓ Include disaster risk reduction in the education system and the research community
- ✓ Develop disaster risk reduction training for key sectors
- ✓ Enhance the compilation, dissemination and use of disaster risk reduction information.

AWARENESS CAMPAIGNS AS MEANS TO INFLUENCE AND CHANGE BEHAVIOUR

Awareness-raising is an interactive process in which different parties are engaged, each with its own roles, responsibilities and ways to make its voice heard and to create social influence. In awareness campaigns, policy makers and other interested groups aim to change behavior by altering social norms and attitudes. Typically, campaigns focus on providing information and knowledge to influence individual attitudes. Public awareness is the process of informing the general population, increasing levels of consciousness about risk and how people can act to reduce their exposure to hazards. This is particularly important for public officials for fulfilling their responsibilities to save lives and property in the event of disaster.

LONG TERM PREVENTION STRATEGY

1. Community Participation

Community participation (CP) has been defined "as a process whereby individuals, families and communities are involved in the planning and conduct of local vector control activities so as to ensure that the programme meets the local needs and priorities of the people who live in the community, and promotes community's self-reliance in respect to development." In short, CP entails the creation of opportunities that enable all members of the community and extended society to actively contribute to, influence the development of, and share equitably in the fruits of accrued benefits. Objectives of community participation in dengue prevention and control:

- To extend the coverage of the programme to the whole community by creating community awareness. This however often requires intensive inputs.
- To make the programme more efficient and cost-effective, with greater coordination of resources, activities and efforts pooled by the community.
- To make the programme more effective through joint community efforts to set goals, objectives and strategies for action.
- To promote equity through sharing of responsibility, and through solidarity in serving those in greatest need and at greatest risk.
- To promote self-reliance among community members and increase their sense of control over their own health and destiny.

HOW TO INVOKE COMMUNITY PARTICIPATION

- ***By showing concern:*** Community and government organizers should reflect the true concern for human suffering, i.e. morbidity and mortality due to dengue in the country, economic losses to the families and the country, and how the benefits of the programme fit into the people's needs and expectations.
- ***Initiating dialogue:*** Community organizers and opinion leaders or other key personnel in the power structure of the community, namely women's groups, youth groups and civic organizations, should be identified. Dialogue should be undertaken through personal contacts, group discussions and film shows. Interaction should generate mutual understanding, trust and confidence, enthusiasm and motivation. The interaction should not be a one-time affair, but should be a continuing dialogue to achieve sustainability.

- ***Creating community ownership:*** Organizers should use community ideas and participation to initiate the programme, community leaders to assist the programme, and community resources to fund the programme. Disaster preparedness activity, Mosquito control, abatement agency and community partnerships should be strong, but limited to providing technical guidance and expertise.
- ***Health education (HE):*** Health education should not be based on telling people the do's and don'ts through a vertical, top-down communication process. Instead, health education should be based on formative research to identify what is important to the community and should be implemented at three levels, i.e. the community level, systems level and political level.

Community level: People should not only be provided with knowledge and skills on vector control, but education materials should empower them with the knowledge that allows them to make positive health choices and gives them the ability to act individually and collectively.

Systems level: To enable people to mobilize local actions and societal forces beyond a single community, i.e. health, development and social services.

Political level: Mechanisms must be made available to allow people to articulate their health priorities to political authorities. This will facilitate placing vector control high on the priority agenda and effectively lobby for policies and actions.

- Resource-sharing
- Policy adjustments among the various ministries and nongovernmental sectors.

2. Risk identification

- Hazard maps, GIS systems, vulnerability analysis, risk analysis, understanding the direct, indirect, and secondary effects of disasters

3. Risk reduction

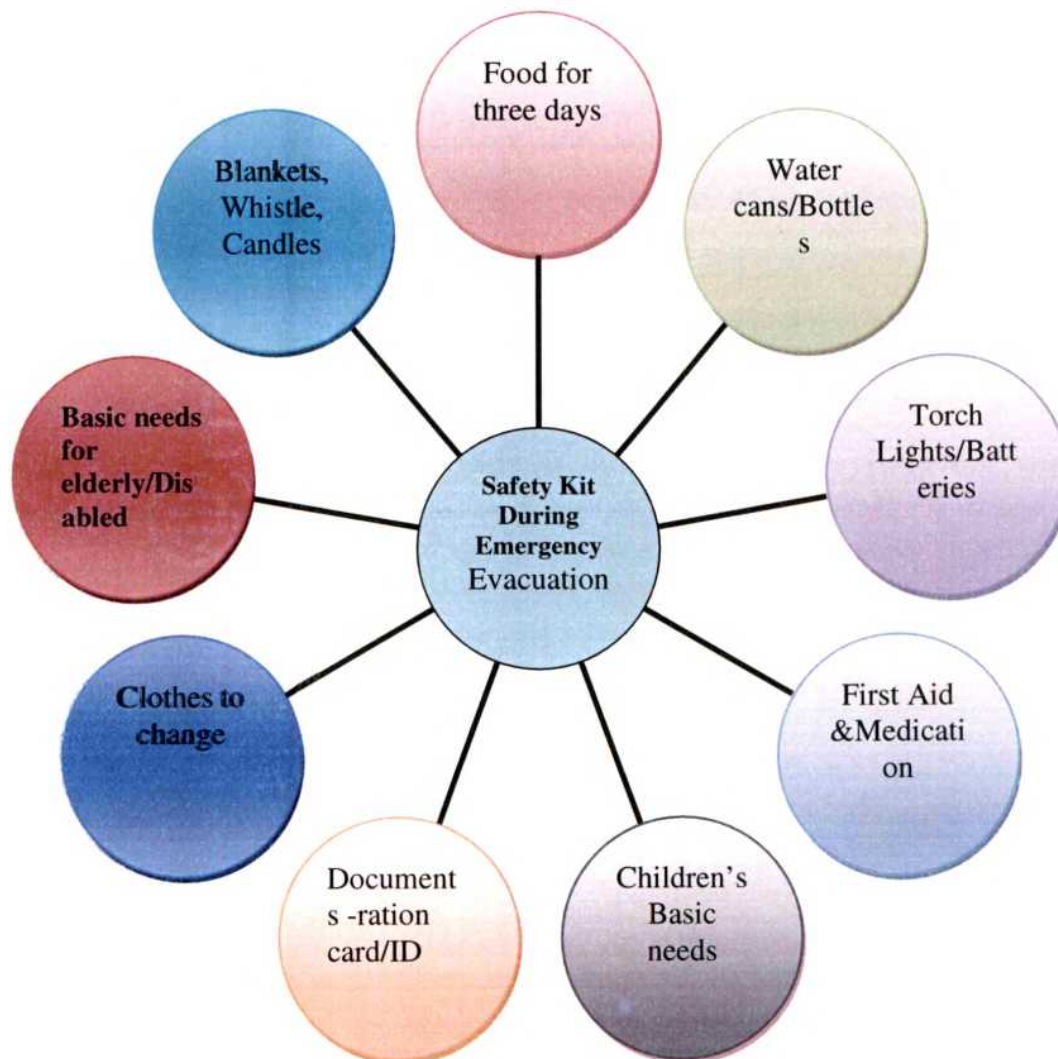
- Structural and non-structural mechanisms (e.g. land use planning, design and construction practices, building codes, early warning systems, preparedness and response plans, public awareness and education)

4. Risk transfer and financing

- Insurance, catastrophe bonds, contingency financing, safety nets, calamity funds, micro-insurance, informal risk sharing arrangements

**SOME OF THE COMMON THINGS THAT WERE COMPILED FROM
THE RESPONSES RECEIVED**

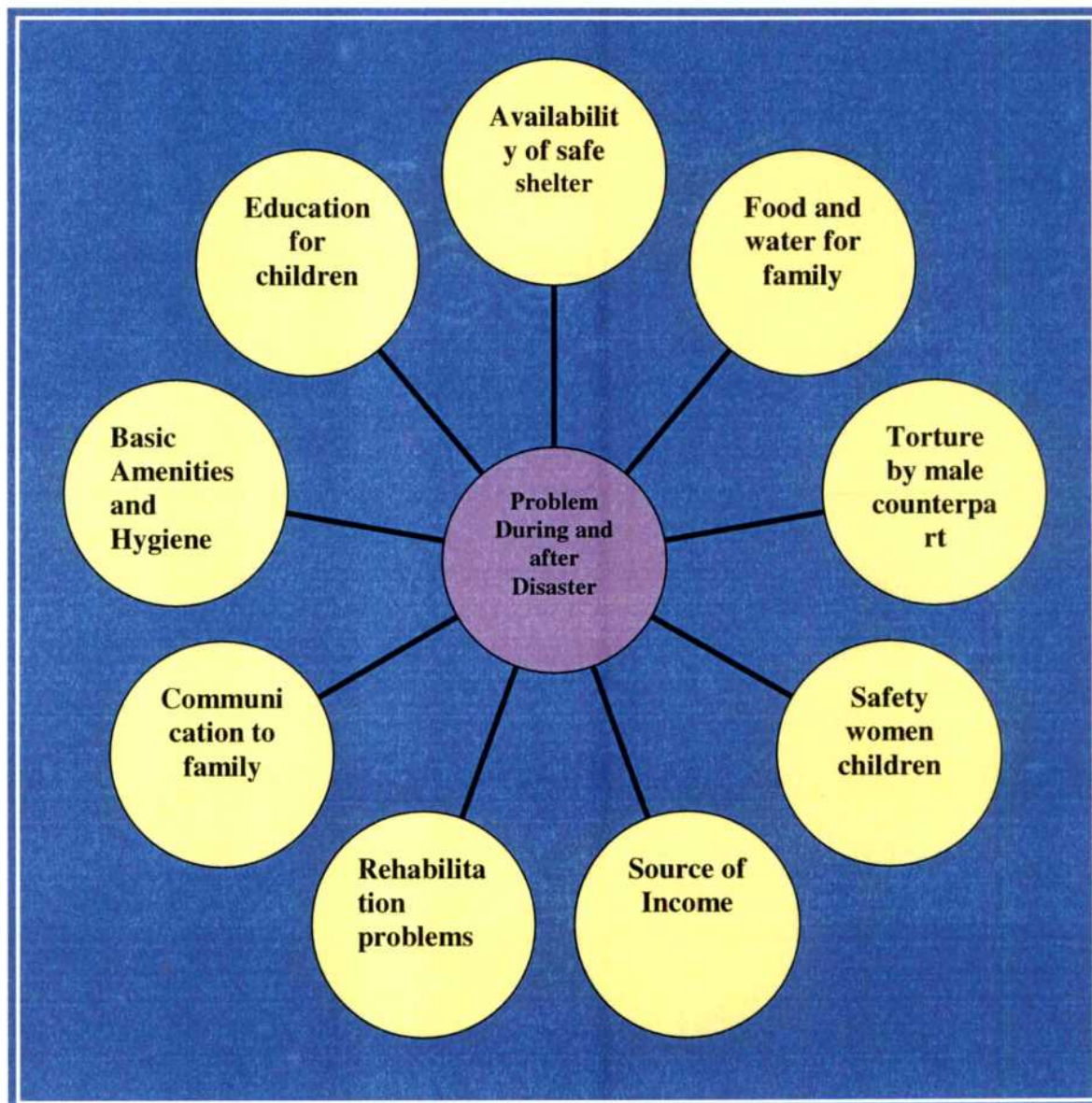
Figure No: 5.2.41



The above figure is a compilation of the list of safety kit suggested by the respondents. It will help a person to survive for at least a minimum of three days until external help arrives.

CHALLENGES ENCOUNTERED BY COMMUNITY DURING AND AFTER DISASTER

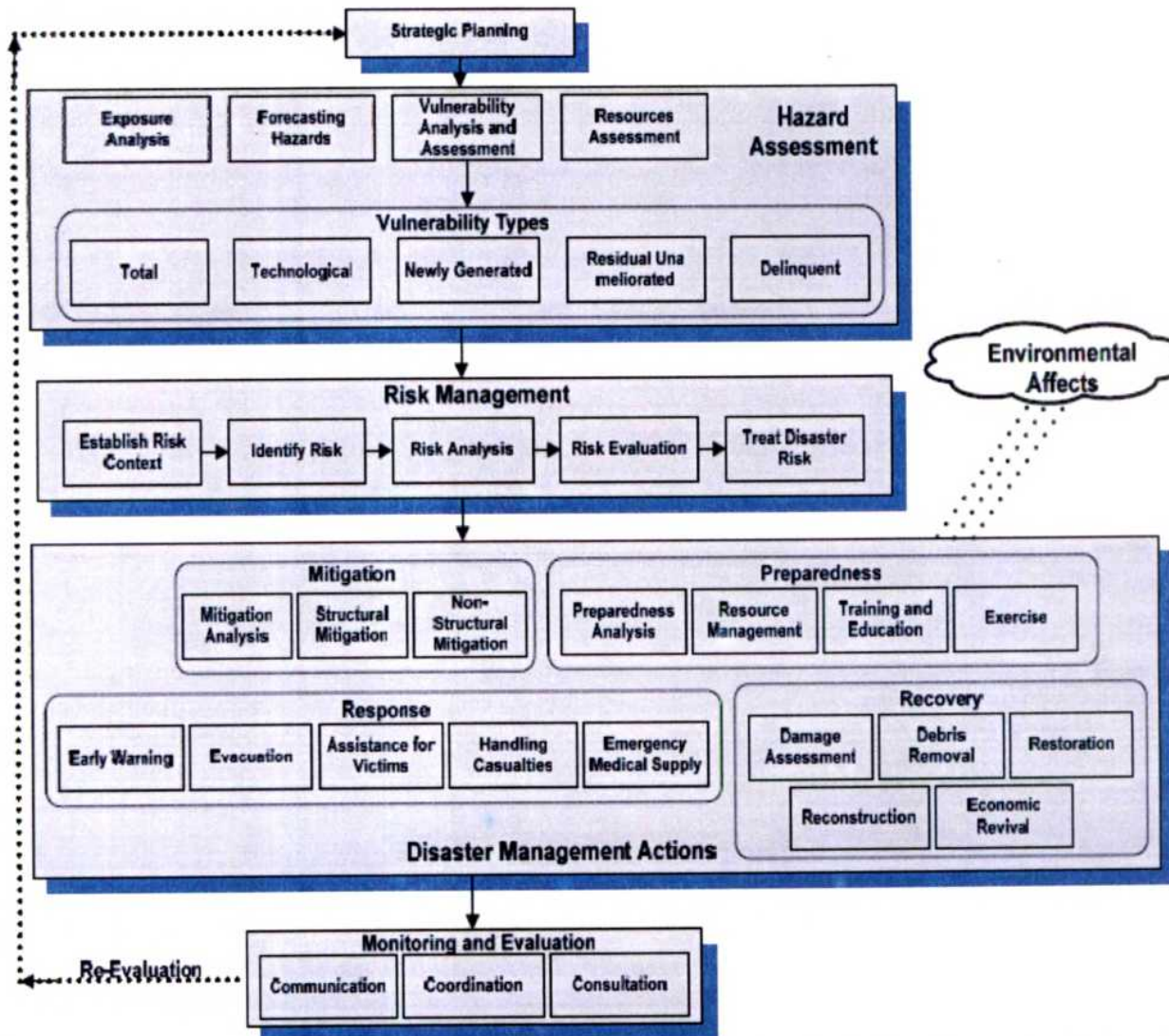
Figure No: 5.2.42
COMPILED RESPONSES RECEIVED DURING INTERVIEW



The above figure brings out the challenges that the respondents have faced after the disaster. They are the most common challenges that require immediate attention failing which the respondent may not be able to lead a dignified life.

