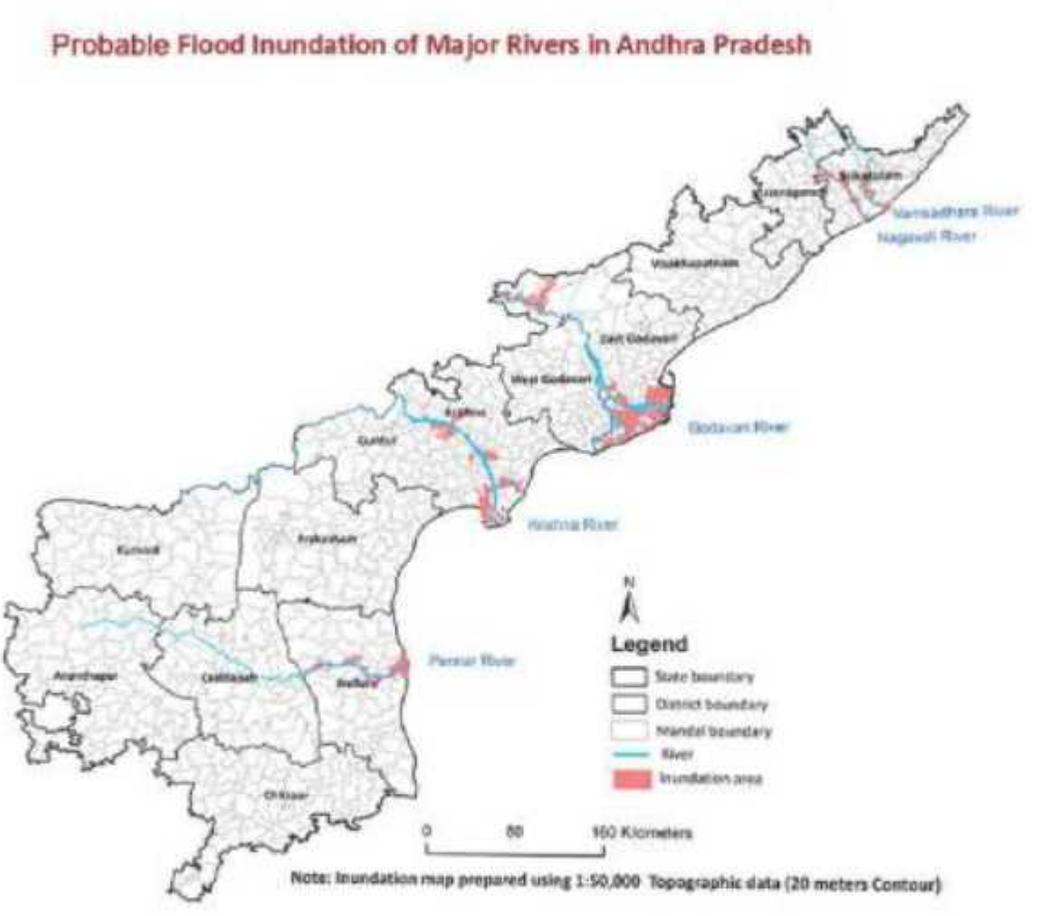
Chapter 3

Action Plan for Floods in Andhra Pradesh



3.1 Introduction

Flood is a temporary inundation of large regions as the result of an increase in reservoir, or of rivers flooding their banks because of heavy rains, high winds, cyclones, storm surge along coast, tsunami, melting snow or dam bursts. Floods are characterized as any high stream flow which overlap natural or artificial banks of a river or a stream and are markedly higher than the usual; and the inundation of low lands. Sometimes copious monsoon rains combined with massive outflows from the rivers cause devastating floods. Flooding is caused by the inadequate capacity within the banks of the rivers to contain the high flows brought down from the upper catchment due to heavy rainfall. Areas having poor drainage characteristics get flooded by accumulation of water from heavy rainfall. Flooding is accentuated by erosion and silting of the river beds resulting in reduction of carrying capacity of river channel, earthquakes and landslides leading to changes in river courses, obstructions to flow, synchronization of floods in the main and tributary rivers and retardation due to tidal effects.

In order to circumvent flood havoc, including flash flooding, preparation of an

emergency action is the need of the hour, comprising the activities as listed below

3.1.1 The Action Plan consists of the following activities:

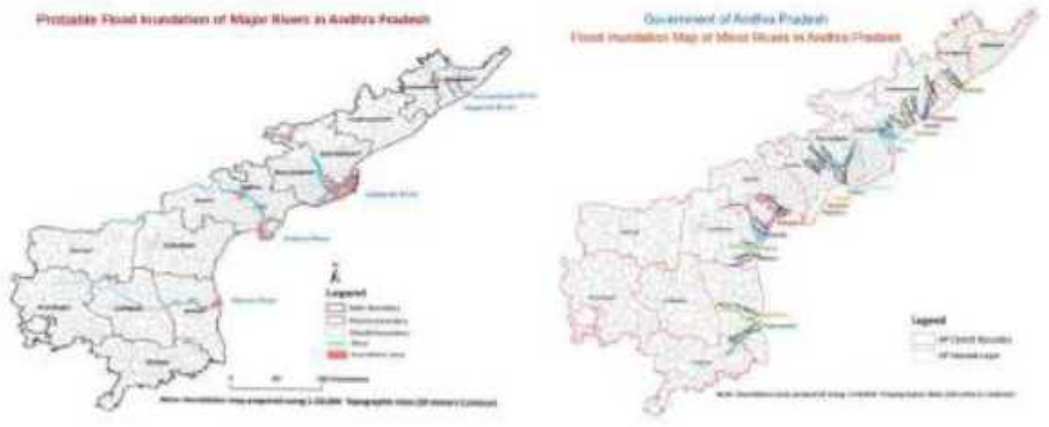
1. Identifying the main elements at risk;
2. Declaration of Flood disaster;
3. Flood Forecasting and Warning;
4. Trigger mechanism; and
5. Response mechanism of the concerned line departments alongside the tasks responsibilities of the official machinery.

3.1.2 Elements at Risk

Anything in the flood plains will get inundated. Buildings built of earth, weak foundations and water soluble materials will collapse endangering human beings and their property. Utilities like sewerage, water supply, communication lines, and power are put at risk. Food stock in the godowns (storage houses), agricultural fields, salt pans, livestock, vehicles, machinery and equipment's mounted on the ground, fishing boats are also put at risk.

3.1.3 Hazard Zones

According to Andhra Pradesh State Development Planning Society, the flood hazard zones for river Godavari are East and West Godavari; for Krishna river, it is Guntur and Krishna; for Pennar river the district affected is Nellore; and rivers Vamsadhara and Nagavalli affect Srikakulam district. The problem is intensified by factors like silting of riverbeds, reduction of carrying capacity of river channels, beds and banks leading to changes in river courses, obstructions to flow due to landslides, synchronization of floods in the main and tributary rivers and retardation due to tidal effect.



(source: APSDPS, download on 01052017.
http://www.apsdps.ap.gov.in/pages/early_warning_maps/vulnerability_maping_flood.html

It is estimated that 44% of AP's total territory is vulnerable to tropical storms and related hazards, while its coastal belt is the most vulnerable, especially the area covering more or less the entire coastal region. Along the coastline, the section between Nizampatnam and Machilipatnam is most prone to storm surges. The fertile Delta areas of the Godavari and Krishna rivers, which contribute substantially to the State's agricultural economy, experience recurrent flood and drainage problems.