Figure 5.2.43

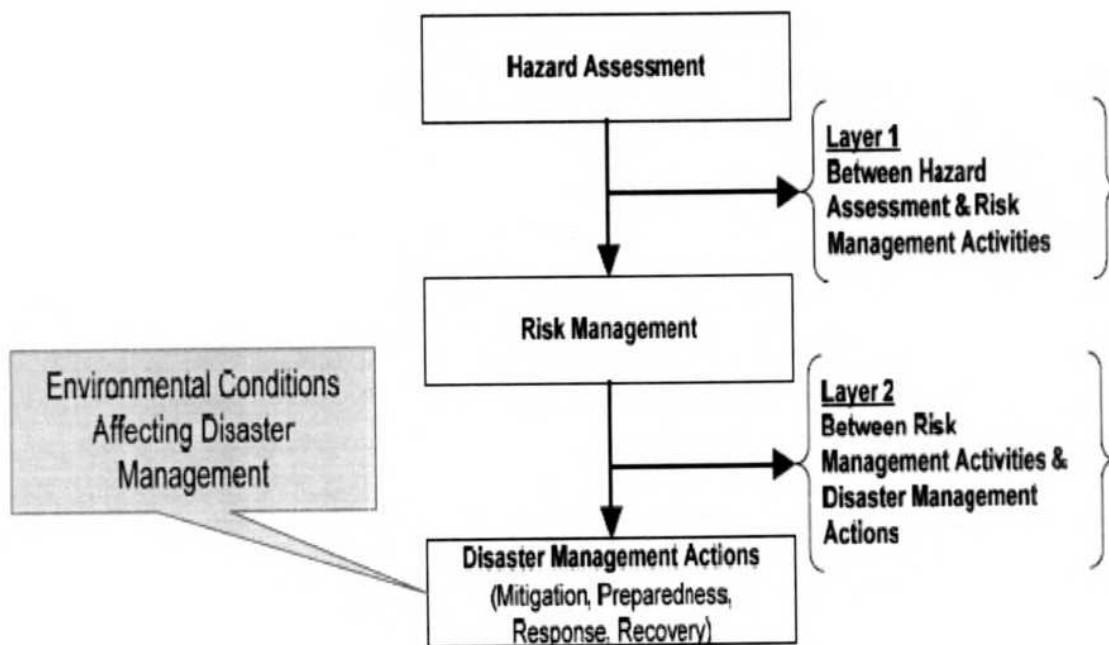
SUGGESTED STRATEGY PLANNING PROCESS



The above process begins with hazard assessment which will include identifying the type of hazard and the type of vulnerability followed by a Risk management strategy that begins with identification of risk and ends with how to treat the risk. This will lead to Mitigation process & preparedness plan that may help a person to understand the response and recovery measures. This can be monitored and evaluated to make necessary amendments.

Figure 5.2.44

LAYERED RELATIONSHIP DERIVED FROM COMPREHENSIVE MODEL

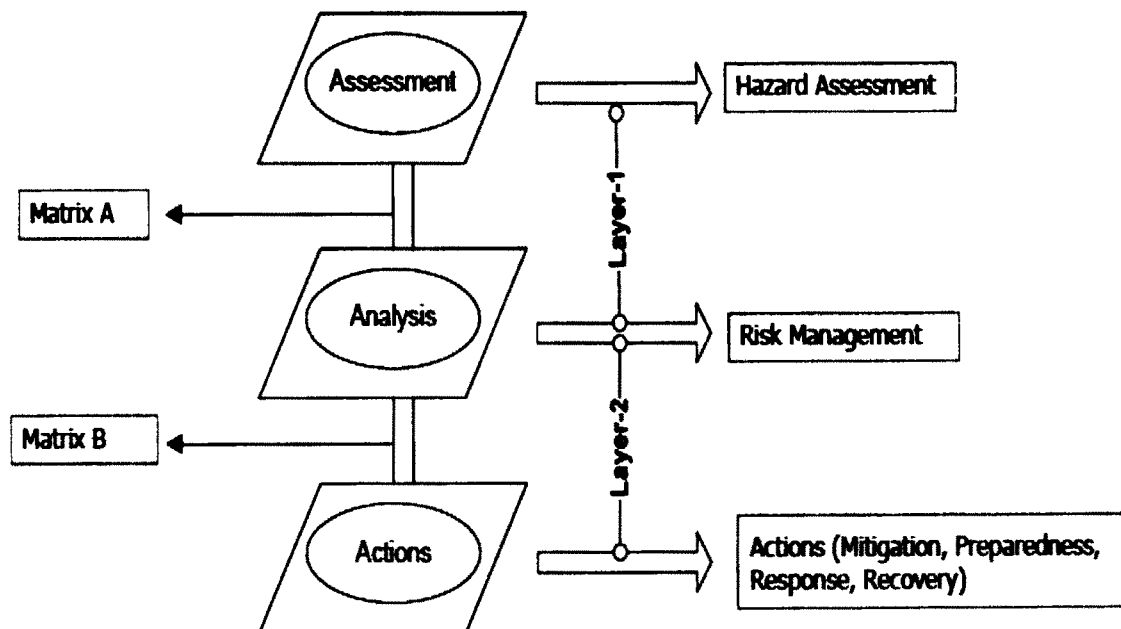


The above figure brings out the layered relationship between the Hazard assessment based on which the Risk can be analyzed and treated according to its intensity and severity. Mitigation, Preparedness, Response and Recovery will be based on the preplanned Risk Management strategy planned

Figure 5.2.45

LAYERED RELATIONSHIP AND MATRICES

1. **Activity Matrix A:** Hazard Assessment and Risk Analysis
2. **Activity Matrix B:** Risk Analysis and Action (mitigation, preparedness, response and recovery)



The above figure depicts the nature of task that should be involved in each stage that is Assessment, Analysis and Actions. Each task will be dependent and based on each other.

Figure 5.2.46

SUGGESTED ACTIVITY MATRIX FOR HAZARD ASSESSMENT AND RISK ANALYSIS

Risk Management → Hazard Assessment ↓	Risk Context	Identify Risk	Analyse Risk	Evaluate Risk	Treat Risk
<i>Exposure Analysis</i>					
<i>Hazard Forecasting</i>		X	X	X	
<i>Vulnerability Analysis</i>	X	X	X		
<i>Resource Assessment</i>					X

ACTIVITY MATRIX FOR RISK MANAGEMENT AND ACTIONS

Risk Management → Actions ↓	Risk Context	Identify Risk	Analyse Risk	Evaluate Risk	Treat Risk
<i>Mitigation</i>	X	X	X	X	
<i>Preparedness</i>		X	X	X	
<i>Response</i>					X
<i>Recovery</i>					

The above figure is slice of each stage and the task involved in the Hazard Analysis and risk management. It brings out the relationship and elements that are to be integrated to arrive at an action plan.

**CONCEPTUALIZE THE RELATIONSHIP BETWEEN
HAZARD/DISASTER ASSESSMENT, RISK MANAGEMENT,
AND ACTIONS FOR DISASTER MANAGEMENT.**

Figure 5.2.47(a)

**CONCEPTUALIZING THE RELATION BETWEEN HAZARD ASSESSMENT, RISK
MANAGEMENT AND DISASTER MANAGEMNET ACTIONS**



The pictorial relationship denotes that all three tasks are interrelated and interdependent on each other. It should not be treated as independent from each other.

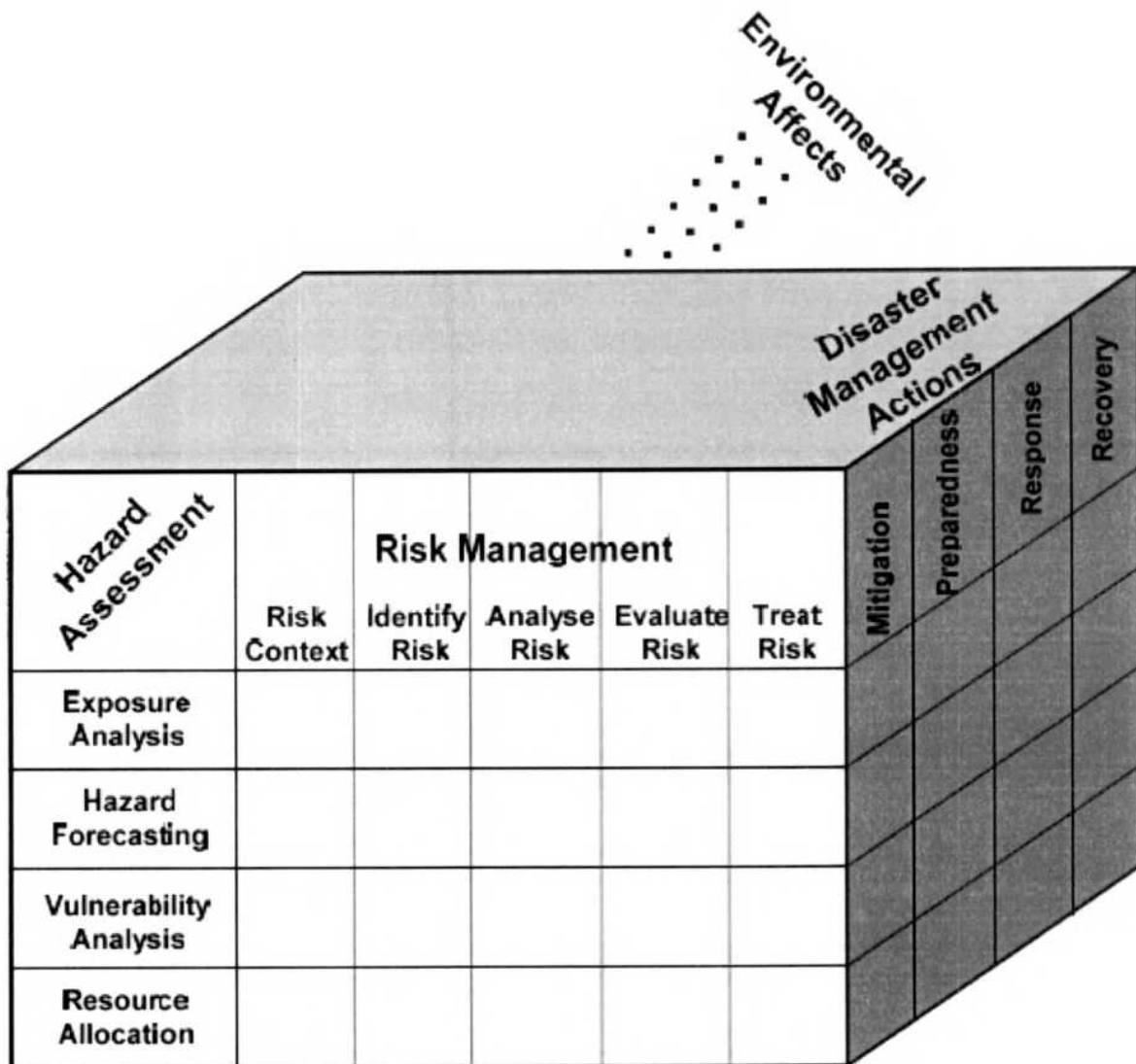


Figure 5.2.47(b)

The above figure shows that though expert advice and recommendations for each task may require individual independent specialized skills, each stage may need the strongest coordination with each other to produce a compiled report on the way each disaster can be treated.

**A CUBE REPRESENTING THE RELATIONSHIP BETWEEN HAZARD
ASSESSMENT, RISK MANAGEMENT AND DISASTER MANAGEMENT
ACTIONS**

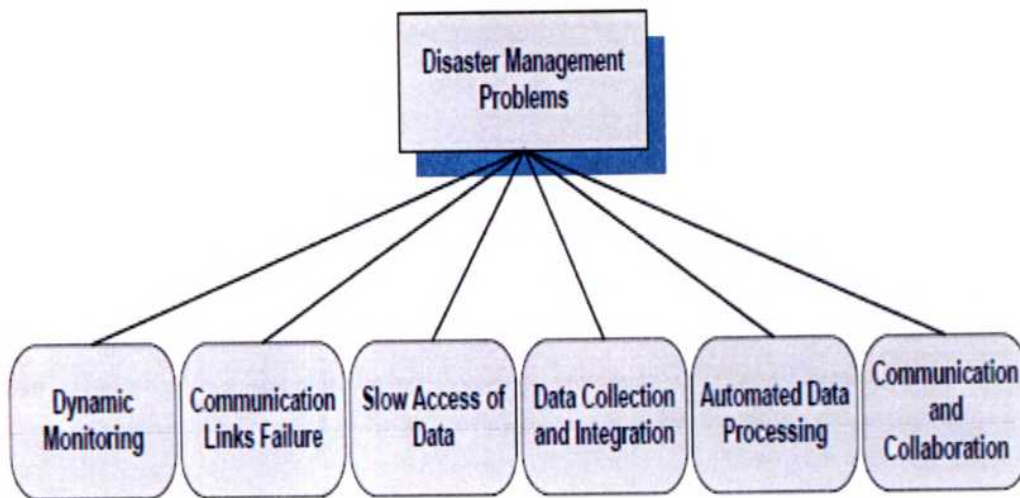
Figure 5.2.47(c)



The above cubical is a combination of elements that requires action plan for all the three stages. This is based on the intensity and severity of the assessment.

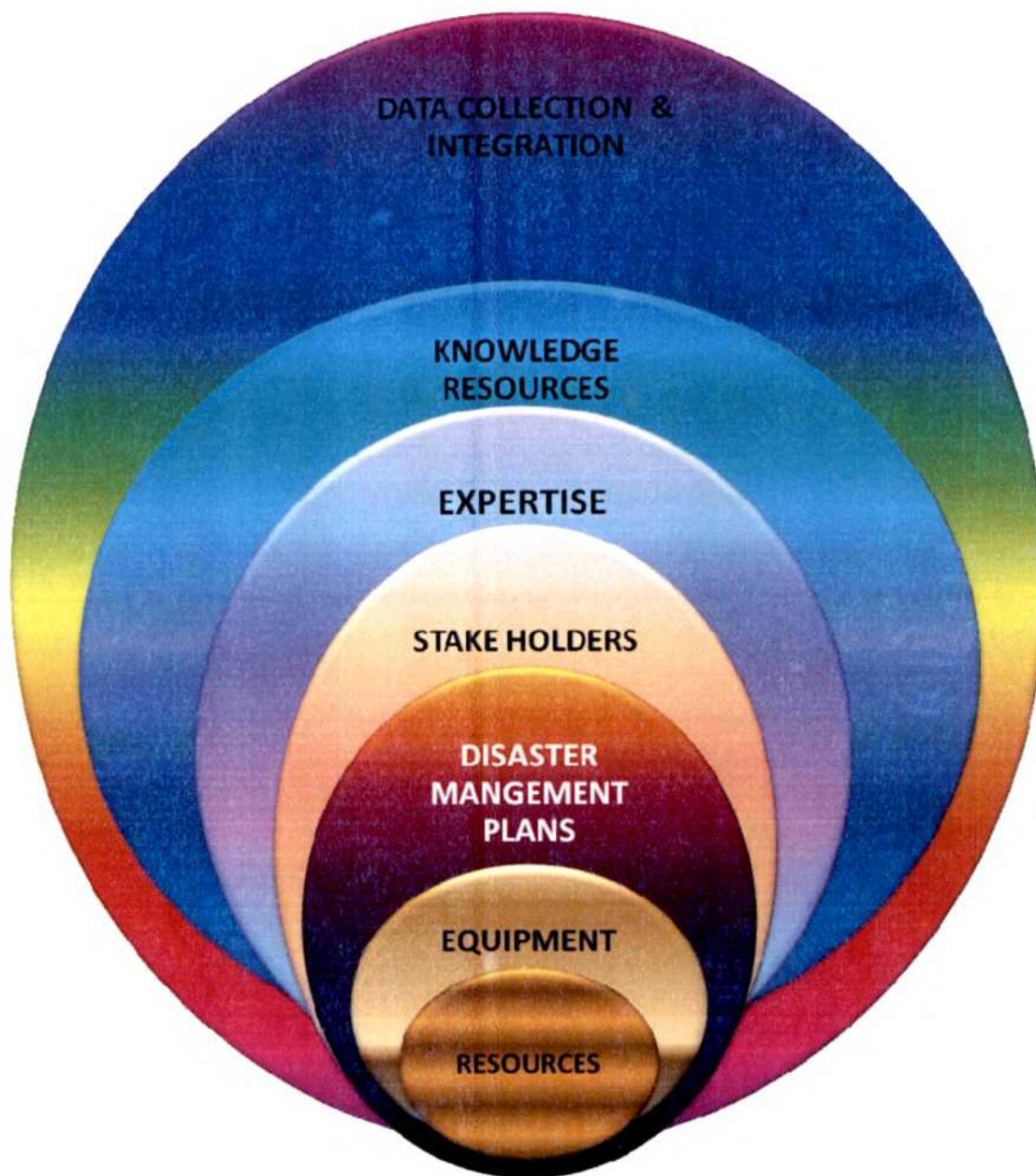
Figure 5.2.48

THE OVERALL COMPLEXITY OF DISASTER MANAGEMENT DOMAIN



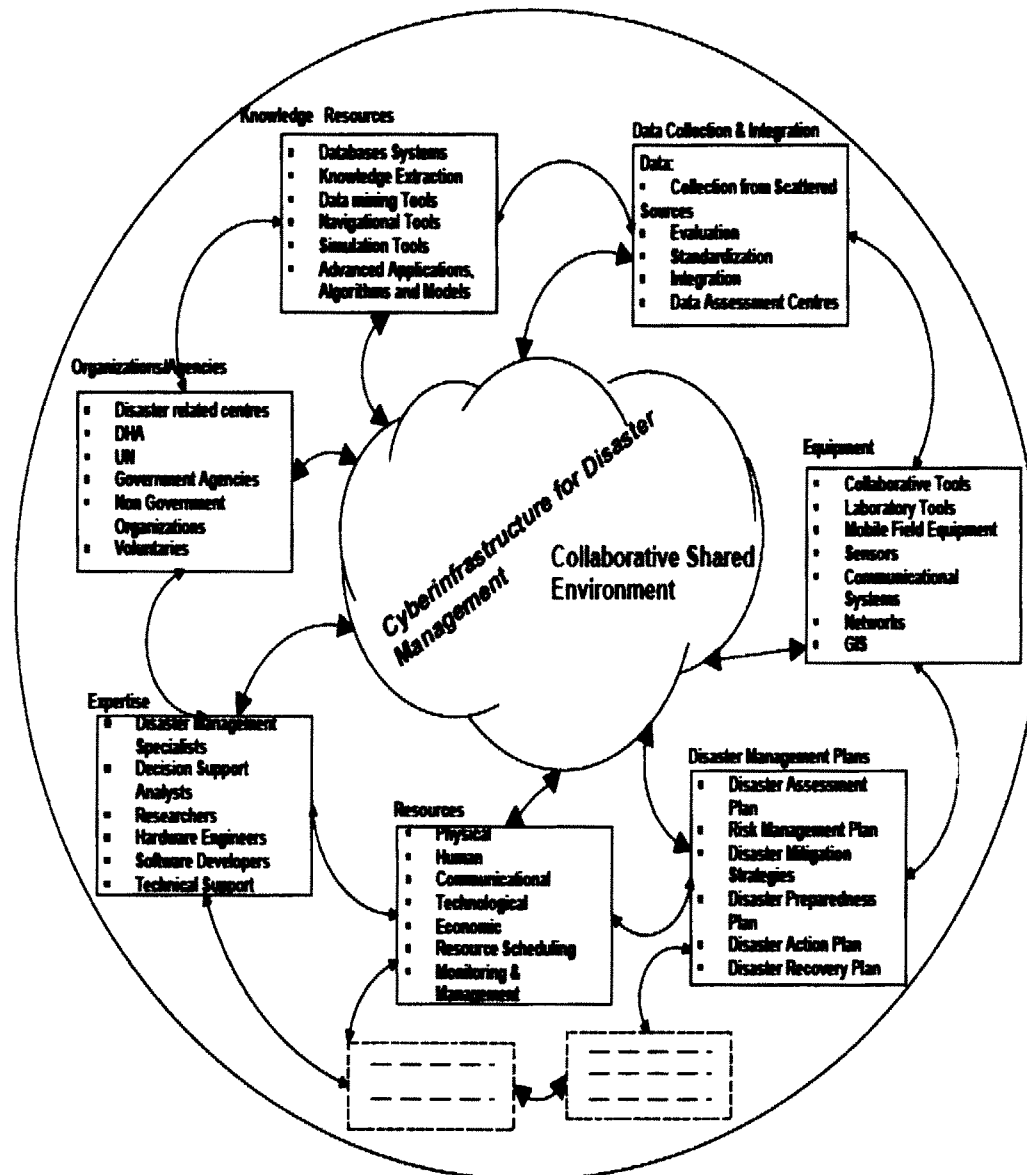
The above figure brings out the most common problems or challenges the strategic planners may face while executing the disaster management programs.

**EVOLVING A CYBER INFRASTRUCTURE FOR DISASTER
MANAGEMENT. Figure 5.2.49(a)**



The above figure 5.2.49 (a) shows the interdependence and importance of the elements required to overcome the challenges faced by experts as mentioned in the earlier figure 5.2.48. The above elements will enable a free flow of communication pattern.

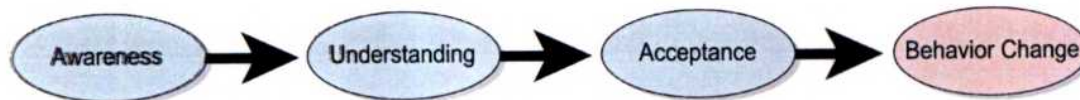
**SUGGESTED CYBER INFRASTRUCTURE FOR DISASTER
MANAGEMENT Figure 5.2.49(b)**



The above figure explains the various concepts to be dealt with in each of the essential elements mentioned earlier in order to develop a cyber infrastructure.

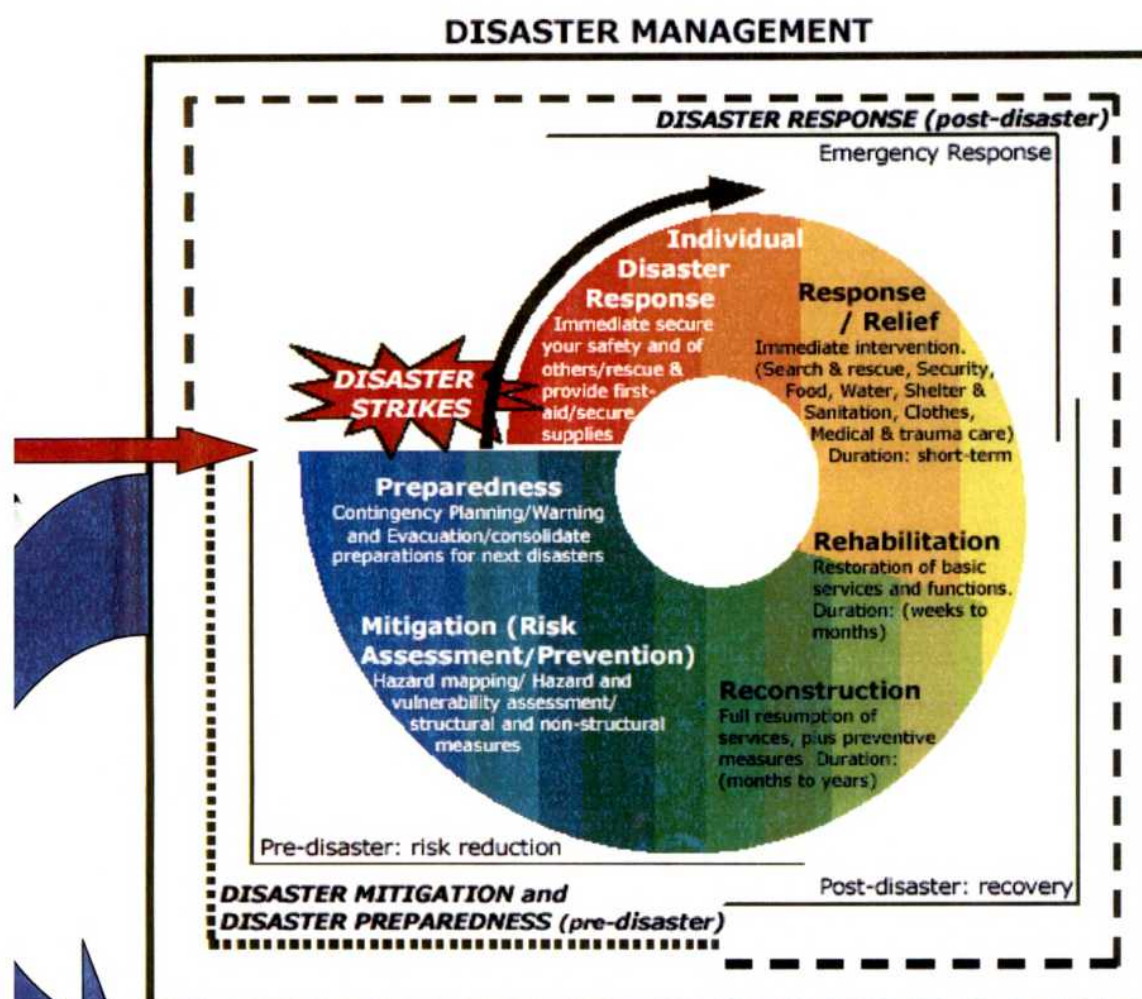
Figure No: 5.2.50

Communications Continuum



The Persuasive Communication Continuum Model

Effective education and outreach must be based in a thorough understanding of the process that individuals go through when they make decisions about modifying their personal behavior. Warning specialists must understand human behavior in order to design and implement better warnings. Figure below shows the key stages in the continuum of persuasive communication that leads to behavior change. The success of a warning rests in the publics/individual's awareness, understanding, and acceptance of their risk.

Figure No: 5.2.51

Reference: *Are you Prepared? Learning from the Great Hanshin-Awaji Earthquake Disaster - Handbook for Disaster Reduction and Volunteer activities*

Source: *Primer of Parliamentarian, Govt. of India*

The research study focused only on “strategy planning for community awareness on disaster management “There is a lot more to be done by all the stake holders responsible in the development process to mitigate and reduce the impact of disaster whether it is Natural or Man made disaster.-Latha Mazumder

CHAPTER VI

FINDINGS

SUMMARY OF FINDINGS

FINDINGS FROM DATA ANALYSIS

- ✓ It is found that most of the respondents are fishermen and women by occupation who resides in the coastal region. It was found from the interactive session that the respondents were finding it difficult to manage the day to day expenses as the occupation was highly dependent on the weather conditions. It is found that the community where the research was undertaken has a majority of the respondents (48.1%) who are male earning members and only 25.6% of earning members are female. It is also noted that around 26.2% of respondents have both the counterparts as the earning members. Out of 640 respondents, 48.1% are Male earning members, and 25.6 % of the earning members in the family are female. 26.2% of the respondents have both Male and Female members who earn in the family.
- ✓ The findings on the financial status prove that most of the respondents earn very less and find it challenging to meet the expenses. There is barely any surplus to be saved. Therefore, they have to find alternative source of income for extra revenue to meet the day to day expenses. Some of them undertake domestic work and manage to have one square meal from the place where they work. Out of 640 respondents, 39.1% earn below Rupees 3000/- per month, 36.9% of the respondents earn between Rs.3001 to Rs.6000/- and 24.1% earn between Rs.6001/- to Rs.9000/- and none of them earn above Rs.9001/- .
- ✓ It is evident and proved from the data analysis that the majority of the respondents are matured adults who are above 31 years of age and have the ability to be trained and educated on the various community awareness programs. Out of the 640 respondents, 21.6% of the respondents are

growing population and are between the age group of 21 to 30 years, 36.2% are between 31 to 40 years of age. 31.6% fall between 41 to 50 years and 10.6% are above 51 years of age.

- ✓ Literacy: It is found that 59.4% of the respondents are not literate, and 40.6% are literate. It indicates that training for community awareness must be more intense and use of written and printed material may have little importance to them. Either the literacy rate must be increased or the community awareness programme must be more of activity oriented or in the form of workshops that involve every individual in person.
- ✓ Around 33.3% out of the 640 respondents have an opinion that the region is prone to flood. 33.8% feel that the region is vulnerable to Tsunami, while 5.3% are of the opinion that the region is prone to earth quake and 27.7% feel that there could be fire accidents. The fear of occurrence exists. Equally, the respondents also fear that there would be flooding and stagnation of water due to heavy rains as there is no proper sewage or drainage system. Moreover, they are not sure about the evacuation and relocation plan. It is essential for the authorities to undertake a vulnerability assessment along with capacity and resource availability assessment. The region should be tested for any occurrence of the disaster. **Disaster history** should be recorded both historical as well as from memory of occupants. It is essential to conduct a **scientific analysis** based on meteorological, geological, hydrological, environmental, and epidemiological aspects.
- ✓ Majority of the respondents have experienced disaster earlier. Most of the respondents are victims of Tsunami. They have been affected by the Tsunami and have experienced the trauma of the after effects of the event. Most of the respondents are fishermen community and have been able to recover from the event. They have indeed lost everything including their

kith and kin. Destruction of structural and nonstructural properties has caused many to lose their belongings and valuables. Such community experience can indeed be used as a very strong base to build a strategy and learn from the past experience on the shortcomings. 51.7% of the respondents have experienced disaster while 48.3% have not experienced disaster.

- ✓ It was found from the analysis that around 309 that is 48.3% of the respondents out of 640 have been trained to cope with disaster while 51.7% have not been trained. Clarity is lacking when asked details of specific disasters. Only a few have a planned evacuation system.
- ✓ The respondent's had different source through which they were trained. 19.2% of them have been trained by Non government organizations, while 12.8% were trained by government authorities, 16.2% claim that they were trained by family and friends while this question was not applicable to 51.7% of the respondents.
- ✓ The analysis and interpretation leads to a conclusion that only 74.8% of the respondents claim that their homes are built to withstand the catastrophic event, while 25.2% said no when asked if their homes were built to withstand catastrophic event. Eventually, when inspected by expert committee who accompanied the researcher, found that the homes did not comply with the safety standards and were not in hygienic conditions.
- ✓ The analysis leads to a finding where the respondents claim to have rebuilt or renovated their homes in various time spans. 20.3% of the respondents claim that they have renovated the house in the last 12 months. 23% have renovated in last 1-3 years while 56.7% had renovated the house within the last 5 years that is 3-5 years.