Besides natural surges and outflow of waters from streams and rivers, floods are caused by peak discharges. As part of AP Hazard Mitigation and Emergency Cyclone Recovery Project (CERP), the Andhra Pradesh State Remote Sensing Application Center (APSRSAC), the Department of Statistics and Planning, GoAP, had prepared several 100-year return period maps for all major river systems by the Revenue (Disaster Management II) Department of GoAP in 2010. With a coastline of 974 kilometers, AP had experienced over 103 cyclones and resulting floods in the last century.

Devastating Tungabhadra Floods (2009)

The October-November 2009 floods in AP, occurred in Kurnool District which lies on the southern banks of Tungabhadra as well as Handri rivers. Normally, the river course receives small discharge up to 50,000 cusecs. However, by October 02, 2009 the river had received 2, 00,000 cusecs resulting in flood water entering the flanks of the river and inundating 80% of Kurnool town and surrounding areas. Similarly, the capacity of Tungabhadra river course was 4,00,000 cusecs. Mantralayam in Kurnool District along with other towns were severely affected due to the floods, a combined total of 87 Mandals; 525 villages were affected, which includes Kurnool, Mahbubnagar (now in Telangana State) and other surrounding districts.

An estimated 20.72 lakh people were affected due to the floods. Incessant rains and inevitable discharges from upstream reservoirs of Narayanpur and Tungabhadra dams were one of the primary reasons of unprecedented inundation in Kurnool and Mahbubnagar districts between 30th September and 3rd October 2009.

3.2 Declaration of Flood Disaster

The Andhra Pradesh Disaster Management Rules(2007) provide for the State Government to declare any area, where floods have occurred or likely to occur as a disaster affected area on the recommendations of the Commissioner, Disaster Management (Revenue) Department (CDM) or the concerned District Collector (s). The purpose of the declaration is to organize effective response in mitigating the flood effects. Such a declaration provides for wide powers and responsibilities to the CDM and the District Collectors in order to handle the incident effectively.

3.3 Flood Forecasting and Warnings

Flood forecasting is a process whereby the authorities are alerted to impending conditions where floods are likely occur. Flood forecasting requires understanding of meteorological and hydrological conditions and is therefore the responsibility of the appropriate government agencies such as IMD and Central Water Commission, they provide early warning in co-ordination with State Government Agencies such as Irrigation Department.

3.4 Community Based Flood Forecasting & Warning Systems

It is important that the people in each community receive information as early as possible about the possibility of flooding in their area. In addition to the valuable information from the official flood warning system, communities should attempt to develop their own warning systems. At community level, it is important that warnings are received by all individuals. The way in which messages are disseminated in communities will depend on local conditions, but may include some or all of the following devices:

a. Media warnings (both print and electronic)

b. General warning indicators for e.g., sirens, fire crackers, drum beating, etc., could be used

c. Warnings delivered to areas by community leaders or emergency services

d. Dedicated automatic telephone warnings to at-risk properties

e. Information about flooding and flood conditions in communities upstream. One approach to disseminating messages is to pass warning messages from village to village as the flood moves downstream

f. Keep watch and be regularly informed about the river level and embankment conditions in the local area. The monitoring of the river and embankment should be increased as the water level increases and crosses the critical danger level

g. A community-based warning system to pass any information about an approaching flood to every family.

f. Communities to be involved in data collection for flood forecasting, and the importance of their role is vital to reduce risk of flooding to communities. They could take care of installations/equipment, read rain and water level record, Radio operators to report real-time observations and provide info to the concerned authorities on time.

3.5 Procedure for Disseminating Warnings to Remote Areas

The communities in remote areas may not be able to receive the types of warnings described in the previous section. Responsibilities need to be defined clearly for lower tiers of administration and the emergency services to have pre-defined links with communities in remote areas. This should include:

(a) Local Radio, which should be supplied with clear and accurate information

(b) Use of appointed community wardens with direct two-way Radio or Mobile Telephone access to warning agencies and emergency authorities

(c) Local means of raising alarms, for example church/temple bells, PA System, sirens, loud hailers, loud speakers, etc. The latter could be the responsibility of selected individuals or wardens, who need to be provided with equipment and transport, for example motor cycles or bicycles;

(d) 'Sky Shout' from emergency service helicopters.

(e) Doordarshan & local cable channels (TV & Radio Channels including FM Radio)

(f) HAM Radios

(g) Press Bulletins

(h) Satellite based Disaster Warning Systems

(i) Fax, Telephone and Mobile Communications, etc.

3.6 Trigger Mechanism: Plan Activation

The flood response system will be activated on the occurrence of a heavy rain. The Commissioner, Revenue (DM) will activate all the Departments for emergency response including the State EOC. The department will issue instructions to include the following details:

(a) Specify exact resources required

(b) The type of assistance to be provided

(c) The time limit within which assistance is needed

(d) The State, District or Other contact persons/agencies for providing assistance

(e) Other Task Forces with which coordination should take place

The State EOC and other control rooms at the state level as well as district control rooms should be activated with full strength. The GoAP may publish a notification in the Official Gazette declaring such locations to be disaster-affected areas under APSDM Rules (2007). Once the situation is totally controlled and normalcy is restored, the Revenue, (DM) declares "End of Emergency Response" and issues instructions to withdraw the staff deployed on emergency duties.

3.7 Tasks and Responsibilities Matrix

Structural Measures

S#	Task	Activities	Responsibilities
1	Construction Works	• Construction of dams, flood protection wall, flood diverting channels • Improvement of design for irrigation and flood protective structures • Strengthening/repair of existing roads and bridges and other critical infrastructure in flood plain • Strengthening of dams and canals	• R & R • Irrigation Dept. • PWD Dept. • All line Depts.
2	Development of catchment area	• Development of catchment area of the flood plain • forestation • land sloping • small reservoirs/check dams/ponds etc.	• Irrigation Dept. • Forest & Environment Dept
4	Techno-legal regime	• Enactment and enforcement of laws regulating developmental activities in flood plain • Specific building by-laws for flood plains	• Revenue Dept. • Secy. R&R • Irrigation Dept. • UD Dept, Panchayat & Rural Housing • Local Urban Bodies • CDM
5	Forecasting and warning	• Strengthening and up-gradation of Existing flood forecasting system • Establish infrastructure for od warning and dissemination	• Revenue (DM) • Irrigation Dept • CWC • IMD

Non-Structural Measures			
1	Capacity Building	• Ensure flood search and rescue materials are purchased and kept at local level • Set up rain-gauge recording stations • Departmental flood contingency plan • Flood related departmental action plan and SOP • Imparting training to the stakeholders involved in flood mitigation and management. • Organize mock drills on flood rescue	• Revenue Dept. • CDMU • Irrigation Dept • Line Dept.
2	Awarness	• Dissemination flood risk to general Public residing in flood prone areas • campaign for flood safety tips • Develop IEC materials on dos and don'ts	• Revenue Dept. • Director CDM • Irrigation Dept • SDMA • Information Dept. • Line Dept.

3.8 Role & Responsibilities of Departments at the District

3.8.1 Revenue Department

The Revenue Department at all levels in the State will be responsible for response and relief operations. It should prepare a vulnerability analysis for all villages. The district gulde lists out all the villages located on river banks and were subjected to floods in the past with other details.

The data should be updated once in six months. It should earmark teams for rescue and evacuation, opening of shelters or relief camps, arranging transport for teams, warning public and disseminating information to all the concerned about relief operations / plans including non-governmental organizations taking part in the operations or likely to take part on arrival from outside the district.

Reception and briefing arrangements for the Army deployed for relief work should be arranged besides providing them with maps and/or guides. Organize relief camps, emergency feeding, clothing and household supplies and provision of temporary shelter assistance wherever necessary. They should also arrange for air dropping of food packets and water sachets in marooned and isolated villages.

3.8.2 Irrigation Department

The moment a heavy rain and flood warning is given by the IMD or the CWC, the Irrigation Department should arrange for patrolling of flood banks. It should keep sand bags in sufficient numbers wherever needed to plug breaches. It should lower the water level in reservoirs on time according to the impending rainfall.