- ✓ It is found that 48.8% of the respondents possess the knowledge to analyze the loss if disaster strikes whereas, 51.2% have no knowledge of the extent of loss if disaster strikes. As most of them are not aware of the loss if disaster strikes, they may not be prepared for mitigation and recovery measures. When planning a community awareness program it is essential to cover up the financial strategies for managing the economic impact of natural disasters.
- ✓ Out of the 640 respondents, 67.2% of them have Senior citizens who need help during disasters while 32.3% have no senior citizens dwelling at home. Training needs to be imparted to voluntary groups and disaster recovery personnel to handle elderly senior citizens during disaster. Medical help along with comfortable evacuation plan for senior citizens needs to be considered.
- ✓ It is found that most of the respondents have no basic idea for alternative plans to rescue the senior citizens. They will be dealt with in a similar way like any other person. Hence, it is very essential to impart training to deal with senior citizens during community awareness programs.
- ✓ Out of the 640 respondents, 46.4% have taken precaution for loss reduction while 53.6% have not taken any precaution to reduce the loss. The importance of mitigation and insurance should be emphasized during the awareness program. Hazard mapping and the mitigation process should also be highlighted in a community awareness programme.
- ✓ The respondents have given a high priority to Early warning system with a Mean of 4.47, with second highest priority to Vulnerability assessment for mitigation of losses which has obtained a mean of 4.36. The third importance is given to the communication system with a mean of 4.22.

- ✓ The findings clearly depicts that 44.7% have planned their communication about survival to other family members while 55.3% have not planned the communication of survival to other family members. The importance of such systematic communication plan within the family as well as the communication required externally should be emphasized in the community awareness program. The strategic planning should include policies required for a strong communication plan.
- ✓ The findings reveal the ranking of respondents for preferred contacts for communication about survival. The highest priority is given to close relative living within state limits with a mean of 6. The second preferred contact is Friends with a mean of 5.2. The third priority is given to close relative living in distant place with a mean of 5.12.
- ✓ Out of the 640 respondents, 35% of the respondents have made arrangements and are aware of the Early warning system while 65% are not aware of the Early warning system. The most essential points to be considered during strategic planning for community awareness on disaster management is to emphasize on the common alert system which can be understood and followed by all. Currently radio and loud speaker announcement by the rescue workers/ authorities/ police personnel to fishermen community are the only method of EWS adopted. It is important that the early warning system is quick, reliable and economical to reach the entire city.
- ✓ The respondents have prioritized the Government as the highest ranked / preferred source for Early Warning system with a mean of 7.36. Radio is ranked second by the respondents having a mean of 6.97. The T.V., Family members and Friends are prioritized as 3rd, 4th, and 5th rank with a mean of 6.55, 4.4, and 3.68 respectively.

- ✓ The community must be motivated to participate in meetings and training camps. Only 38.6% of the respondents attend the community meeting once in a month while 43.9% attend the meeting once in three months and 17.5% attend meeting once in six months.
- ✓ Out of the 640 respondents it is found that only 59.4% agree that there is appropriate place for conducting meeting and discussion while 40.6% do not agree that there is appropriate place for discussion or conducting the meeting. They feel that the place of meeting and discussion selected should be free of any religious /community background.
- ✓ As regards the programs or activities during the meeting, the respondent's views were as follows. 87.5% of the respondents agree that the major part of most of the meetings will revolve around community development issues while 6.9% will be religious gathering and 5.6% on entrepreneurial training programs.
- ✓ It is found from the analysis that 28.9% of respondents are aware of Hazard mapping while 71.1% are not aware of the Hazard mapping. The community must be aware of the various hazards and the likeliness of its occurrence. The probability and severity of its occurrence must be transparently discussed with all stake holders for proactive approach to disaster management.
- ✓ The community must be trained to do the Physical, Social, Economic and Environmental assessment of vulnerability. Only 22.3% of 640 respondents are aware of the assessment of vulnerability while a majority of 77.7% is not aware of the assessment of vulnerability.
- ✓ It is observed that each have their own evacuation plan, it is not a coordinated effort. This will create more chaos if it is not channelized properly, hence it is essential to clearly define and draft a single plan with

alternative action plan. Though 58.1% of the respondents are aware of the evacuation plan while 41.9% are not aware of the evacuation plan

- ✓ A check list to ensure that the community is really aware of the communication plan must be done. If majority of them are dependent on telephone lines, then a telephone line jam may cause disruption of communication. 59.5% of the respondents have communication plan in case of Emergency while 40.5% of them do not have a communication plan.
- ✓ It is essential to record every data with a local hospital for immediate reference during emergency. It is found from the analysis that only 83.4% of the total 640 respondents are aware of the location of the nearby hospital which can be approached in case of emergency during disaster. A percentage of 16.6 of the respondents are not aware of the nearby hospital.
- ✓ It is also essential to include the information regarding readily available specialty services offered at nearby hospitals during training program. It is found that only few of the respondents are aware of the speciality services offered by the hospital.
- ✓ Fishermen Community members must be taught important skills that can support them as an alternative source of income in case they may not be allowed to go to the sea due to bad weather conditions. This will help them to earn a decent living without being dependent on relief measures or other indigenous money lenders. Plan must include capacity building measures. It is found from the analysis that 14.4% of the respondents have made arrangements of alternative source of income and 85.6% have not made any arrangements for alternative source of income.
- ✓ More such activities have to be included during the community awareness program so that people within the community help each other during emergency before professional help can arrive. Only 12.5% of the

respondents are trained to help people in need of artificial respiration while 87.5% are not trained to treat people in need of artificial respiration. During the strategic planning of community awareness program, activities like mock drills, first aid, do's and don'ts guidelines must be included according to the need of the stake holders.

- ✓ It is found that 98% of the respondents are willing to attend training programs if offered to them regularly while 13 of them constituting 2% are not willing to attend the training program as they fear of loosing their daily wages. It is essential to consider the convenience of the participants and their availability for the programs.
- ✓ It is found that one must take into consideration the convenient preferred time for such programs and split the activities to suit requirements. 22% of the respondents out of 640 prefer early morning sessions while 60.2% prefer evening sessions for the training program. 17.8% expressed their wish to attend a late evening session as the most convenient time for conducting training program.

FINDINGS FROM STATISTICAL ANALYSIS

- ✓ **The importance given by the respondents to the initiatives to reduce the vulnerability:** Majority of the respondents have ranked the entrepreneurial ventures as the first and most important initiative to reduce the vulnerability with a mean of 4.95. Skills enhancement and Training & Development occupies the second and third preferred initiative with a mean of 4.77 and 4.62 respectively. The 4th and the 5th position is given to Capacity building to cope with disaster and Vulnerability assessment for mitigation of losses with a mean of 4.4 and 3.23 respectively. Psychological /moral boosting and resistance & Resilience have been the 6th and 7th preferred initiatives with a mean of 3.07 and 3.03 respectively.

- ✓ **The ranking list of intense problems encountered commonly among community after disaster:** Majority of the respondents express an opinion that the Basic amenities and hygiene is the most intense problem that is ranked first with a mean of 8.04. They have expressed concern about the Source of Income which is the second major problem with a mean of 7.7. The third and fourth important problems that are commonly encountered by community are Rehabilitation and Food/water for family with a mean of 7.38 and 6.86. The fifth, sixth and seventh problems that disturb the community are Availability of safe shelter, Safety for women and Children and Relocation issues with a mean of 5.96, 5.64 and 5.33 respectively. Other problems that the community encounters are ranked eighth, ninth and tenth and they are Communication to family, with a mean of 3.49, Education for Children with a mean of 3.1 and Torture by counterparts with a mean of 1.32
- ✓ There is significant difference between age groups with respect to importance of initiatives to reduce the vulnerability. Multiple comparison tables show the significant differences between the age groups.
- ✓ Frequency of meetings make significance in the community to take initiatives to reduce the vulnerability
- ✓ There is significant difference between literacy with respect to importance of initiatives to reduce the vulnerability.
- ✓ There is significant difference between Preparation & Training with respect to importance of initiatives to reduce the vulnerability.
- ✓ Disaster faced earlier has impact on importance of initiatives to reduce the vulnerability
- ✓ Awareness of Hazard mapping helps to take initiatives to reduce the vulnerability.

- ✓ Training in artificial respiration (CPR) helps to take initiatives to reduce the vulnerability.
- ✓ There is association between Literacy and preparation & training to cope up with the event.
- ✓ There is no association between literacy and alternative source of income.
- ✓ There is association between family income and precautions for loss reduction
- ✓ There is association between age and convenient timing to conduct training.
- ✓ There is association between age and preparation & training to cope up with the event.
- ✓ There is association between age and knowledge to analyze the loss if disaster strikes.
- ✓ There is association between literacy and knowledge to analyze the loss if disaster strikes.
- ✓ There is association between disaster faced earlier and renovation of building.
- ✓ There is association between literacy and alternative arrangements for loss reduction.
- ✓ There is association between literacy and precaution for loss reduction.
- ✓ There is association between age and precautions for loss reduction
- ✓ There is association between literacy and communication about survival
- ✓ There is association between literacy and assessment of vulnerability.
- ✓ There is association between literacy and communication in case of emergency.
- ✓ There is association between awareness of hazard mapping and communication about survival.

- ✓ There is association between experience of disaster and the residence which is system built.
- ✓ There is association between the type of disaster faced and the system based house.
- ✓ There is association between the type of disaster faced and training received.
- ✓ There is association between training and analyze the loss if disaster strikes.
- ✓ There is association between training received and awareness of early warning system.
- ✓ There is association between frequency of meeting and awareness of early warning system.
- ✓ It is inferred that factor 1 that is, Activities With intense Community Participation is a combination of 4 original variables such as Capacity building to cope with disaster, trained voluntary groups for rescue operations, Early warning system and Evacuation plan. Factor 2 that is, Activities with intense Expert participation is a combination of 3 original variables Vulnerability Assessment for mitigation of losses, Communication system in place and Hazard mapping to find the probability of occurrence.
- ✓ It is inferred that factor 1, Safety kit for survival is a combination of six original variables such as Children's basic needs, First aid & medication, Water cans / bottles, Food for three days, Clothes for change and Basic needs for elders. Factor 2, Safety kit for identification and convenience is a combination of 4 original variables Documents like ration card, important papers to prove identity, Torch lights / Batteries and Blankets, Whistle, Candle.

- ✓ It is inferred that factor 1, Initiative for reducing vulnerability based on individual needs is a combination of 4 original variables such as Skills enhancement, Capacity building cope with disaster, Psychology and moral boosting to cope with disasters and Vulnerability assessment for mitigation of losses. Factor 2, Initiative for reducing vulnerability based on Group needs is a combination of 3 original variables Training and development, Entrepreneurial ventures and Resistance & resilience.
- ✓ It is inferred that factor 1, Measures required for survival is a combination of 4 original variables such as Availability of basic needs, Availability of safety kit, Safe shelter and rescue and Proper medication. Factor 2, Measures required for safety & preparedness is a combination of 2 original variables Training to cope and Pre- planned evacuation. Factor 3, Measures required for established infrastructure & reliable support is a combination of 2 original variables Early warning system and Timely help from Government / authorities.

SPECIFIC FINDINGS

The specific findings are based on the prime objectives of the research study.

- ✓ The research study is undertaken to understand the Strategic planning process for community awareness on disaster management.
- ✓ To examine the community awareness on risk reduction measures of the most affected coastal regions of Thiruvallur district.
- ✓ To analyze the literacy and training level among community to cope with disaster
- ✓ To identify factors that contribute to the initiatives to reduce vulnerability
- ✓ To find and list out the safety kit and loss reduction measures in disaster management
- ✓ To analyze the challenges encountered by community during and after disaster
- ✓ To conceptualize the relationship between hazard/disaster assessment, risk management, and actions for Disaster Management.
- ✓ To evolve a cyber infrastructure for disaster Management.

**FINDINGS ON THE STRATEGIC PLANNING PROCESS FOR
COMMUNITY AWARENESS ON DISASTER MANAGEMENT**

- ✓ It is found from the study that the following tasks are essential for the strategic planning process for community awareness on Disaster management.
 - Develop an Internal work plan
 - Get necessary approval from respective authorities for executing the plan well in advance
 - Compile all relevant information
 - Process and disseminate data and required information to all levels and all stake holders
 - Convene planning among the stake holders and communicate the plan and intention.
 - Allocate responsibilities and accountability with deadlines.
 - Execute the task
 - Consultation with experts and ultimate stake holders
 - Disseminate the outcome and results
 - Follow up every action
 - Monitor the progress and evaluate.
 - Take corrective measures if required.

**FINDINGS ON EXAMINING THE COMMUNITY AWARENESS ON
RISK REDUCTION MEASURES OF THE MOST AFFECTED
COASTAL REGIONS OF THIRUVALLUR DISTRICT**

- ✓ The community awareness on risk reduction measures was based on their experience and knowledge. Majority of the respondents have responded that the place is prone to the Tsunami disaster. This indicates that the region is highly vulnerable and requires to be reconstructed to withstand the calamity. 33.3% of the respondents have an opinion that the place is prone to Flood and 33.8% have felt that the place is prone to Tsunami while 5.3% have an opinion that there may be earth quake and 27.7% have an opinion that the place is prone to fire accidents.
- ✓ It is found that the community members are required to be updated and trained on the evacuation plan during different situations. It is observed that each have their own evacuation plan, it is not a coordinated effort. This will create more chaos if it is not canalized properly, hence it is essential to clearly define and draft a single plan with alternative action plan. 58.1% of the respondents are aware of the evacuation plan while 41.9% are not aware of the evacuation plan. The Essential point to be considered during strategic planning for community awareness on disaster management is that the evacuation plan is understood appropriately and unanimously agreed upon.
- ✓ It is found that the community is not fully aware of a specific communication plan. 59.5% of the respondents have communication plan in case of Emergency while 40.5% of them do not have a communication plan. Essential point to be considered during strategy planning for community awareness on disaster management is to

organize and train the community on a various methodology of communication during different crisis situation. A check list to ensure that the community is really aware of the communication plan must be done. If majority of them are dependent on telephone lines, then a telephone line jam may cause disruption of communication.

- ✓ Though majority of the respondents are aware of the name and the location of the nearby hospital, they have their own preference for admission incase of disaster. The preference of hospitals that is nearby is based on the financial capacity of the individual and the accessibility and the trust & service treatment provided by the hospitals.83.4% of the total 640 respondents are aware of the location of the nearby hospital which can be approached in case of emergency during disaster. A percentage of 16.6 of the respondents are not aware of the nearby hospital. The strategic planning for community awareness on disaster management should include awareness program on government arranged hospitals for such services. It is essential to record every data with a local hospital for immediate reference during emergency.65.6% of the respondents prefers hospital that is located in 3 km from the residential area. 6.6% prefer a hospital that is within 6 km and .90% prefers a hospital that is within 10 km. 10.3% prefer a hospital that is located above 10 km from the residential area.
- ✓ It is found that only 19.5% of the respondents are aware of the facilities and services available in the hospital whereas 80.5% of the respondents are not aware of the facilities and services offered by the hospital. The strategic planning for community awareness on disaster management should include awareness program on various services and facilities provided by every hospital so that the patient is taken to the right

- hospital for the right kind of attention needed. It is essential to include the information regarding readily available specialty services offered at nearby hospitals during training program.
- ✓ The findings state that only 2% of the total respondents are aware of the blood group of the people residing in the area as they regularly organize blood donation camp where as 98% are not aware of the blood group of the community. Emphasis on record of blood group list must be made available at the community development office for emergency purpose.
 - ✓ The respondents are located in the interiors where the services of the fire station may or may not be able to reach the place due to unplanned concentrated, congested layout of the houses. 75.5% of the respondents say that the fire station is around 3 km from their homes, while 8.6% say it is within 6 km. 1.9% say that it is within 6 to 10 km and 14.1% indicate that the fire station is located more than 10 km away. This clearly indicates that they are not sure or aware of the services of the fire station.
 - ✓ It is observed that the majority of the respondents rely on the religious records maintained in their respective place of worship than the data sheet available by the government authorities. 75.8% agree that there is record available on the number of members in each family, while 24.2% do not know about the number of members in each family.
 - ✓ Majority of the respondents who have undergone the Preparation & Training for disaster have shown keen initiative to reduce the vulnerability. This also shows that respondents are aware of the importance of the initiatives to reduce the vulnerability.
 - ✓ From the analysis it is found that there is association between age and knowledge to analyze the loss if disaster strikes.