3.8.3 Roads & Buildings Department

As many national highways pass through cities and villages, the Roads and Buildings Department should keep a list of road points which are prone to inundation and culverts which are weak and likely to overflow. Immediately after floods, it should estimate damages and carry out repairs. Its immediate task is to ensure that traffic is not interrupted and no relief activity is affected. Besides this, the department should also estimate damage to buildings, if any, and submit it to the authorities concerned. It should also keep helipads ready for flood relief operations.

3.8.4 Police Department

The Police Department is responsible for law and order, protection of property, helping in evacuation, assisting in search and rescue operations, providing

required number of radio sets with operators and positioning mobile VHF sets as per district plans. It should ensure speedy delivery of messages received and help in disposal of the dead, if any. During floods and heavy rains, the Police should also ensure that no trucks and buses cross causeways and bridges especially when the streams and rivulets are in spate, especially when they are under water. Quite often, vehicles are washed away when they ply on causeways and bridges under water.

3.8.5 Information Department

The District Public Relations Officer should educate public on flood hazards and the steps they should take. It can do this through local newspapers, posters and handbills. It can exhibit posters at prominent public places such as bus terminals, railway stations, post offices and cinema halls. People should be advised to listen to All-India Radio bulletins made available by the Information & Public Relations Department. Slides on important aspects of "Dos" and "Don'ts" should be shown in cinema halls. Community radio sets should be checked by Sarpanch/ executive officer / village secretary / headmaster of elementary school. The PRO should also carry out media liaison release approved information for publication / telecast.

3.8.6 Medical & Health Department

The District Medical and Health Officer is responsible for providing emergency medical treatment to flood victims, maintenance of public health, checking the quality of drinking water and maintaining sanitary conditions. It should train selected volunteers in villages in first aid, coordinate utilization of medical teams, medical supplies and ambulances and issuance death certificates, etc.

3.8.7 Education Department

Flood relief should be included in school curriculum. School and college buildings should be made available for relief camps. The camps should have an adequate number of toilets and water. Schools and colleges could also be used for organizing awareness camps.

3.8.8 Electricity

As Disaster Preparedness Measures suggest, power lines and installations are to be kept free from obstructions. They should maintain power supply at the best possible level during floods, particularly at relief camps and hospitals/treatment centers, adopt public safety measures for installations damaged and provide generators.

3.8.9 Forest Department

The Forest Department should be ready to procure and supply material such as bamboos and palm leaves for temporary shelters especially in slum areas.

3.8.10 Transport Department

The Regional Transport Officer or the Deputy Commissioner (Transport) should provide the required number of vehicles as per allocations made by the Municipal Commissioner. Data of available transport in the district should be maintained.

3.8.11 Posts & Telecommunications Department

It should provide additional telephones for relief operations as requested by the Municipal Commissioner and ensure rapid repair of damaged telecommunications.

3.8.12 Training of Government Officials

All officers likely to be drafted for flood duty should be trained. At the moment, organizations like Administrative Training Institutes (ATIs) are organizing regular courses on disaster management.

3.9 Relief Measures

3.9. 1 Short Term Relief Measures

a) Food & Nutrition

In an extreme flood situation, people lose standing crops and stored food grains. In such cases, free distribution of foods shall be made to avoid hunger and malnutrition. Wherever is possible, dry rations should be distributed for home cooking.

b) Water

Water supply is invariably affected in natural disasters. Availability of safe drinking water is very challenging particularly during floods. It must be ensured that affected people have adequate facilities and supplies to collect, store and use clear and safe water for drinking, cooking and personal hygiene.

c) Health

During post-disaster phase, many factors increase the risk of diseases and epidemics because of overcrowding, inadequate quantity and quality of water, poor environmental and sanitary conditions, decaying biological matter, water stagnation and inadequate shelter& food supplies. There should be adequate supply of medicines, disinfectants, fumigants, etc., to check outbreak of epidemics. It should be ensured that the medicines have not reached expiry date.

d) Clothing & Utensils

The people affected by the disaster shall be provided with sufficient clothing, blankets, etc. to ensure their safety and well-being. Each disaster affected household shall be provided with cooking and eating utensils.

e) Shelter

In case of flood, a large number of people are rendered homeless. In such situations shelter becomes a critical factor for survival and safety of the affected population. In view of this, flood affected people, who have lost their houses shall be provided sufficient covered space for shelter. Disaster affected households shall be provided with necessary tools, equipment and materials for repair, reconstruction and maintenance for safe use of their shelter.

f) Relief camp

Relief camps also provide good temporary arrangements for people affected by flood. Adequate number of buildings or open space should be identified where relief camps can be set up during emergency. The requirements for operation of relief camps should be worked out in detail in advance. The temporary relief camps should have adequate provision of drinking water and bathing, sanitation and essential health-care facilities.

g) Sanitation and Hygiene

Sanitation services are crucial to prevent an outbreak of epidemics in the post-disaster phase. Therefore a constant monitoring of any such possibilities needs to be carried out. It should be ensured that disaster affected households have access to sufficient hygiene measures.

3.9.2. Interim Relief Measures

a) Arrangements to be made for quick identification and maintenance of the records of disposal of dead bodies in the affected areas (Home Dept., Revenue Dept., Health Dept. and Local Authorities).

b) Arrangements to be made to record the complaints of all persons reported missing. Follow up action in terms of verification of the report also needs to be made (Home Department)

c) District Magistrates and Sub-Divisional Magistrates to be empowered to exempt the requirement of identification and post-mortem in case of mass casualties. Revenue Dept may depute additional Sub-Divisional Magistrates to expedite disposal of the dead bodies (Revenue & Home Departments)

d) Unclaimed/ unidentified dead bodies to be disposed of with help of pre-identified voluntary agencies at the earliest after keeping their records. (Home, Revenue, Health Departments & Local Bodies)

e) Additional manpower to be deployed in the affected areas for supplementing the efforts of the local administration (General Administration Department (GAD)).

f) Separate Cell to be established at State/District/Mandal levels to coordinate with the NGOs and donor/ aid agencies. (Revenue Department)

g) Regular Meetings of the different stakeholders/departments should be organized at state level for sharing information, developing strategies for relief operations. (Commissioner, Disaster management & Collectors at the District Level)

h) Information & Public Relations Dept to coordinate with the media to play a positive role in disseminating appropriate information to public and the government in order to facilitate the speedy recovery (I&B Department).

3.9.3 Assessment of Damage/ Loss and Relief Needs

a) The Commissioner, Revenue (DM) to issue instructions to the District Collectors to provide the "Need Assessment Report". The Revenue (DM) should consolidate the same and to prepare the State's "Need Assessment Report".

b) The Commissioner, Revenue (DM) to issue instructions to the District Collectors to provide the "Damage and Loss Assessment Report". The Commissioner, DM to consolidate the same and to prepare the State's "Damage and Loss Assessment Report" which will be useful in planning and implementing the relief operations for disaster victims.

c) Adequate manpower, vehicles, stationery etc., should be provided to supplement the efforts for need/ loss assessment. (Commissioner, DM& Revenue Department)

d) the Relief Need Assessment Report should be provided by the Collectors to GoAP (Commissioner, DM, for necessary action)

e) Identification and demolition of dangerous structures in the affected areas to minimize further loss of life and injuries. (R & B, Revenue Departments and Local Bodies)

f) Arrangements for distribution of gratuitous relief and cash doles. (Revenue Dept., Panchayati Raj &Rural Housing, Urban Development Departments and the Collectors)

g) Arrangements to be made for survey of human loss and distribution of ex-gratia relief to the families of deceased persons.(Revenue Department)

h) Teams to be formed and dispatched to the affected areas for detailed assessment of houses and property damage assessment (Revenue Department and Local Bodies)

i) Satellite based Disaster Waning Systems.

j) Telephone/Fax

The SEOC and other control rooms at the state level as well as district control rooms should be activated with full strength. The State Government may publish a notification in the official gazette, declaring such area to be disaster-affected area under APSDMA Rules of 2007. Once the situation is totally controlled and normalcy is restored, the Commissioner Revenue (DM) declares End of Emergency Response and issues instructions to withdraw the staff deployed in emergency duties.

3.10 Other Important Concerns at the District and below Levels

3.10.1 People's Participation

As we involve people in development projects right from the planning stage through participatory methods, we could do the same in the case of Disaster Management. Officials could discuss flood disaster in wards also. They could also discuss the subject in SHG groups. Women, being the managers of houses, could play a key role during disasters.

3.10.2 Awareness Campaigns

A campaign should be launched to promote awareness of disasters and people's participation in meeting them. It should cover people, elected representatives of local bodies, institutions, students, women groups, NGOs and local political leaders. The Information & Public Relations Department, with the help of media, is most suited for this purpose. This awareness campaign should be taken up in all vulnerable villages. Once the public, the concerned officials and volunteer groups are fully aware of the repercussions of floods, they would be prepared to face them. Disaster Management (DM) Teams can be formed from among the category of persons identified above. One amongst them could be selected as a team leader.

3.10.3 Needs Assessment

The DM Teams should be able to identify the resources available at ward level and immediately after the floods. Such data available for ward should be included in ward / division resource record. The record will be useful in identifying resources that have to be brought from outside the ward / mandal. Such assistance can be quantified and requisitioned.

3.10.4 Preparedness Plan

Having achieved this, the DM Team can translate its awareness into preparedness by enlisting participation of all sections of society. It is important that women members in the team are consulted as they give useful suggestions particularly affecting women and children. An action plan has to be drafted based on ideas gathered over a series of mutual discussions. The plan should list out the actions to be carried out by various persons at specified time periods and list the resources (both human and material) to be used.

3.10.5 Potential for Reducing Hazard

Embankments along the rivers, sea walls along the coasts may keep water away from the flood plains. Water flow can be regularized through construction of the reservoirs, check dams, alternate drainage channels/routes, and increasing vegetation cover and by providing storm drains.

3.11 Main Mitigation Strategies

3.11.1 Mapping of the Flood-prone areas

This is a primary step involved in reducing the risk of the region. Historical records give the indication of the flood inundation areas and the period of occurrence and the extent of the coverage. The basic map is combined with other maps and data to form a complete image of the flood plain. Warning can be issued looking into the earlier marked heights of the water levels in case of potential threat. In the coastal areas the tide levels and the land characteristics will determine the submergence areas. Flood hazard mapping will give the proper indication of water flow during floods.

3.11.2 Land use control

This will reduce danger of life and property when waters inundate the floodplains and the coastal areas. The number of casualties is related to the population in the area at risk. It's better to reduce the densities in areas where neighborhoods are to be developed. In areas where people already have built their settlements, measures should be taken to relocate to better sites so as to reduce vulnerability. No major development should be permitted in the areas which are subjected to high flooding. Important facilities should be built in safe areas. In urban areas, water holding areas can be created in ponds, lakes or low-lying areas.

3.11.3 Construction of engineered structures

Construction activity in the flood plains and strengthening of structures to withstand flood forces and seepage is the sine-qua-non. The buildings should be constructed on an elevated area; and, if necessary build on stilts or platform.

3.11.4 Flood Control

It aims at reducing flood damage. This can be done by Flood Reduction by decreasing the amount of runoff by treatment like reforestation (to increase absorption could be a mitigation strategy in certain areas), protection of vegetation, clearing of debris from streams and other water holding areas, conservation of ponds and lakes etc. Flood Diversion includes levees, embankments, dams and channel improvement. Dams can store water and can release water at a manageable rate. Flood Proofing reduces the risk of damage.

Measures include use of sand bags to keep flood water away, blocking or sealing of doors and windows of houses etc. Houses may be elevated by building on raised land. Buildings should be constructed away from water bodies.

3.11.5 Flood Management

Flood management comprises both structural and non-structural measures. Structural measures include storage reservoirs, flood embankments, drainage channels, anti-erosion works, channel improvement works, detention basins etc. Non-structural measures include flood forecasting, flood plain zoning, flood proofing, disaster preparedness etc. The flood management measures undertaken so far have provided reasonable degree of protection to an area of 15.81 million hectares throughout the country.

3.11.6 Community Based Flood Disaster Mitigation

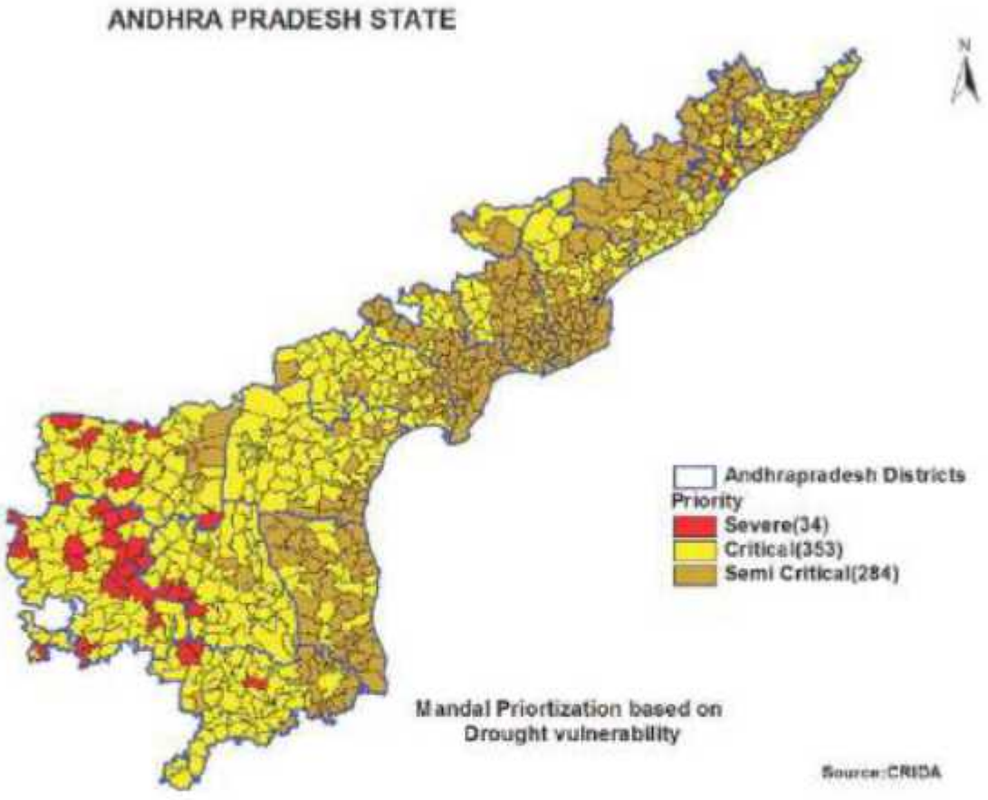
Apart from the sustained efforts by the government and experts to bring about speedy recovery soon after the flooding, it is the responsibility of the local community that plays a vital role in mitigating the sufferings at the grassroots through its active involvement in several different ways. Sedimentation clearance, reforestation program, dike and flood wall construction can be taken as part of the community based mitigation program. The community could be capable of participating in flood fighting by organizing work parties to repair embankments, pile sandbags and stockpile needed materials. Farming practices have to be flood compatible. Special varieties of seeds are available which can be harvested during the flood season. Houses constructed need to be flood resistant and multi-purpose shelters should be constructed by the community. Banks of the earth can be raised and it can give shelter to the community as well as the livestock during the time of floods.