- ✓ From the Analysis of Variance test it is found that there is association between awareness of hazard mapping and communication about survival.
- ✓ It is proved and found from the Analysis of Variance that there is association between frequency of meeting and awareness of early warning system.

FINDINGS FROM THE ANALYSIS ON THE LITERACY AND TRAINING AMONG COMMUNITY TO COPE WITH DISASTER

- ✓ It is found from the research that majority of the respondents are not literates but can converse in the local language with ease. The majority of the respondents constituting 59.4% are illiterate and 40.6% are literate. Majority of the respondents are not literate. Though almost all of them are good in spoken language, they are not in a position to read or write in the regional language Tamil.
- ✓ It is found from the research that out of 640 respondents only 48.3% are prepared to cope with disasters while 51.7% are not prepared and trained to cope with disasters. Essential Points to be considered during Strategic Planning: It is to be noted that the respondents are prepared and trained only in certain aspects of disaster preparedness. Though a clear understanding on evacuation plan, communication to family members, Emergency contact details, emergency needs for children and elderly etc are still to be worked out. Only a few of them have been trained for artificial respiration in case of emergency. First aid training needs to be imparted.
- ✓ NGO's have played a major role in the training programme apart from the initiatives taken by the government. . It is found that they were

responsible for the education, training of the majority of the respondents 51.7% of respondents are not prepared to cope with disaster and hence this question is not applicable to them. Out of the balance of 48.3% who have been trained, 19.2% are trained by NGO's, 12.8% by Government authorities, 16.2% by family and friends. Majority of the respondents who are trained and prepared to cope with the disaster agree that they are prepared and trained to cope with disasters from NGO's

- ✓ Hazard mapping is one of the most important aspects during the Disaster preparedness stage. Though these are undertaken by professionals and technical people from the local authoritative it is essential for the community to be aware of the outcome of the Hazard mapping tests. 28.9% of respondents are aware of Hazard mapping while 71.1% are not aware of the Hazard mapping. Essential point to be considered during strategic planning for community awareness on disaster management: The community must be aware of the various hazards and the likeliness of its occurrence. The probability and severity of its occurrence must be transparently discussed with all stake holders for proactive approach to disaster management.
- ✓ It is found that the community where the research was undertaken, that the majority of the community are not aware of the assessment of vulnerability. 22.3% of 640 respondents are aware of the assessment of vulnerability while a majority of 77.7% is not aware of the assessment of vulnerability. Essential point to be considered during strategic planning for community awareness on disaster management: The community must be trained to do the Physical, Social, Economic and Environmental assessment of vulnerability

- ✓ First aid on (CPR) Artificial respiration is one of the training modules which are essential for first hand help during emergency. Only 12.5% of the respondents are trained to help people in need of artificial respiration while 87.5% are not trained to treat people in need of artificial respiration. Essential point to be considered during strategic planning for community awareness on disaster management: More such activities have to be included during the community awareness program so that people within the community help each other during emergency before professional help can arrive.
- ✓ Majority of them are not trained to provide first aid service in case of emergency. 42.8% of the respondents are trained to provide first aid while 57.2% are not trained to provide help on first aid to injured people. Essential point to be considered during strategic planning for community awareness on disaster management: During the strategic planning of community awareness program, activities like mock drills, first aid, do's and don'ts guidelines must be included according to the need of the stake holders.
- ✓ It is found that Literate respondents understand the importance of preparation & Training. From the t-test it is found that there is association between Literacy and preparation & training to cope up with the event
- ✓ It is found that illiterate respondents find any kind of support through alternative source of income by taking up petty jobs. From the analysis it is found that there is no association between literacy and alternative source of income.
- ✓ It is found that there is association between age and preparation for training to cope with any catastrophic event. The maturity ,age and

experience plays an important role in realizing the importance of preparation and training to cope with the event. There is association between age and preparation & training to cope up with the event.

- ✓ It is evident from the analysis and found that there is association between literacy and knowledge to analyze the loss if disaster strikes. Literate respondents understand the importance of analyzing the loss if disaster strikes.
- ✓ The analysis proves that there is association between literacy and alternative arrangements. Literate respondents understand the necessity of alternative arrangements for coping with disaster.
- ✓ The statistical analysis proves and it is found that there is association between literacy and communication in case of emergency. Literate respondents are able to plan the communication in case of emergency.
- ✓ The type of disaster faced by the respondents has influenced the training received by the respondents. There is association between the type of disaster faced and training received. The alternative hypothesis is accepted.
- ✓ The statistical analysis has proved that there is association between training and analysis of the loss if disaster strikes. Trained respondents are able to analyze the extent of damage or loss if disaster strikes.
- ✓ The analysis has made it evident that the respondents who have undergone training are the ones who are aware of the early warning system. There is association between training received and awareness of early warning system. The alternative hypothesis is accepted

FINDINGS ON FACTORS THAT CONTRIBUTE TO THE
INITIATIVES TO REDUCE VULNERABILITY

- ✓ **FEAR OF LOOSING HOMES:**
STEPS TAKEN TO MAKE THE HOUSE SYSTEM-BUILT TO WITHSTAND DISASTER: 74.8% of respondents have residence which is system built to withstand any catastrophic event. 25.2% have residents that are not built to withstand any catastrophic event. 20.3% of the respondents have renovated their residence within the last 12 months, while 23% have renovated within one to three years. 56.7% of the respondents have renovated between three to five years.
- ✓ **KNOWLEDGE OF LOSS IF DISASTER STRIKES:** 48.8% of 640 respondents have got the knowledge to analyze the loss if Disaster strikes while 51.2% do not have the knowledge to analyze the loss. As most of them are not aware of the loss if disaster strikes, they may not be prepared for mitigation and recovery measures. When planning a community awareness program it is essential to cover up the financial strategies for managing the economic impact of natural disasters.
- ✓ **AWARENESS/KNOWLEDGE ON AVAILABILITY OF ALTERNATIVE ARRANGEMENTS/ PRECAUTION TO BE TAKEN TO FACE THE CRISIS:** 31.9% of respondents have made alternative arrangements to face crisis situation while 68.1% have not made any arrangements. It is to be noted that most of the respondents have no basic idea for alternative plans to rescue the senior citizens. They will be dealt with in a similar way like any other person. Hence, it is very essential to impart training to deal with senior citizens during community awareness programs.

- ✓ **KNOWLEDGE ON MITIGATION PROCESS:**46.4% have taken precaution for loss reduction while 53.6% have not taken any precaution to reduce the loss. The importance of mitigation and insurance should be emphasized during the awareness program. Hazard mapping and the mitigation process should also be highlighted in a community awareness programme
- ✓ **AWARENESS OF COMMUNICATIOON SYSTEM:** 44.7% have planned their communication about survival to other family members while 55.3% have no not planned the communication of survival to other family members. The most essential aspect in disaster preparedness is the communication plan. The importance of such systematic communication plan within the family as well as the communication required externally should be emphasized in the community awareness program. The strategic planning should include policies required for a strong communication plan.
- ✓ The ranking of respondents for **preferred contacts** for communication about survival. The highest priority is given to close relative living within state limits with a mean of 6. The second preferred contact is Friends with a mean of 5.2. The third priority is given to close relative living in distant place with a mean of 5.12. The neighbors are preferred contacts with a mean of 4.31 and a ranking of 4th position. Distant relative, nearby hospitals have been prioritized as 5th and 6th ranking with a mean of 3.61 and 2.98 respectively. There are a few who are not willing or do not have a preferred contacts for communication about survival and it has the least mean of 1.42.
- ✓ **FREQUENCY OF MEETINGS:** 38.6% of the respondents attend the community meeting once in a month while 43.9% attend the meeting once in three months and 17.5% attend meeting once in six months. The

community must be motivated to participate in meetings and training camps.

- ✓ **FACILITY FOR MEETINGS:** 59.4% agree that there is appropriate place for conducting meeting and discussion while 40.6% do not agree that there is appropriate place for discussion or conducting the meeting. The place of meeting and discussion selected should be free of any religious /community background.
- ✓ **REDUCING LOSS BY MAKING ALTERNATIVE SOURCE OF INCOME:** 14.4% of the respondents have made arrangements of alternative source of income and 85.6% have not made any arrangements for alternative source of income. Fishermen Community members must be taught important skills that can support them as an alternative source of income in case they may not be allowed to go to the sea due to bad weather conditions. This will help them to earn a decent living without being dependent on relief measures or other indigenous money lenders. Plan must include capacity building measures
- ✓ **REALIZING THE IMPORTANCE OF TRAINING:** 98% of the respondents are willing to attend training programs if offered to them regularly while 13 of them constituting 2% are not willing to attend the training program as they fear of losing their daily wages due to this. It is essential to consider the convenience of the participants and their availability for the programs.
- ✓ One must take into consideration the convenient preferred time for such programs and split the activities to suit requirements. 22% of the respondents out of 640 prefer early morning sessions while 60.2% prefer evening sessions for the training program. 17.8% expressed their wish to

attend a late evening session as the most convenient time for conducting training program.

- ✓ It is found and proved by the statistical analysis that there is association between disaster faced earlier and renovation of building. Respondents who have faced the disaster earlier understand the importance of the renovation of the houses to meet the catastrophic event.
- ✓ The importance given by the respondents to the initiatives to reduce the vulnerability. Majority of the respondents have ranked the entrepreneurial ventures as the first and most important initiative to reduce the vulnerability with a mean of 4.95. Skills enhancement and Training & Development occupies the second and third preferred initiative with a mean of 4.77 and 4.62 respectively. The 4th and the 5th position is given to Capacity building to cope with disaster and Vulnerability assessment for mitigation of losses with a mean of 4.4 and 3.23 respectively. Psychological /moral boosting and resistance & Resilience have been the 6th and 7th preferred initiatives with a mean of 3.07 and 3.03 respectively.
- ✓ Respondent's age has an impact on the initiatives to reduce the vulnerability. There is significant difference between age groups with respect to importance of initiatives to reduce the vulnerability. Multiple comparison tables show the significant differences between the age groups.
- ✓ Frequency of meetings makes significant impact in the community to take initiatives to reduce the vulnerability. The more the meetings organized, they realize the importance of reducing the vulnerability.
- ✓ Statistical analysis proves that the Disaster faced earlier has impact on importance of initiatives to reduce the vulnerability.
- ✓ From the research analysis it is found that awareness of Hazard mapping helps to take initiatives to reduce the vulnerability.

- ✓ Extra training on the CPR training in artificial respiration helps to take initiatives to reduce the vulnerability.
- ✓ It is proved that there is association between literacy and assessment of vulnerability. The more literate a respondent is , he/she is aware of the importance of assessment of vulnerability.
- ✓ Experience of facing the disaster has an impact on making arrangements to renovate the house to cope with the disaster event. There is association between experience of disaster and the residence which is system built.

FINDINGS ON LIST OF SAFETY KIT AND LOSS REDUCTION

MEASURES DURING DISASTER MANAGEMENT

- ✓ **LOSS REDUCTION MEASURES:** The respondents have given a high priority to Early warning system with a Mean of 4.47, with second highest priority to Vulnerability assessment for mitigation of losses which has obtained a mean of 4.36. The third importance is given to the communication system with a mean of 4.22. The respondents have given fourth ranking to trained voluntary groups for rescue operations. The fifth priority ranking goes to Evacuation plan with a mean of 4.12. The respondents have prioritized the Hazard mapping to find the probability of occurrence in the sixth position with a mean of 3.99 and the last ranking to Capacity building to cope with disaster with a mean of 3.85.
- ✓ Currently radio and loud speaker announcement by the rescue workers/ authorities/ police personnel to fishermen community are the only method of EWS adopted. It is important that the early warning system is quick, reliable and economical to reach the entire city. 35% of the respondents have made arrangements and are aware of the Early warning system while 65% are not aware of the Early warning system.

The respondents have prioritized the Government as the highest ranked / preferred source for Early Warning system with a mean of 7.36. Radio is ranked second by the respondents having a mean of 6.97. The T.V., Family members and Friends are prioritized as 3rd, 4th, and 5th rank with a mean of 6.55, 4.4, and 3.68 respectively. A mean of 2.52, 2.32, and 2.24 were given to Neighbors, Voluntary organization and the NGO's with a 6th, 7th and 8th rank respectively. Though the preference were ranked by the respondents on the source of Early warning system, it is essential to analyze the feasibility and access, authenticity and reliability of the source of information dissemination during the disaster.

- ✓ **MEETINGS EXCLUSIVELY TO BE ARRANGED FOR DISASTER PREPAREDNESS ACTIVITY:** It is found that very less importance is given to the disaster management and preparedness meeting. 87.5% of the respondents agree that the major part of most of the meetings will revolve around community development issues while 6.9% will be religious gathering and 5.6% on entrepreneurial training programs. The community awareness programmed should be well programmed.
- ✓ Statistical analysis has proved that there is association between family income and precautions for loss reduction.
- ✓ It is proved there is association between age and convenient timing to conduct training.
- ✓ The analysis proves that there is association between literacy and precaution for loss reduction. The literacy level has an impact on the loss reduction measures.
- ✓ The analysis states that there is no association between age and precautions for loss reduction.

- ✓ The statistical analysis proves that there is association between literacy and communication about survival
- ✓ It is evident from the research analysis that there is association between the type of disaster faced and the system based house. It is found that factor 1 is a combination of 4 original variables such as Capacity building to cope with disaster, trained voluntary groups for rescue operations, Early warning system and Evacuation plan. Factor 2 is a combination of 3 original variables Vulnerability Assessment for mitigation of losses, Communication system in place and Hazard mapping to find the probability of occurrence
- ✓ From the statistical analysis it is evident that factor 1 is a combination of six original variables such as Children's basic needs, First aid & medication, Water cans / bottles, Food for three days, Clothes for change and Basic needs for elders. Factor 2 is a combination of 4 original variables Documents like ration card, Important papers to prove identity, Torch lights / Batteries and Blankets, Whistle, Candle
- ✓ From the research study it is found that factor 1 is a combination of 4 original variables such as Availability of basic needs, Availability of safety kit, Safe shelter and rescue and Proper medication. Factor 2 is a combination of 2 original variables Training to cope and Pre- planned evacuation. Factor 3 is a combination of 2 original variables Early warning system and Timely help from Government / authorities.

**FINDINGS ON ANALYSIS OF THE CHALLENGES ENCOUNTERED BY
COMMUNITY DURING AND AFTER DISASTER**

- ✓ **ARRANGEMENT TO HELP SENIOR CITIZENS:** Training needs to be imparted to voluntary groups and disaster recovery personnel to handle elderly senior citizens during disaster. Medical help along with comfortable evacuation plan for senior citizens needs to be considered. 67.2% of 640 respondents have senior citizens at home who need help while 32.8% do not have senior citizens at home.
- ✓ The most common challenges are the **availability of basic amenities, health and hygienic living**. The ranking list of intense problems encountered commonly among community after disaster. Majority of the respondents express an opinion that the Basic amenities and hygiene is the most intense problem that is ranked first with a mean of 8.04. They have expressed concern about the Source of Income which is the second major problem with a mean of 7.7. The third and fourth important problems that are commonly encountered by community are Rehabilitation and Food/water for family with a mean of 7.38 and 6.86. The fifth, sixth and seventh problems that disturb the community are Availability of safe shelter, Safety for women and Children and Relocation issues with a mean of 5.96, 5.64 and 5.33 respectively. Other problems that the community encounters are ranked eighth, ninth and tenth and they are Communication to family, with a mean of 3.49, Education for Children with a mean of 3.1 and Torture by counterparts with a mean of 1.32.
- ✓ From the statistical analysis it is found that factor 1 is a combination of 4 original variables such as Skills enhancement, Capacity building cope with disaster, Psychology and moral boosting to cope with disasters and

Vulnerability assessment for mitigation of losses. Factor 2 is a combination of 3 original variables Training and development, Entrepreneurial ventures and Resistance & resilience.

**FINDINGS ON THE RELATIONSHIP BETWEEN HAZARD
ASSESSMENT, RISK MANAGEMENT AND DISASTER MANAGEMENT
ACTION.**

- ✓ The component hazard assessment will include Exposure analysis; Hazard forecasting, Vulnerability and resource allocation.
- ✓ Risk Management will ensure an in depth study on the Risk context, Identifying the type of risk, Analysis of Risk, Evaluate the risk and Treat the risk based on the Exposure Analysis, Hazard forecasting and Vulnerability analysis.
- ✓ The disaster management action will include Mitigation, Preparedness, Response and Recovery based on the Risk Identified, Analysis of intensity of risk and its severity, Evaluation of risk and its treatment.
- ✓ Hence, the three aspects Hazard Assessment, Risk Management and Disaster Management Actions are inter-related to each other. A diagrammatic representation of the relationship is shown in this research study. Reference to Page number 233, 234 and 235 respectively can be made for a better understanding.

**FINDINGS ON THE FACTORS THAT CONTRIBUTE TO BUILD A
CYBER INFRASTRUCTURE FOR DISASTER MANAGEMENT
THAT HELPS COMMUNITY AWARENESS PROGRAM**

- ✓ Resources are seen as a major and integral factor that helps to build a cyber infrastructure. Resources include Physical resources, Human Resources, Communication Resources, Technological resources, and Economic resources. Resource scheduling, Monitoring and Managing Resources is an important and challenging task.
- ✓ Equipments are required to support and implement the disaster management plans. Collaborative tools, Laboratory tools, Mobile field equipment, Sensors, Communication equipments, Networks and GIS are a few important infrastructural requirements for smooth functioning of the plans.
- ✓ Expertise advice and support is required. Disaster management specialist, Decision support analyst, Researchers, Hardware engineers, Software developers, and Technical support engineers are required to support the cyber infrastructure.
- ✓ Data collection and Integration should be done appropriately by experts. Information should be collected from scattered sources. Evaluate each step and each information for authenticity. Standardization of information, integration and monitoring and motivating Data collection centers should be done.
- ✓ Link up all stake holders in the process
- ✓ Knowledge Resources like database systems, Knowledge extraction, Data mining tools, Navigational tools, Simulation tools, Advanced Applications, Algorithm and models should be put to optimum use.
- ✓ Disaster Management plans like Disaster Assessment plan; Risk Management Plan, Disaster Mitigation strategy; Disaster preparedness plan,

Disaster action plan and Disaster Recovery plan should be executed and informed to all channels and all levels using the cyber infrastructure.

EDUCATIONAL IMPLICATIONS / SOCIETAL
IMPLICATIONS OF COMMUNITY AWARENESS
IN DISASTER MANAGEMENT

- To educate and make communities aware of the types of hazards that might affect them as well as the procedures to follow before, during and after a disaster
- To make communities aware of their vulnerabilities and risks
- To educate communities of the best disaster risk management practices that they could use or apply to daily living and community development so that the impacts of disasters on their communities can be substantially reduced or mitigated
- To properly plan and prioritize disaster awareness programmes in order to fully utilize limited resources
- To integrate this strategy with the awareness programmes of other agencies to reflect agency collaboration and co-operation in delivery of awareness programmes.
- To develop a greater level of understanding of roles and responsibilities of disaster management and emergency response agencies

SUGGESTIONS
&
RECOMMENDATIONS

SUGGESTION AND RECOMMENDATIONS

Disaster Planning & Management

Suggestive Strategies, Recommendations and Action Plan for Disaster Mitigation, Prevention and Preparedness:

Government of India has taken several initiatives for strengthening disaster reduction strategies. Government of India constituted an Expert Group to examine the related issues and evolve recommendations for improving preparedness and prevention with respect to natural disasters caused by earthquakes, floods and cyclones.

Issues to be addressed

The following areas have to be examined to verify and check the current status of work being carried out in these areas:

- | | |
|---|---|
| <ul style="list-style-type: none"> ✓ Monitoring of Hazards ✓ Vulnerability Assessment ✓ Prediction and Forecasting ✓ Retrofitting of Existing Unsafe Structures and Buildings | <ul style="list-style-type: none"> ✓ Hazard Mapping ✓ Disaster Risk Assessment and Mapping ✓ Preparation of Building Guidelines ✓ Assessing Gaps in the Above. Filling them as much as possible |
|---|---|

The following reports must be prepared and be made transparent to the public:

- Identification of various hazard prone areas.
- Vulnerability and Risk Assessment of Buildings
- Disaster damage scenarios,
- Technical Guidelines for Hazard Resistant Construction of Buildings.
- Upgrading of Hazard Resistance of Existing Housing Stock by Retrofitting, and
- Techno-Legal Regime to be adopted

It is recommended strongly that these need to be urgently considered for evolving a national policy. The first and the foremost is to restructure the National Policy on disaster management reflecting the holistic approach involving **prevention, mitigation and preparedness in pre-disaster phase** with appropriate additional funding, along with the so far existent policy of the *post-disaster relief and rehabilitation* under crisis management.

- **Creation of awareness** for disaster reduction is urgently needed amongst policy makers, decision makers, administrators, professionals (architects, engineers and others at various levels) financial institutions (banks, insurance, house financing institutions) and NGOs and voluntary organizations.
- **Creating awareness for improving preparedness amongst the communities**, using media, school education, and the network of the building centre.
- **Appropriate amendments** in the legislative and regulatory instruments (state laws, master plans, development area plan rules, building regulations

and bye-laws of local bodies) along with **strengthening of the enforcement mechanisms** at different levels.

- **Capacity building at local and regional levels** for undertaking rapid-assessment surveys and investigations of the nature and extent of damage in post disaster situations.
- **Conducting micro-zonation surveys of large urban areas** falling in the disaster prone regions and preparing appropriate preparedness and mitigation plans on an urgent basis.
- **To ensure use of disaster resistant construction techniques in all housing and other buildings** to be undertaken under the Central and State schemes.
- **Making mandatory, the use of disaster resistant codes and guidelines** related to disaster resistant construction in the houses and buildings in all sectors of the society by law and through incentives and disincentives.
- **To create a suitable institutional mechanism at national/state level to advise and help the existing disaster relief set up in formulation and updating of short and long range action plans** for the preparedness, mitigation and prevention of natural disasters. (the mechanisms suggested are establishment of a National Scientific and Technical Committee at Central level and Natural Disaster Mitigation Centers at State levels).
- To promote the study of natural disaster prevention, mitigation and preparedness as **subjects in architecture and engineering** curricula.
- **To create detailed database** on hazard occurrences, damage caused to buildings and infrastructure and the economic losses suffered and ensure its accessibility to interested researchers for effective analysis of costs of disasters and benefits of imitative actions.

- **To devise appropriate policy instrument and funding support** for urgent disaster preparedness and prevention actions in high risk areas including upgrading the resistance of existing housing and related structures and systems.
- **To include R&D work in disaster preparedness, mitigation and prevention as a *thrust area*** so that adequate funds are earmarked for the schemes of R&D organizations as well as the concerned Central Ministries and State Governments.
- **Database:** on various resources, skills, and services required for relief at short notice. It will have information on safety equipments, oxygen cylinders and various other equipments, skills and other information required to deal with emergency.
- **Logistics:** One of the most difficult problems to be handled is the organization of supply chain for relief. Several colleagues at IIMA also developed logistics system for Collectorate at Bhuj. This system could not be integrated with the GIS system so that supplies could be tracked right up to the village. This needs to be done. Likewise, other elements of logistics need to be put in place.
- **Technological Needs:** Whole range of technical questions regarding buildings, cutting concrete slabs, rescue and relief emerged which needed to be solved on the spot. The best practices have to be put in use.
- **Self Reliance:** The community self-reliance, lot of aid led to excessive inventory at the household level leading to reduced incentives for work and self-help. Likewise, there were areas where communities came together to help each other. The lessons of community self-help need to be put together. A database of volunteers who can move at short notice will need to be developed.

- **Communication Infrastructure:** This is a serious problem and has to be resolved once for all. It will require network of ham radios, use of All India Radio, setting up help lines, etc. We will also have to create information dissemination system and develop mechanism for capacity building.
- **Emergency Preparedness:** Drills will have to be organized to keep society prepared for dealing with such emergencies. One will have to learn from the experience of other similar drills.
- **Forecasting:** Wherever possible, disasters which can be anticipated over time or space need to be looked into. For instance, buildings erected on land fill areas which were wet lands or low lying areas were more likely to get damaged, as was borne out by the recent evidence
- **Disaster Mitigation & Vulnerability Atlas of India:** A combination of local hazard intensity and vulnerability of existing house types has been used for carrying out risk analysis given in the district-wise tables. The Vulnerability Atlas, thus, provides ready macro-level information for use by the authorities for natural disaster mitigation and preventive actions. Recognizing the usefulness of the Vulnerability Atlas for formulating proactive policies to face the threat of natural hazards, is being brought to the notice of the development planners, decision makers, professionals and householders.

To reduce the long-term impact of disasters, and to achieve sustainable growth, affected countries must (i) assign financial resources for prevention and mitigation of the foreseeable impact of disasters, and (ii) ensure that once disasters occur, reconstruction investments incorporate vulnerability-reduction measures. This latter point should be underscored in light of reconstruction efforts undertaken by many countries. In most cases, we

observe that vulnerability is reconstructed along with destroyed assets, mainly because of scarce resources available beyond the emergency and humanitarian assistance stage.

- ✓ Literacy among community should be emphasized.
- ✓ Capacity building measures will ensure speedy recovery measures.
- ✓ Alternative source of earning should be taught
- ✓ Community must be able to understand the evacuation and danger signals for which training must be imparted.
- ✓ Statistical data should be available to note the relief needs.
- ✓ SHG's among women should be more productive, efficient and sustainable for which training, counseling and consultancy are required
- ✓ Addresses of Adequate hospitals, first aid help and other sources of relief should be informed to the women as well.
- ✓ Local Women must be included in decision making process for relief measures.
- ✓ Disasters do not happen in a void. Climatic and geomorphologic events have natural causes as well as those associated with socially reduced or increased vulnerability. It is important to understand these key concepts when designing and planning policies to reduce human suffering.
- ✓ Post-disaster response involves not only the management of an emergency. The way in which reconstruction needs are filled can either reconstruct previous vulnerability or include appropriate mitigation and prevention measures that will allow the country to better manage risk in the future. When recurrence of events is certain within short time cycles, they are fundamental to keeping the country's development process on track.

- ✓ The answers to the following questions will let us know our status and need. What types of needs – short, medium and long term – emerge after a disaster, and what types of approach do they require? Are there any positive outcomes of disasters? Short-term time recovery brings increased activity and demand in some sectors, namely construction, but disasters can also jumpstart change in structures and organizational arrangements by making obvious the need for greater resilience. Changes can include better preparation, monitoring, the creation of early warning and contingency plans, reinforcement of infrastructures, financial provisions, etc. How can one ensure that governments and communities take advantage of the post-disaster “window of opportunity”? What type of policies should they choose? From the viewpoint of macroeconomic policy, the key questions are: how much money does the government need to finance the reconstruction costs and how quickly can it obtain it while remaining within the framework of sustainable fiscal policy? To answer this question we need to know what interventions are required how to identify them and prioritize among them. Three types of issues need clarification:
- Methodological: performing a needs assessment vs. a causal analysis of the disaster
 - Operational: setting priorities; differentiating between different types of assessment depending on the disaster phase
 - Policy: translating the assessment into policy: resource allocation vs. policy change promotion.

Family Emergency Plan

- Identify an **out-of town contact**. It may be easier to make a long-distance phone call than to call across town, so an **out-of-town contact** may be in a better position to communicate among separated family members.
- One must be sure every member of the family **knows the phone number** and has a cell phone, **coins**, or a **prepaid phone card** to call the emergency contact. If one has a cell phone, program that person(s) as "ICE" (In Case of Emergency) in the phone. If one is in an accident, emergency personnel will often check your ICE listings in order to get a hold of someone the person may know. One must make sure to tell the family and friends that they have listed them as emergency contacts.
- Teach family members how to use text messaging (also known as SMS or Short Message Service). Text messages can often get around network disruptions when a phone call might not be able to get through.
- Subscribe to **alert services**. Many communities now have systems that will send instant text alerts or e-mails to let you know about bad weather, road closings, local emergencies, etc.

ROLE OF GOVERNMENT IN IMPROVING RISK INFORMATION AND EARLY WARNING.

- Establish an initiative for countrywide risk assessment
- Review the availability of risk related information and capacities for data collection and use.
- Assess capacities and strengthen early warning system
- Develop communication and dissemination mechanism for disaster risk information and early warning.

Disaster Management Information System must be built in every district of the country linked with each other, available on the web and also in public libraries. We should know where the inventories are available of critical equipments, skills; resources and information and how one can access them on voluntary or payment basis. The database of various services and infrastructure in private, public and voluntary sectors should be updated regularly. Every college should take responsibility for collecting and updating information about certain categories of services or equipments. Simple information such as about ham radio operators can be put on the web without fail.

- Just as we have national services scheme, we must now think of national disaster management volunteers who would receive training and be empowered to organize themselves as effective teams for helping local communities around them. No amount of state help can substitute for community based structures for self help. Supreme Court had passed judgments and given advice for starting courses on disaster management in various educational institutions. Have we ever monitored how many such courses exist and what quality of preparedness has been achieved?
- In cases where fishing communities or island based indigenous / tribal communities have been affected very severely, long term rehabilitation plans have to be initiated. These plans must learn from the mistakes made in earlier rehabilitation projects.
- There is very important need to document the experience of the damage caused and ensuing suffering along with the coping strategies of local communities and administration. Some novel lessons would emerge.
- One of the major problems in relief is that what is needed where is often not known to the people who want to provide support. The result is that lot of

materials get wasted or misdirected. We need to put a spreadsheet immediately on the web pointing out village wise needs, contact persons' names and addresses so that civil society efforts can be targeted more efficiently. We had tried to put an inventory management system in place after Gujarat earthquake with the help of our students and faculty. The students had stacked the relief material received from all over the country in Kutch and given assorted sheets to the Relief Commissioner. Where we failed was to link this system with GIS so that one could track the deliveries, collect the response and also avoid pilferages. It will be useful if some of the IT firms in Chennai would volunteer to create such a GIS so that people can update the demand and supply information and every unit of material is optimally utilized.

- The psychological rehabilitation is no less important. The children affected by the shock and tragedy are particularly vulnerable. The arrangements for adoption of orphan children with proper community care have to be put in place.
- It is very disheartening to hear that in large number of cases of dead people, the Public Health authorities have been reportedly hesitant in maintaining proper records. It might save the state and central governments some money from the compensation fund but it would certainly inflict damage on the social conscience of the society. If the rehabilitation funds reach late, they are as good as not given. Unless central government ensures delivery of compensation through community control systems within next 24 hours, the fairness in the system will become more and more difficult to achieve with every passing day. While we still need immediate help, the long-term rehabilitation must be simultaneously planned.