Conclusion

Disasters like floods could happen all the time. We cannot always avoid occurrence of floods. But disaster reduction measures with community participation can limit the scale of devastation. As a result, the role of the community participation in disaster management is imperative. When the community becomes a part of the decision making system, it ensures the ownership and accountability. Consequently, the most important objective of community based disaster management (CBDM) is to reduce the impact of natural disasters on living conditions of the vulnerable communities in the disaster-prone areas. This could be achieved through ensuring that people are capable of withstanding the impact of a flood disaster initially for the first few days during the post-disaster phase, until such time the external assistance reached them; and, a long-term sustenance of their safety and livelihoods attained.

Chapter 4

Action Plan for Drought in Andhra Pradesh



4 Introduction

Andhra Pradesh has traditionally remained one of the drought-prone States in the country. Over 40 per cent of the State's geographical area lies in semi-arid region rendering it vulnerable to water scarcity. All districts in the Rayalaseema region and certain Mandals (revenue units comprising a varying number of villages) in some districts of Coastal Andhra region experience drought frequently. Failure of the monsoon affects both Kharif and Rabi crops in these areas. Not only the poor rainfall affects crops, but also the unevenness of rains within the monsoon months (long dry spells) could be very damaging for crops. As a result, when there is scanty rainfall, the scarcity of water both for drinking purpose and cultivation is acute.

On October 28, 2015, the Andhra Pradesh government declared that 196 Mandals in seven districts as drought-affected during the Kharif season 2015. These districts were Srikakulam (10 mandals), Prakasam (21), Nellore (14), Chittoor (39), Kadapa (33), Anantapur (39) and Kurnool (40). Further, on November 22, 2015, 163 more Mandals were added to the list of drought-hit by the GoAP, bringing the total number to 359 Mandals. These Mandals are in Guntur, Krishna, Vizianagaram

districts. Thus, Drought was declared in 10 out of 13 districts.

Consequent to the declaration of drought, the government directed the concerned District Collectors to notify the specific drought-hit areas in the District Gazette to enable farmers to avail of credit facilities. Crop loan and relief measures were to be taken up in these Mandals as per the guidelines. Besides, the state demanded central assistance to a tune of Rs 2,000 crore to take up mitigation measures. As of now, the drought situation in the State remains pretty much the same.

4.1 Definition of Drought

Drought is an insidious natural hazard that results from a departure of precipitation from expected or normal that, when extended over a season or longer periods of time is insufficient to meet the demands of human, plant and animal activities. Therefore, drought is a situation arising out of lack of moisture in the weather due to scarce rainfall and prolonged dry spells. Such observable fact resulting in damage of crops, is termed as "Drought". More often than not, this is the experience in AP and elsewhere in the country, where the primary sector involving agriculture and allied activities depends largely on monsoon-related rains.

In India, agriculture, being the mainstay of the primary sector, has become the backbone for the country's economy. It mostly depends on the effects of both South-west and North-east monsoon periods in a year. The drought or famine occurs due to the continuous failure of monsoon for longer periods. The Indian Meteorological Department (IMD) defines 'drought' as a situation, which occurs in any area where the annual rainfall is less than 75% of the normal level, i.e., where the residual deficiency in rainfall is 25% or more.

4.2 Onset type and Warning

Drought is a slow-onset disaster and as it is difficult to demarcate the time of its onset and end. Falling rainfall levels, falling groundwater levels, drying wells, rivers and reservoirs, and poor agricultural production warn the onset of drought. According to the Indian Meteorological Department, the country is said to be drought affected when the overall rainfall deficiency is more than 10 per cent of the long period average and more than 20 per cent of the country area is affected by such drought conditions.

4.3 Elements at Risk

Drought impacts mostly rain-fed crops to start with and subsequently the irrigated crops. Areas with minimum of alternative water sources to rainfall (ground and canal water supplies), areas subjected to drastic environmental degradation such as denuded forest lands and altered ecosystems, and areas where livelihoods alternative to agriculture are least developed are most vulnerable to drought. The herdsman, landless labourers, subsistence farmers, women, children, and farm animals are the most vulnerable groups affected by the drought conditions. It impacts education of children, especially the adolescent girls.

4.4 Typical Effects

Drought, different from other natural disasters, does not cause any structural damages. The typical effects include: loss of crop, dairy, timber (forest fires), fishery production, increase in energy demand for pumping water; reduced energy production; increased unemployment, loss of biodiversity, reduced water, air, and

landscape quality; groundwater depletion, food shortage, health reduction and loss of life, increased poverty, distress sale of assets, reduced quality of life, and social unrest leading to distress migration. The chances of increase in child marriage and child labour are observed as well as migration to towns and cities.

4.5 Preliminary measures

Once deficiency in rainfall is noticed, the District Collector and the Directorate of Economics and Statistics shall take immediate steps for the conduct of additional crop cutting experiments to work out the estimates of average yields at the Mandal level. These additional experiments should be organized by Revenue Agency, under the supervision of Statistical Agency. The guidelines for conducting additional crop cutting experiments and the format to be used as specified in drought manual.

The Agriculture and Animal Husbandry Departments should take initiatives for educating besides giving wide publicity for earmarking 3% of cropped area for production of fodder to meet the fodder requirement during drought.

The effect of drought will be felt not only on human beings but also on animals. With the decrease in ground water table or water in irrigation sources, the farmers may not be able to produce crop and fodder; and, thereby resulting in distress sale of animals and livestock. Therefore, when drought situation prevails, shandies, where the livestock are normally sold need to be watched.

Implementation of various employment generation programs to be identified and MGNREGA to be initiated. Migration would also be high to cities for eking out their livelihood. Therefore, loss of livelihoods, access to employment guarantee activities, and migration related aspects should be looked into while assessing the situation of drought .

4.6 The District Collector's report for Drought

I. A statement showing the actual rainfall received during the period, the normal rainfall in the area, the deficiency in rainfall, and the number of rainy days should be prepared by the District Administration and furnished Mandal-wise and submitted to the Commissioner, Disaster Management for taking appropriate steps.

II. The Statement shows water levels in various major irrigation and minor irrigation sources in each Mandal in the district indicating the normal levels during the corresponding period of normal year and the existing levels and the period for which the supply would be sufficient, duly indicating the areas falling under fully/partly assured irrigation sources.

III. Statement showing cultivation particulars indicating the areas under wet, irrigated dry, dry and the actual area cultivated, the extent left uncultivated, the extent damaged after cultivation due to the failure of rains, approximate loss in the production of food grains and the computed money values of the loss of food grains. This statement furnished by the Tahsildar (Mandal Revenue Officer (MRO)) to the Collector should furnish particulars regarding the cultivation of each crop and anticipated loss in yield of food grains crop-wise compared to normal areas of each crop.

IV. Statement of actual District population as per latest census: Number of agricultural laborers, small and marginal farmers in the district as per the latest agricultural census, and the number of persons assumed to be affected by the drought and provided with employment.

V. Statement showing the number of bore wells or open wells, protected water supply schemes and other drinking water sources available Mandal-wise. The number of wells which require deepening on account of low water level or the number of bore wells or open wells that should be taken up to augment drinking water supply.

VI. A statement showing the approximate number of cattle, the availability of existing fodder and additional fodder requirements.

VII. A statement showing the prices of principal food grains, availability of essential commodity food grains, pulses, diesel oil, kerosene oil, etc.

VIII. A statement showing the number of aged persons, who are not in receipt of old age pensions and who need economic support during the occurrence of drought.