IMPORTANT REQUIREMENTS

- The first and the foremost is to restructure the National Policy on disaster management reflecting the holistic approach involving prevention, mitigation and preparedness in pre-disaster phase with appropriate additional funding, along with the so far existent policy of the *post-disaster relief and rehabilitation* under crisis management.
- Creation of awareness for disaster reduction is urgently needed amongst policy makers, decision makers, administrators, professionals (architects, engineers and others at various levels) financial institutions (banks, insurance, house financing institutions) and NGOs and voluntary organizations.
- Creating awareness for improving preparedness amongst the communities, using media, school education, and the network of the building center.
- Appropriate amendments in the legislative and regulatory instruments (state laws, master plans, development area plan rules, building regulations and bye-laws of local bodies) along with strengthening of the enforcement mechanisms at different levels.
- Capacity building at local and regional levels for undertaking rapid-assessment surveys and investigations of the nature and extent of damage in post disaster situations.
- Conducting micro-zonation surveys of large urban areas falling in the disaster prone regions and preparing appropriate preparedness and mitigation plans on an urgent basis.
- To ensure use of disaster resistant construction techniques in all housing and other buildings to be undertaken under the Central and State schemes.

- Making mandatory, the use of disaster resistant codes and guidelines related to disaster resistant construction in the houses and buildings in all sectors of the society by law and through incentives and disincentives.
- To create a suitable institutional mechanism at national/state level to advise and help the existing disaster relief set up in formulation and updating of short and long-range action plans for the preparedness, mitigation and prevention of natural disasters. (The mechanisms suggested are establishment of a National Scientific and Technical Committee at Central level and Natural Disaster Mitigation Centers at State levels).
- To promote the study of natural disaster prevention, mitigation and preparedness as subjects in architecture and engineering curricula.
- To create detailed database on hazard occurrences, damage caused to buildings and infrastructure and the economic losses suffered and ensure its accessibility to interested researchers for effective analysis of costs of disasters and benefits of mitigate actions.
- To devise appropriate policy instrument and funding support for urgent disaster preparedness and prevention actions in high risk areas including upgrading the resistance of existing housing and related structures and systems.
- To include R&D work in disaster preparedness, mitigation and prevention as a *thrust area* so that adequate funds are earmarked for the schemes of R&D organizations as well as the concerned Central Ministries and State Governments.

CONCLUSION

CONCLUSION

Vulnerability to disaster is a function of both physical and social factors. The former includes exposure to such risks as tsunami, earthquakes and floods. The latter involves social arrangements and expectations related to such statuses as gender and age. Part of the vulnerability of the community is socially constructed, involving existing barriers to the full participation of community members in society and the failure to devote time and resources to more fully protect people including children, despite the fact that children represent a society's most valuable social capital and its future.

However, community members should not be seen merely as potential victims of disaster (Enarson 1998). Although often less visible, the community does carry out immunity portent disaster-related functions, including preparedness and response activities that often reflect their traditional role of caregiver (Fothergill 1996). Yet few members of the community represent an under-utilized resource in both developed and developing societies. They have the potential to make greater contributions to their own safety as well as that of others. Attention needs to be given to developing ways in which community can participate more fully in disaster prevention, preparedness, response, and recovery efforts, for which it is to impart literacy among people. Literate community members will be more responsible and will understand the importance of such training program for disaster preparedness. Moreover, literacy will also enhance their skills and empower them to perform better and earn a decent living without being dependent. From the research it is evident that literacy plays an important role in determining the role the community can play in restructuring and risk reduction

measures. Basic and Foundation classes to educate the masses should be the first and foremost effort of the Government and the NGO's along with other skill development classes that they have planned. Children, too, are more than potential victims of disaster. They represent the gateway to creating a culture of prevention in society. They can be taught the value of prevention and encouraged to play a **proactive role** in disaster reduction efforts, including conservation and ecological activities that increase protection from floods and other natural disasters. The international community can help developing countries meet the far greater challenge they face regarding the exposure of community to disaster risks by giving more attention to the most common issues. One of a growing number of positive signs in this respect is that the World Bank is investigating gender in relation to the experiences of Honduras and Nicaragua following Hurricane Mitch, which struck in 1998.

STRATEGY TO PLAN THE RISK REDUCTION MEASURES FOR THE FOLLOWING DISASTERS

MEASURES FOR EARTHQUAKE RISK REDUCTION

For better understanding of all the possibilities of earthquake risk reduction, it is important to classify them in terms of the role that each one of them could play. Therefore, in the pre-earthquake phase, preparedness, mitigation and prevention are concepts to work on. Post-disaster, immediate rescue and relief measures including temporary sheltering soon after an earthquake until about 3 months later and re-construction and re-habilitation measures for a period of about six months to three years need to follow. To encapsulate, the most effective measures of risk reduction are pre-disaster mitigation, preparedness and preventive measures to reduce vulnerability and expeditious, effective rescue and relief actions immediately after the occurrence of the earthquake. **Depending upon the**

calamity and its consequences, strategies can also be divided into long term (five to fifteen years), medium term (one to five years) and short term (to be taken up immediately in high risk areas). Since it has been realized that earthquakes don't kill people but faulty constructed buildings do, the task of reducing vulnerability of structures and buildings will be the key to earthquake risk reduction. Also, pre-disaster preparedness through a post-earthquake response plan, including **training** of the concerned personnel in various roles, is considered essential for immediate and effective response after an earthquake occurrence.

STRATEGIC PLANNING FOR COMMUNITY AWARENESS ON PRE-DISASTER PREVENTIVE MEASURES FOR EARTH QUAKE

Long-term measures

- Re-framing buildings' codes, guidelines, manuals and byelaws and their strict implementation. Tougher legislation for highly seismic areas.
- Incorporating earthquake resistant features in all buildings at high-risk areas.
- Making all public utilities like water supply systems, communication networks, electricity lines etc. earthquake-proof. Creating alternative arrangements to reduce damages to infrastructure facilities.
- Constructing earthquake-resistant community buildings and buildings (used to gather large groups during or after an earthquake) like schools, dharamshalas, hospitals, prayer halls, etc., especially in seismic zones of moderate to higher intensities.
- Supporting R&D in various aspects of disaster mitigation, preparedness and prevention and post-disaster management.

- Evolving educational curricula in architecture and engineering institutions and technical training in polytechnics and schools to include disaster related topics.

Medium term measures

- Retrofitting of weak structures in highly seismic zones.
- Preparation of disaster related literature in local languages with dos and don'ts for construction.
- Getting communities involved in the process of disaster mitigation through education and awareness.
- Networking of local NGOs working in the area of disaster management

STRATEGIC PLANNING FOR COMMUNITY AWARENESS ON FLOOD MANAGEMENT

MEASURES FOR RISK REDUCTION DURING FLOOD

Flood Disaster Management

The various measures adopted for flood mitigation may be categorized into two groups:

- Structural
- Non- structural

The general approach was aimed at preventing floodwaters from reaching the potential damage centers, as a result of which a large number of embankments came up along the various flood prone rivers. The main thrust of the flood

protection program undertaken in the country so far in the form of structural measures may be grouped into the following:

- Dams and Reservoirs
- Embankments, flood walls, sea wall
- Natural detention basin
- Channel improvement
- Drainage improvement
- Diversion of floodwaters.

The effective functioning of all the physical measures taken, it is necessary that pre- and post-monsoon checks must be made special repairs must be carried out prior to flood period. The non-structural measures, on the other hand, aim at modifying the susceptibility to flood damage as well as modifying the loss burden. The various non-structural measures being implemented in the country are: Modifying the susceptibility to flood damages through:

- *Flood plain management*
- Flood proofing including disaster preparedness, and response planning and
- Flood forecasting and Warning

Modifying the flood loss burden through:

- Disaster Relief
- Flood fighting including Public Health Measures

Setting up of flood forecasting and warning services is one of the most cost-effective non- structural measures available.

Preparedness against Floods

Within the overall master plan for the state, there has to be a contingency plan for each district, involving steps required to be taken before the onset of floods during the floods and post- flood management. The following would be some of the essential components of flood preparedness: -

By the Department Concerned

- ✓ "Pre Monsoon Inspection" of all railway tracks, canals and drains by respective departments, which could include silt and details clearance from seasonal rivulets.
- ✓ Regular clearance of the drains from silt and weeds to make the drainage system fully functional and restoration of natural drainage blocked by roads, railway tracks and canal.
- ✓ Regular maintenance of embankments of rivers canals, distributors etc. and regular check of the canals and siphons and clearing them from silt.
- ✓ Clearing of storm water and sewerage drains in towns before monsoon.
- ✓ Constitution of committees comprising of heads of all emergency services, medical, police, transportation and the district administration to ensure proper co- ordination during the crisis.

By the State and District Administration

- ✓ Review of Contingency Plan.
- ✓ Update/ Modify it, if deemed necessary
- ✓ Co- ordinate with NGOs/ CBOs.
- ✓ Review and visit to likely places for evacuation to ensure their functional availability and make people aware of the warning dissemination mechanism

Response Mechanism: On receipt of warning of the impending disaster, part of the immediate response has to be to warn people. In the case of floods and cyclones, enough early warning time is normally available for this purpose. Existing procedures lay down dissemination procedures on the part of the Government agency concerned- through print and electronic media as well as informing the authorities concerned. It is the secondary reach to all the people in the likely affected areas that is the responsibility of the District administration especially to those people who have no access to mass media modes. This could be by beat of drums, sounding of sirens, village gongs, if any or by word of mouth. Some local means needs to be evolved and be kept in place to ensure that people come to know of the impending calamity and to take suitable follow- up action to save their lives and property as also to help the neighborhood wherever they can.

STRATEGIC PLANNING FOR COMMUNITY AWARENESS ON CYCLONE

MEASURES FOR CYCLONE RISK REDUCTION

Possible Risk Reduction Measures

Risk Assessment: The evaluation of risk for a tropical cyclone is a relatively straightforward process. A hazard map should be prepared for any given year. The following information could be used to estimate the probability of storms of cyclones of various intersections that may strike different parts of the county.

- Analyses of climatologically records to determine how often tropical cyclones have struck- their intensities and locations.
- History of wind strengths, frequencies, height and location of storm surges frequencies of flooding.
- Information about tropical cyclone occurrences in the past 50-100 years over the ocean adjoining the part of the country in question.

a) An Integrated Warning/Response System

Specific preparedness measures to counter the impact of tropical cyclones may be classified into two categories:

- Those of long term or seasonal nature, which need to be planned, implemented and operationally tested and co-ordinated by means of simulation exercise well before a seasonal threat commences. Among these are pre-season co-ordination meetings at headquarters, district and local levels, at which operational contingency plans are reviewed

and amended, training and community preparedness programs conducted and community lifelines.

- Those of a short-term nature, which relate to a state of readiness to cut in once a contemporary cyclone threat is announced. Among these are domestic, vocational and animal husbandry arrangements to safeguard the survival, property assets and livelihoods of individual families and communities.

b) Public Warning System

The three main objectives in a tropical cyclone warning are:

- To alert the people to the danger by announcing the existence of a threat due to a cyclone.
- To identify the areas where people will be actively threatened by cyclone and where communities should monitor further warning announcements, and
- To call the people to action by recommending specific preparedness activities, which may be part of, and integrated warning/response plan to protect vulnerable resources.

STRATEGIC PLANNING FOR COMMUNITY AWARENESS ON **DROUGHT**

MEASURES FOR DROUGHT MANGEMENT

The strategy for this management is basically threefold.

- Close monitoring of the emerging drought scenario so as develop an advance warning system
- Relief measures required for providing immediate succor to the affected population and the upkeep of the cattle wealth, and if possible to integrate it with long term objectives and
- Hammering out an alternative crop strategy for maximum possible retrieval.

Since drought prediction methods are at a very nascent stage, IMD has made efforts to provide a long range forecast of monsoon rainfall. In 1988, a parametric power regression model was developed on the basis of global and regional meteorological and oceanic parameters (physically related monsoon and rainfall) for estimating the monsoon rainfall of India. The model is successful in estimating the correct nature of monsoon and can be utilized for drought mitigation planning. IMD carries out rainfall monitoring unto district level on a real time basis.

All this helps in estimating the drought conditions over any particular region

STRATEGIC PLANNING FOR COMMUNITY AWARENESS ON **TSUNAMI**

What to do before and during a Tsunami

The following are guidelines for what you should do if a tsunami is likely in your area:

- **Turn on your radio** to learn if there is a tsunami warning if an earthquake occurs and you are in a coastal area.
- **Move inland to higher ground** immediately and stay there.
- **Stay away from the beach.** Never go down to the beach to watch a tsunami come in. If you can see the wave you are too close to escape it.
- **Caution - If there is noticeable recession in water away from the shoreline this is nature's tsunami warning and it should be heeded.** You should move away immediately.

What to Do After a Tsunami

The following are guidelines for the period following a tsunami:

- **Stay away from flooded and damaged areas** until officials say it is safe to return.
- **Stay away from debris in the water;** it may pose a safety hazard to boats and people.
- **Save yourself - not your possessions**

DO'S AND DON'T'S DURING DISASTER

EARTHQUAKE FACT SHEET

- **Learn about an earthquake's causes and effects. Speak about them in a calm and composed manner, not spreading anxiety about the phenomenon.**
- **Keep a torch and a portable transistor radio handy.**
- **Keep the corridors in the house clear of furniture and toys, making movement easier.**
- **Attach shelves, gas cylinders, vases and flowerpots to the walls of your home.**
- **Place heavy or bulky objects on the floor or on the lowest shelves.**
- **Teach all members of your family how to turn off the electricity, water and gas supply.**

During an earthquake

- **Keep calm and help others do that.**

If you are at home or inside a building

- **Do not rush to the doors or exits; never use the lifts; keep well away from windows, mirrors, chimneys and furniture.**
- **Protect yourself by staying under the lintel of an inner door, in the corner of a room, under a table or even under a bed.**

If you are in the street

- Walk towards an open place in a calm and composed manner. Do not run and do not wander round the streets.
- Keep away from buildings, especially old, tall or detached buildings, electricity wires, slopes and walls, which are liable to collapse.

If you are driving

- Stop the vehicle away from buildings, walls, slopes, electricity wires and cables, and stay in the vehicle.

After an earthquake

- Keep calm, switch on the radio/TV and obey any instructions you hear on it.
- Keep away from beaches and low banks of rivers. Huge waves may sweep in.
- Expect aftershocks. Be prepared.
- Turn off the water, gas and electricity.
- Do not smoke and do not light matches or use a cigarette lighter.
- Do not turn on switches. There may be gas leaks or short-circuits.
- Use a torch.
- If there is a fire, try to put it out. If you cannot, call the fire brigade.
- If people are seriously injured, do not move them unless they are in danger.
- Immediately clean up any inflammable products that may have spilled (alcohol, paint, etc).

- If you know that people have been buried, tell the rescue teams. Do not rush and do not worsen the situation of injured persons or your own situation.
- Avoid places where there are loose electric wires and do not touch **any** metal object in contact with them.
- Do not drink water from open containers without having examined it and filtered it through a sieve, a filter or an ordinary clean cloth.
- Eat something. You will feel better and more capable of helping others.
- If your home is badly damaged, you will have to leave it. Collect water containers, food, and ordinary and special medicines (for persons with heart complaints, diabetes, etc.)
- Do not re-enter badly damaged buildings and do not go near damaged structures.
- Do not walk around the streets to see what has happened. Keep clear of the streets to enable rescue vehicles to pass.

Dos and Don'ts DURING CYCLONES

- Listen to the radio for advance information and advice. Allow considerable margin for safety. A cyclone may change direction, speed or intensity within a few hours, so stay tuned to the radio for updated information.

If storm-force winds or severe gales are forecast for your area, then...

- Store or secure loose boards, corrugated iron, rubbish tins or

anything else that could become dangerous.

- Tape up large windows to prevent them from shattering.
- Move to the nearest shelter or vacate the area if this is ordered by the appropriate government agency.

When the storm hits...

- **Stay indoors and take shelter** in the strongest part of your house.
- **Listen to the radio** and follow instructions.
- **Open windows** on the sheltered side of the house, if the roof begins to lift.
- **Find shelter** if you are caught out in the open.
- **Do not go outside** or into a beach during a lull in the storm.

Community resilience requires the following processes:

1. **Communications and Coordination** – A key to effective hazards management is effective communication. This is especially true for hazards like tsunamis and flash floods, since inundation arrival times may be measured in just minutes. Such a “short-fused” event requires an immediate, careful, systematic and appropriate response.

2. **Warning Reception** – Warning points and community Emergency Operations Centers (EOC) each need multiple and redundant pathways to receive warnings and to respond quickly.
3. **Warning Dissemination** – Upon receipt of warnings or other reliable information suggesting a hazard is imminent, local emergency officials should communicate the threat to as much of the population as possible.
4. **Community Preparedness** – Public education is vital in preparing communities to respond properly to threats. An educated person is more likely to take steps to receive warnings, recognize potentially threatening events, and respond appropriately to those events.
5. **Administration** – No program can be successful without formal planning

The international community also can help developing countries by initiating cooperative capacity building efforts aimed at the problem. Efforts focusing on prevention and preparedness are especially needed. Some of these types of activities have been implemented in the past few years. In collaboration with partner organizations, the nonprofit organization Geo Hazards International recently completed demonstration projects for increasing school safety in Ecuador and Nepal (Tucker 1999). These projects involved training local builders in earthquake-resistant design and construction practices, and raising hazard awareness among government officials, teachers, children, and parents. Such capacity building activity is needed on a wide scale in developing countries. In helping to reduce the impacts of disasters on the community, it would also help lift a major barrier to social and economic development in poor countries.

Disasters are clearly a development problem. First, because certain natural phenomena tend to have greater effects on developing countries than on developed countries. Second, because several structural factors associated with a low level of development exacerbate such effects. Third, because the negative impact of natural phenomena on the prospects for long-term development is considerably greater in less developed countries. Thus, confronting them in a systematic and coherent fashion must be an explicit objective of development strategies.

There is no one given behavior or pattern in the effects and scale of the damages caused by different disasters. Rather, the resulting pattern is determined by a combination of factors including the size of the economy and its situation before the event, the structure of production, the nature and scale of the phenomenon, the moment (time and duration) at which the disaster takes place, the degree of social organization and participation, political and institutional capacity, and the way in which the government, society and the international community face the problem. Thus, assessments of damages caused by natural disasters should include their highly disturbing effects on the emotional stability of affected populations and the dislocation of large population groups, with important impacts on social and political stability, in addition to valuing the direct losses and indirect effects on the economy and the environment.

The short, medium and long-term impact manifests in different ways (damages in economic and social infrastructure, changes of priorities, environmental changes, external or fiscal imbalances, inflationary processes, negative income redistribution, changes in demographic structure, etc.). The long-term macroeconomic effects are reflected in a large number of variables and may be summarized as a downtrend in per capita income. One of the most important

effects of a disaster is the immediate worsening of national living standards. This effect, albeit mostly concentrated in the directly affected population living in the area where the disaster was most violent, generally affects a country's entire population in one way or another. In some cases irradiation even reaches neighboring countries (migrations, vector transmission, increased risk due to deterioration in watersheds, reduced demand for imports, interrupted communications, etc.).

All things considered, the long-term effects of disasters call into question at least two aspects related to a country's development strategy: first, understanding that resources earmarked for preventing and mitigating the impact of natural phenomena are a very high-yield investment, both in economic and social and political terms, in line with long-term growth. Second, the spending actions and decisions that are taken once a phenomenon has arisen must be seen from the perspective of reducing vulnerability, in other words, in a combined reconstruction and transformation approach aimed at positively and increasingly reducing the degree of vulnerability and, therefore, improving the prospects for future development.

Taking stock of our research in this area allows us to identify what remains unknown or under researched. Several smaller, exploratory studies discussed here raise new issues that have not been systematically researched. Domestic violence, intensified in a disaster, is one such issue that needs further investigation. In addition, the areas of preparedness, recovery, and reconstruction contain gender differences, yet the data are minimal and the gaps are large. Furthermore, the relationship between childcare responsibilities, location in the disaster, and

chances of survival deserves greater analysis; as such a connection would have great practical and methodological implications.

In addition to the suggestions above, systematic quantitative analyses of casualties caused by disasters throughout the world disaggregated by gender, age, and socioeconomic status are needed to develop a more comprehensive understanding of the relative vulnerability of women and children. Research, including both carefully designed case studies and surveys, is also needed to better understand the similarities and differences between the risk exposure of women and children in developing and industrialized countries. In addition research is needed on the transferability of best practices and technology for reducing the vulnerability of the community from originating industrialized countries to developing countries. The evidence suggests that so far only modest transfers have occurred (Alexander 1997). Perhaps some policies to reduce the disaster-related vulnerability of women and children in developing countries and elsewhere would work best if they were integrated with other efforts aimed at protecting and improving the quality of life of citizens. For example, in some cases, rather than developing special programs that are difficult to sell to stakeholders, governments, NGOs, and private sector groups can most effectively address the vulnerability of the community when they also contemplate related actions, such as improving housing and educational facilities in at-risk communities.

Mechanisms developed in other sectors, such as micro finance and insurance, that have the potential to increase the capacity of poor women and children to meet the challenges posed by living in a hazardous environment also deserve full examination. This investigation would involve both research and the development of pilot and demonstration projects. Risk mapping in disaster-prone areas should identify the vulnerable population by sex and identify ways in which community

members are particularly at risk. The development of networks and community groups to discuss disaster preparedness, examine past experiences and decide on solutions should also be encouraged. Reporting of sex-differentiated mortality and morbidity data would improve field interventions. In camps for persons displaced by **natural** disasters registration for services such as food or health care should also be done by sex of recipient.

There has been a spectacular rise in relief funding in the last few years, and donors under pressure from relief and development agencies clamoring for increasing resources are raising questions about traditional approaches. Relief operations are coming under greater pressure to provide better quality of service and higher levels of cost-efficiency. A first step towards reducing the vulnerability and number of disaster victims would be to integrate community more fully into the planning and execution of disaster preparedness and relief schemes. The questionnaire used in the research study also covers a survey on the living conditions and building structures of the residents of Thiruvallur district. Disaster preparedness program should be seen as a Development program for Safe cities.

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APPENDIX

**“A STUDY ON STRATEGY PLANNING FOR COMMUNITY AWARENESS ON
DISASTER MANAGEMENT”**

(For Mother Teresa Women’s University-Research Scholar Latha Mazumder

PART A

1. Name: _____
2. Earning members in the family Gender: Male Female Transgender
3. Total income in the family
 Below 3000 3001-6000 6001-9000 9001 and above
4. Age: 21-30 31-40 41-50 51-60 60 above
5. Literacy Illiterate Literate (Can read & write in Tamil)
6. Number of Family members Adults Children Senior Citizens
7. Disasters your place of residence is prone to/ or has undergone in the past?
 Flood Tsunami Earth Quake Thunder Storm Epidemic Fire
8. Have you faced the Disasters earlier: Yes No?
9. Are you prepared and trained to cope with the event: Yes No
10. If Yes, by whom NGO Govt.Authorities Family/Friends Others

11. Is your building or residence system built to withstand any catastrophic event?
 Yes No
12. When was the last time your buildings/house renovated/ constructed?
 Before 12 months 1 to 3 years 3 to 5 years More than 5 years.
13. Did you analyze the loss you would incur if the disaster strikes?
 Yes No
14. Do you have a Senior citizen, physically challenged person in your family who
may need extra help during disasters/ evacuation? Yes No
15. Have you made alternative arrangements for helping them face the crisis?
 Yes No
16. a. Have you taken precautionary measures for loss reduction? Yes No

16 b) if yes, do you agree with the importance of the following activities according to their priorities.

Activities	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Hazard Mapping to find the probability of occurrence					
Vulnerability Assessment for Mitigation of losses					
Capacity building to cope with disaster					
Communication system in place					
Evacuation plan					
Trained voluntary group for rescue operations					
Early warning system					

17a). Have you developed a communication plan, decide a point of contact /

Name / number of a contact person, place incase a disaster strikes among

To inform about your survival so that others in your family are informed

Yes. No

17. b) If yes, prioritize whom you would prefer for a contact person incase a disaster strikes. (Rank 1 to 8, 8 for the highest preference and 1 for the least preferred)

- | | |
|--|--|
| <input type="checkbox"/> Distant relative | <input type="checkbox"/> Neighbors |
| <input type="checkbox"/> Friends | <input type="checkbox"/> Nearby hospitals |
| <input type="checkbox"/> Close relative living within state limits | <input type="checkbox"/> I have no contact person. |
| <input type="checkbox"/> close relative living in distant place | |

PART B

**SURVEY ON COLLECTIVE PLANNING & COMMUNITY AWARENESS ON
DISASTER MANAGEMENT**

18. Have you made arrangements for Early Warning systems or Emergency?

alert news in your community / residential area? Yes No

19. Which source would you prefer for a safe early warning system accurately? Please rank the order of preference Rank from 1 to 8, 8 for the highest preference and 1 for the least preferred)

- | | |
|---|--|
| <input type="checkbox"/> Neighbors | <input type="checkbox"/> Charity / Voluntary org |
| <input type="checkbox"/> Government authorities | <input type="checkbox"/> Friends |
| <input type="checkbox"/> T.V. | <input type="checkbox"/> Family members <input type="checkbox"/> NGO |
| <input type="checkbox"/> Radio | |

20. What according to you, should be prioritized to reduce the loss incurred during disaster (Rank from 1 to 8, 8 for the highest preference and 1 for the least preferred)

- | | |
|---|--|
| <input type="checkbox"/> Early warning system | <input type="checkbox"/> Timely Help from Government/Authorities |
| <input type="checkbox"/> Pre-Planned Evacuation | <input type="checkbox"/> Proper medication |
| <input type="checkbox"/> Training to cope | <input type="checkbox"/> Safe shelter and rescue |
| <input type="checkbox"/> Availability of safety kit | <input type="checkbox"/> Availability of basic needs |

21. Please rank the safety kit in order of preference if asked to prepare/plan for the disaster event that your area is prone to (Rank 1 to 10, 10 for the highest preference and 1 for the least preferred)

- | | |
|---|---|
| <input type="checkbox"/> Food for three days | <input type="checkbox"/> Documents like ration card |
| <input type="checkbox"/> Water cans/ bottles | <input type="checkbox"/> Clothes to change |
| <input type="checkbox"/> Torch lights/batteries | <input type="checkbox"/> Basic needs for elderly |
| <input type="checkbox"/> First aid and medication | <input type="checkbox"/> Blankets, whistle, Candle |
| <input type="checkbox"/> Children's basic needs | <input type="checkbox"/> Important papers to prove identity |

22. How often do you have meetings in your community?

Once in a month

Once in six months

Once in three months

Please specify

23. Do you have a community hall or fixed place for conducting discussions/ meetings in your community? Yes No

24. What forms a major part of the discussion in the meetings you conduct in your community?

Community development programs

Entrepreneurial training

Cultural

Religious meetings

Disaster preparedness

Government relief measures

25. Are you aware of hazard mapping? Yes No

26. Have you assessed the vulnerability of your region? Yes No

27. Do you have an evacuation plan for the community people? Yes No

28. Have you discussed the flow of communication in your community in case of emergency? Yes No

29. a. Are you aware of any hospital near your community? Yes No

29. b If so, how far is it from your community?

Within 3 km

3 -6 km

6-10 km

More than 10 km

30. Are you aware of the availability of bed capacity, emergency services, and trauma care in the hospital? Yes No

31. Have you made a list of blood groups of people residing in your community

Yes No

32. How far is the fire station service from your community?

Within 3 km

3 -6 km

6-10 km

More than 10 km

33. Have you thought of any alternative source of income? Yes No

34. Are you trained in artificial respiration CPR? Yes No

35. Are you trained to handle and help if first aid is required in the community?

Yes

No

36. If the following training is conducted regularly in the community hall, Will you attend? Yes No

a. Vulnerability assessment b. Capacity Building c. Hazard Assessment

37. What is the convenient timing for offering training to your community?

Early morning Afternoon Evening Late Evening

38. Have you got a count of the number of family members in each house in the community? Records Available No records available.

39. Please specify if you agree with the importance of initiatives to reduce the vulnerability of the community

Activities	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Training and Development					
Vulnerability Assessment for Mitigation of losses					
Capacity building to cope with disaster					
Resistance & Resilience					
Skills Enhancement.					
Psychology and moral boosting to cope with disaster.					
Entrepreneurial Ventures					

40. How would you rate the intensity of problems you might encounter after the disaster?

(Rank from 1 to 10, 10 for the problem with highest intensity and 1 for the least problem)

Availability of safe shelter Food and water for family Torture by male counterparts Safety for women and children Source of income Rehabilitation problems.

**EXPERT OPINION ON
STRATEGIC PLANNING FOR COMMUNITY AWARENESS IN DISASTER
MANAGEMENT
DELPHI TECHNIQUE-PHASE I**

1. What are the tasks generally involved in strategy planning for community awareness in disaster management? Please List them

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2. What are the conditions that facilitate the above tasks?

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3. What are the indicators that assess the progress of the above tasks?

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4. What are the challenges one faces in planning a strategy for community awareness for disaster management?

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5. Who are the stake holders in strategy planning for community awareness in disaster management?

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Thank You very much for your valuable opinion. Will get back to you for the second phase of expert opinion.

**EXPERT OPINION ON
STRATEGIC PLANNING FOR COMMUNITY AWARENESS IN DISASTER
MANAGEMENT
DELPHI TECHNIQUE-PHASE II**

1. Please number the following task logically according to the flow of events.

- ✓ Identify stake holders
- ✓ Assemble information
- ✓ Convene a planning and meeting with stake holders
- ✓ Develop an internal plan
- ✓ Get necessary endorsements and permission/approval
- ✓ Consult and outreach
- ✓ Monitor and Evaluate

2. What are the elements of community centered Early warning system?

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3. What are the strategies to build a culture of safety and resilience?

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4. What are the long term prevention strategies?

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5. How to invoke community participation?

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Thank You very much for your valuable opinion.

**EXPERT OPINION ON
STRATEGIC PLANNING FOR COMMUNITY AWARENESS IN DISASTER
MANAGEMENT
DELPHI TECHNIQUE-PHASE III**

Please list out the strategy to plan the risk reduction measures for the following disasters.

1. Risk reduction measures for coping with Earthquake

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2. Risk reduction measures for coping with Flood

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3. Risk reduction measures for coping with Cyclone

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4. Risk reduction measures for coping with Drought

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5. Risk reduction measures for coping with Tsunami

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Thank you very much for the expert opinion.

SOME PICTURES ON POST DISASTER SITUATION

FAMILIES UNAWARE OF EVACUATION PROCESS



LACK OF EARLY WARNING SYSTEM



EFFECTS OF LACK OF TRAINING AND COMMUNICATION PLAN