IX. A statement showing the number of village artisans, category-wise, who are affected and who need economic support during the occurrence of drought.

X. A statement showing the number of children and nursing expectant mothers, who need special diet supplement during drought periods.

XI. A statement showing out of school children (not receiving the benefit of MDM ration coupon during summer vacations) and orphan children in need of care and support.

At the same time, sending proposals to the Government for sanction of funds under drought relief program, the Collectors should make a note that money available under Calamity Relief Fund is meant for emergent needs for providing temporary relief and not for taking up permanent works and for infrastructure development.

The requisition of funds should be made to the concerned administrative department for meeting the expenditure under normal / planned schemes for taking up permanent works. As per the provision laid down in Treasury Rule (TR)- 27, the Collectors are only authorized to draw the funds in real cases of urgency, i.e., floods, earthquake and like, under "MH 2245 Relief on account of natural calamities".

Further the amounts released for expenditure under MH 2245 for relief works on natural calamities through G.Os should also be drawn by Collectors. Hence, no other officer in the district should draw the bills under MH 2245 except the Collector for easy reconciliation of expenditure and to facilitate the Audit of such expenditure. However, the expenditure under relief should be integrated / dovetailed with the long-term plan expenditure.

4.7 Declaration of Drought

The proposals for declaration of drought should be examined with reference to the norms and the Collectors should send a specific report to the Commissioner, Revenue (DM) by taking Mandal as the unit for mitigation:

a) Deficiency in rainfall of 25% and above in Mandals where the annual normal rainfall is more than 1000 mm, 20% and above in Mandals where the annual normal rainfall is 750 mm to 999.9 mm, and 15% and above in Mandals where the annual normal rainfall is less than 750 mm, i.e., 749.9 mm.

b) Compression / reduction in the cropped areas of 50% and above under all principal crops.

c) Normal reduction in crop yields of 50% and above in relation to average yields.

But, in the case of high input oriented (seed rate heavy and cost also prohibitive) crops like groundnut, Bengal gram, hybrid sunflower, etc., reduction in yield of 40% and above also should be reckoned as affected by drought, yield compared with previous 5 years.

d) Dry spells and its impact on crop damages.

For considering declaration of drought, out of the (4) norms suggested, the first norm of rainfall deficiency must be compulsory and out of the remaining (3) norms, any two norms must be fulfilled.

On receipt of the report from the District Collector, the Commissioner for Disaster Management shall send a consolidated report to the Government with reference to the following points:

(i) Any serious deficiency of rainfall

(ii) Any general failure of crops

(iii) Any abnormal rise in prices

(iv) Any extraordinary mortality or disease among cattle and people.

The report shall indicate the additional amount approximately required under various heads for undertaking relief operations in the affected areas and accompanied by the various statements consolidated for the entire State.

On receiving Report from the Commissioner, Revenue (DM), the Government shall examine and issue a notification identifying the areas as drought affected. Such notification shall be published in the Official Gazette and also communicated to all Commercial Banks including A.P. State Cooperative Bank and A.P. Central Cooperative Agriculture Development Bank.

4.7.1 Actions at District Administration after Drought Declaration

1. Collection of arrears of land revenue and cess, drainage cess, special land tax and all arrears thereof shall stand postponed automatically.
2. The Commercial & Cooperative Banks operating in the districts and drought affected areas are expected to take following steps subject to NABARD and other relevant departmental guidelines and rules, if any:
   - I) Re-schedule agriculture term loans, crop loans as well as other short term loans;
   - II) Grant fresh crop loans for the Rabi season;
   - III) Grant new term loans for financing economic support schemes, agriculture and allied activities;
   - IV) Cottage and Rural Industries & Service Sectors to generate incremental income and employment to the land-less poor, agricultural labor, small and marginal farmers and other weaker sections.
3. The agricultural extension machinery shall take steps to educate the farmers about re-scheduling facilities from their respective bankers.
4. The Revenue Officials in-charge of Village Records shall ensure prompt issue of required extracts of village accounts and other village records to the small farmers and other farmers promptly to enable them to get the re-scheduling facility and fresh loans from their respective banks.
5. The District Rural Development Agency (DRDA), Scheduled Caste Cooperative Society and other district level institutions in-charge of various beneficiary

oriented programs shall take steps to help the affected population, mainly the landless poor, agricultural labor, small & marginal farmers and other weaker sections to identify viable employment generating schemes and impart to them the required skills and help obtain loan from banks and other benefits admissible to them for such schemes as are currently available.

6. Measures should be initiated immediately for starting works to provide employment for the unemployed, particularly the agricultural laborers, small & marginal farmers; and, for augmenting drinking water supply in both rural and urban areas; supply of feed, fodder and pasture seed, fodder and feed supplements, medicine and vaccine and for growing fodder; maintenance of general health conditions of people and prevention of outbreak of epidemics; regular and adequate supply of essential commodities and liberalization of credit assistance. Once the drought conditions are noticed, the Collectors should take up the following programs sincerely:

   - Employment generation programs. Elaborate instructions and adequate funds should be made available. The works taken up should be towards asset creation such as restoration of tanks, etc.
   - Rural Water Supply. The Collectors could be able to order water supply through tankers. They could even arrange for digging of agricultural bore wells by paying due compensation.
   - Supply of rations. The Collector is the authority over the distribution of civil supplies in the District. The ration shops are supposed to supply ration to the poor. As the scheme of rice 2-Rupee a kilo is already being implemented in the State, the Collectors should strictly enforce this scheme.
   - Land Treatment: Sowing across slope/ Ridge and furrow system/ Compartmental bunding/ Broad bed furrow system/ Raised / Raised Bed and sunken system, etc.
   - Rainwater harvesting and Efficient Use: Rainwater harvesting structures/ Farm ponds/ Percolation tanks/ Micro Irrigation systems, etc.,
   - Suitable Crops / Varieties Cropping system: Seed bank/ Seed treatment/ Intercropping systems, etc.,/ Agro-forestry
   - Need based Nutrient Management: Rainwater availability/ Nutrient for foliar spray/ Organic recycling/ Tank silt application, etc.
   - Farm Mechanization: Suitable implements/ Labour sharing mechanization/ Custom hiring centres

- Fodder systems: Silage/ Household / Community/ Fodder systems, etc.

4.8 Drought Mitigation Strategies

4.8.1 Drought monitoring is by continuous observation of rainfall situation, water availability in reservoirs, lakes, rivers and comparing with the existing water needs of various sectors of the society

4.8.2 Water supply augmentation and conservation through rainwater harvesting in houses and farmers' fields increases the content of water available. Water harvesting by either allowing the runoff water from all the fields to a common point (e.g. Farm ponds, see the picture) or allowing it to infiltrate into the soil where it has fallen (in situ) (e.g. contour bunds, contour cultivation, raised bed planting etc) helps increase water availability for sustained agricultural production. Expansion of irrigation facilities reduces the drought vulnerability. Land use based on its

capability helps in optimum use of land and water and can avoid the undue demand created due to their misuse.

4.8.3 Livelihood planning

Livelihood planning identifies those livelihoods which are least affected by the drought. Some of such livelihoods include increased off-farm employment opportunities, collection of non-timber forest produce from the community forests, raising goats, carpentry, etc.

4.8.4 Drought planning

The basic goal of drought planning is to improve the effectiveness preparedness and response efforts by enhancing monitoring, mitigation and response measures. Planning would help in effective coordination among state and national agencies in dealing with the drought. Components of drought plan include establishing drought taskforce which is a team of specialists who can advise the government in taking decision to deal with drought situation, establishing coordination mechanism among various agencies which deal with the droughts, providing crop insurance schemes to the farmers to cope with the drought related crop losses, and public awareness generation.

4.8.5 Public awareness and education

Educating the masses on various strategies would help effective drought mitigation. This includes organizing drought information meetings for the public and media, implementing water conservation awareness programs in the mass media like television, publishing and distributing pamphlets on water conservation techniques and agricultural drought management strategies like crop contingency plans and rainwater harvesting and establishing drought information centers for easy access to the farmers.

Conclusion

Disasters like Drought have been happening most of the time. We cannot always avoid drought from occurring, but disaster reduction envisages limiting the scale of devastation through the involvement of communities in drought disaster mitigation efforts. As a result, the role of the community participation in disaster management is imperative. When the community becomes a part of the decision making system, it ensures the ownership and accountability. Consequently, the most important objective of community based disaster management (CBDM) is to reduce the impact of natural disasters on living conditions of the vulnerable communities in the disaster-prone areas. This could be achieved through ensuring that people are capable of withstanding the impact of a Drought initially during the post-disaster phase, until such time the external assistance reached them; and, a long-term sustenance of their safety of people, livestock and livelihoods attained.

The new Drought Management Manual -2016 can be viewed at http://agricoop.nic.in/sites/default/files/Manual%20Drought%202016.pdf

Chapter 5

Action Plan for Earthquake in Andhra Pradesh

5.1 General Information on Earthquakes in Andhra Pradesh

Most of India is prone to destructive earthquakes. According to Seismic Zoning, the country is divided into five zones based on severity. **AP lies in three zones, i.e., Zone I, Zone II and Zone III. All three zones are relatively low risk zones.** Zone IV and Zone V are considered high risk zones. Most of Himalayas fall under this category. AP lies in the central part of the Peninsular Indian Shield; and is considered stable; and, not prone to earthquakes. However, the Koyna earthquake in 1967, Latur earthquake in 1993 and Jabalpur earthquake in 1997, which also fall in Peninsular Indian Shield completely changed the perspective. As a result a few zones of weakness in the crystal layers in the Peninsular Region have been identified within which reactivation along some faults may take place causing tremors and minor earthquakes.

The Eastern coastal tract and the adjoining area are characterized by many faults/ fractures displaying evidence of seismic activity. The state of AP has a history of earthquakes from the year 1800 to date; but, fortunately there have not been major losses due to the low intensity of the quakes. There are many NE-SW trending fault-bound basement ridges and depressions traversed by transverse features like the Ongole, Avanigadda, Chintalpudi, Pithapuram and Vizianagaram cross trends (Source: Earthquake Manual, Revenue (Relief) Department, GoAP). These NE and NW trending discontinuities may be vulnerable to reactivation with progressive build-up of stress. Among these the most active zone is the Ongole area, which has record of mild earthquakes during the last 30 years. So, Ongole, Bhadrachalam, Srikakulam, and Vizianagaram regions only have recorded magnitude of 5.0 – 5.7 on the Richter scale. These events might have been caused by tectonic activity along the Ongole cross trends. Similar activity to a lesser degree occurred in Vizianagaram area.

5.2 Earthquakes recorded since 2000 in Andhra Pradesh

- In September 2000, a magnitude of 2.816 earthquake was traced at Hyderabad (then AP Capital) at 17.707 N, 78.295 E, D = 015.0 kms, OT = 19:20:22 UTC.
- A mild earthquake struck the twin cities of Hyderabad and Secunderabad (then in AP) on 17 September 2000 at 00:50 AM local time. It had a magnitude of 2.8.
- Extended effects of Sumatra-Andaman earthquake, Mw9.1 was felt in AP on December 26, 2004 at 03.298 N, 95.778 E, D = 010.0 kms, OT = 00:58:50 UTC
- Seismologists believe once a strain release in the form of tremors or earthquake of greater than 5.0 magnitude occurs in Peninsular Shield, it may usually take long time for the stress to build up to required level for subsequent tremors.

5.3 Typical Effects

- Physical Damage- damages of loss of buildings and service structures. Fires, floods due to dam failures, landslides could occur.
- Casualties- often high near to the epicenter and in places where the population density is high, for e.g., multi-storied buildings and structures are not resistant to earthquake forces.
- Public Health- multiple fracture injuries, moderately and severely injured is the most widespread problem, breakdown in sanitary conditions and large number of casualties could lead to epidemics.
- Water Supply- severe problems due to failure of the water supply distribution network and storage reservoirs. Fire hydrants supply lines if vulnerable could hamper fire service operations.
- Transport Network- Severely affected due to failure of roads and bridges, railway tracks, failure of airport runways and related infrastructure.
- Electricity and Communications- all links affected: Transmission Towers, Transponders, Transformers collapses, etc.

5.4 Elements at Risk

Numerous key factors that contribute to vulnerability of human populations to earthquakes are:

- Location of settlements in earthquakes-prone areas, especially on soft ground, on area prone to landslides or along fault lines, etc.
- Dense collection of weak buildings with high occupancy
- Non-engineered buildings (structures) constructed by earth, rubble, buildings with heavy roofs (i.e., more vulnerable light weight structures), poor quality of maintenance of buildings.
- Weak or feeble storey intending for parking purposes

5.5 Types of seismic waves

(i) There are two core kinds of seismic waves viz., Body waves; and (ii) Surface waves.

The Body waves, the fastest seismic waves move through the earth. Slower Surface Waves travel along the surface of the earth. These Body waves tend to cause the most damage. There are two kinds of body waves: (i) Compression waves; and (ii) Shear waves.

Surface Waves: The Surface waves are long and slow waves. They produce what people feel as slow as rocking sensation and cause little or no damage to buildings. There are two kinds of surface waves too: (i) Love waves; and (ii) Rayleigh waves.

5.6 Seismic Activity in India

Major earthquakes in India

Date	Place	Magnitude on Richter Scale	Death Toll
11.10.1737	Calcutta	--	300000
01.09.1803	Mathura & Kumaon	8.0	300
16.06.1819	Kutch	7.8	2000
08.06.1828	Srinagar	8.0	1000
06.12.1897	Assam	8.7	1542
04.04.1905	Kangra, H.P.	8.5	20000
15.01.1934	Bihar & Nepal	8.4	10700
31.05.1935	Quetta	7.5	60000
15.08.1950	Assam	8.5	1500
10.12.1967	Koyna, Maharashtra	6.5	177
29.07.1980	Dharchula	6.1	6
24.08.1980	Jammu & Kashmir	5.2	13
21.08.1988	N.Bihar	6.4	382
20.10.1991	Uttarkashi, UP	6.5	2000
30.09.1993	Latur, Maharashtra	6.2	9326
21.05.1997	Jabalpur, MP	6.0	43
26.01.2001	Kutch, Gujarat	7.7	20083
		Total	**429172**

5. 7 Earthquake Action Plan for Andhra Pradesh

Following the occurrence of earthquakes in Latur and Osmanabad of Maharashtra State in 1992, there is a dire need even for Zone-III areas to have an Earthquake Action Plan. All the coastal districts are in Zone-III; and, therefore an Action Plan is imperative for disaster risk reduction (DRR), in case of a sudden event, i.e., an earthquake occurring all of a sudden. An earthquake of magnitude of 6 or more is likely to cause deaths and injuries to human beings and damages to all types of property- both private and public. Regrettably, there is very little warning available preceding an earthquake. Consequently, planning should provide for a quick response at all levels to reduce the effects to the bare minimum. The Nodal Department for formulating, controlling, monitoring and directing measures for earthquake preparedness, organizing rescue, relief and rehabilitation will be the Revenue (DM) Department in the State Secretariat. All concerned departments should extend full cooperation in all matters pertaining to the management of the earthquake calamity whenever it occurred.

The occurrence of an earthquake may be reported by the Indian Meteorological Department (IMD), /the National Geophysical Research Institute (NGRI)/ Commissioner for Disaster Management by the fastest means. The State Level High Powered (Standing) Committee (HPC) under the Chairmanship of Chief Secretary must be activated right away on the occurrence of any major earthquake (Major earthquake being defined as one where there is damage to property and/or loss of life). Apart from other officers of the HPC, it is essential that following officers, who would be required for organizing immediate rescue / relief operations, should meet within two hours of occurrence of an earthquake.

1.	Chairman:	Chief Secretary	
	Members		
2.	Prl. Secy. (Home)	3.	Prl. Secy. (Revenue)
4.	Prl. Secy. (MA & UD)	5.	Prl. Secy. (Irrigation)
6.	Prl. Secy (Panchayat Raj & RD)	7.	Prl. Secy. (Food & Agriculture)
8.	Prl. Secy. (TR & B)	9.	Prl. Secy. (Industries)
10.	Prl. Secy. (Energy)	11.	Prl. Secy. (Health)
12.	Prl. Secy. (IT)	13.	Prl. Secy. (Finance)
14.	Prl. Secy. (WD, CW & FW)	15.	DG & IG of Police
16.	CMD, APCPDCL	17.	Director of Health
18.	DG, Civil Defence	19.	Post Master General (P&T)
20.	E-in-C (R&B, PR & Irrigation)	21.	G.M. (Telecom)
22.	Commissioner, (I & PR)	23.	Station Comdr. Air Force Station
24.	Col. (FS), Army Sub-Area	25.	MD, HMWS& Sewerage Board
26.	Director, GSI	27.	Director, NGRI
28.	Station Director, IMD	29.	Director, NRSA
30.	Station Director, AIR/ Doordarshan	31.	Director, Fire Services
32.	Secretary, NGOs Disaster Coordination Committee	33.	Commissioner, Disaster Management Member Secretary, HPC
34.	Consultant, CDM, State Training Institute	35.	Consultant (DMU)

5.7.1 The Committee's Role in Earthquakes

The High Powered Committee (HPC) should take immediate stock of the situation and organize rescue and relief operations. A sub-committee of Secretaries headed by the Chief Secretary would monitor the situation on a daily basis to issue necessary instructions/ directions to deal with the situation.

5.7.2 Liaison Officers from Departments

A sub-committee under the Chairmanship of the Commissioner for Disaster Management would organize rescue, relief and rehabilitation operations in the State. A senior officer from each of the Department of Medical & Health, Finance, Planning, Communications, Irrigation, Power, Municipal Administration, Home Departments and any other department connected with the relief operations are required to maintain continuous liaison with the Relief Commissioner. These officers should issue suitable instructions to their field officers in all phases of the management of the calamity.

5.8 Command & Control Room (CCR)

A Command and Control Room will operate in the Secretariat. It shall be manned by one Section Officer and will have one Radio set with the operator round the clock throughout the year. A HAM Radio Set with the Disaster Management Department (DMD) should also be located in the CCR. Telephones for local communications and receiving information from the

Districts should be in working order. Telephone and fax numbers of the CCR should be given to all the districts, officers of the departments involved in the Disaster Management and the agencies including the Non-Governmental Organizations (NGOs) who are likely to play an active role in the relief operations. Link to the

Hazard Mitigation Information System (HMIS) should be established. Maps of concerned districts vulnerable to earthquake should be displayed. Information about population, houses, assets, etc., should be available and updated once in six months. Lists of officers/departments/agencies (as reference in the above table) with addresses and telephone numbers (both Office and Residence) should be readily reachable.

5.9 Government's Prompt Action in case of Tremors or Earthquake

There will be no advance warning in case of an earthquake taking place. In order to be able to take appropriate actions when it occurred, it is necessary that all actions will have to be planned, initiated, and executed without waiting for orders from the District Headquarters. This will involve in the proper identification of likely tasks and the departments responsible for them. This could be done at the Ward/Division, Headquarters during the normal times. The Deputy Commissioners/Collectors having identified the tasks and resources required in an earthquake for their respective Wards/Divisions should plan and specify their requirements to the Municipal Commissioner. As in the case of Cyclone/Floods, the Municipal Commissioners should convene a Municipal Corporation Level Committee meeting with representatives of relevant Government Departments to review the administrative actions required before-, during-, and after- an earthquake had taken place.

5.10 Committees at Municipal Corporations

The Municipal Commissioner/Commissioner of the Municipality or Municipal Corporation should take stock of the assets, resources and the requirements of personnel to take actions in an earthquake. A review of the information from Wards/Divisions will be in order to be able to coordinate the efforts from within the district / municipality or municipal corporation resources and project additional help required from the State Government and other agencies. This should be preferably based on the latest statistics about the vulnerable elements in each of the Wards/Divisions that are likely to be affected. Periodical meetings should be held preferably once in three months. Awareness campaigns should be organized at least once in a year. A large number of institutions like hostels, social welfare residential schools and old age homes are under the control of the Social Welfare Department and the Deputy Director (SW) should be nominated to be member of the Municipal Corporation Level Committees. Similarly, at the Wards/Division level the Assistant Social Welfare Officer should be a member of the Ward or Division Level Committee.

5.11 Focus on the following points is desirable

- Communication resources available and their location including those held in the pool. Requirements of additional wireless sets should be projected to the State Government.
- The required funds for publicity campaign are to be made available to the concerned departments.
- Enforce by law to follow the building code in designing seismic resistant shelters both in private and public sectors in vulnerable Wards/Divisions.
- Maps of the vulnerable areas in the Wards/Divisions to facilitate relief operations particularly for the Rescue/Relief Teams and Agencies arriving from outside the District.

- Earmarking of Teams for Rescue and Relief operations.
- Transport & Water Tankers availability, their road-worthiness and their present location.
- State of the PHCs / Division level health centers and Hospitals regarding the Staff available and the Equipment deficiencies. Capacities of these in dealing with a large number of injury cases must be critically assessed.
- Identify the population vulnerable and the weak houses, buildings and public infrastructure Wards/Division-wise or area-wise and nominate officers to supervise the relief operations in that Wards/Division/area.
- Requirement of opening sub/additional control room and the facilities to make it fully functional.
- Give wide publicity to the "Dos and Don'ts". Suitable publicity materials like posters, pamphlets, leaflets, slides and hoardings should be designed and displayed at prominent public places in vulnerable Wards/Divisions and Villages through the PRO. The required funds for publicity campaign should be made available to the concerned departments.
- Standby arrangements for power supply to the Control Rooms, shelters and the hospitals.
- Availability of digging tools like crowbars, pick axes, shovels, ropes, ladders, fire-fighting equipment.
- Petromax or Battery operated lights for rescue work at night.
- Radios to listen to the AIR broadcasts.
- Availability of food stocks, kerosene and firewood for disposal of dead bodies.
- Availability of potable drinking water.
- All arrangements for establishing relief camps.

  Availability of Mobile Phone Address system.

The first requirement for the District/Municipal Administration would be to get all the information regarding the elements at risk in the vulnerable areas. These should include the types of individual houses, Government structures vulnerable to earthquake and get them retrofitted. Such structures should be marked for quick evacuation. In case of houses belonging to the public, they must be informed of the status of their house and advised to observe the "Dos and Don'ts" for earthquake.

5.12 Requirements of Effective Response

Effective response will depend on two major factors: (a) Information; and (b) Resources.

5.13 Information Management

It is essential to have all the information regarding the areas which are likely to be affected in an earthquake. This, if readily accessible to the Municipal Commissioner's Office on computers, will facilitate in assessing the protective and preventive actions that can be taken before the onset of an earthquake. Once the earthquake strikes, it is not easy to obtain accurate and complete information. Therefore, it is important that following facets are considered:

- Acquisition of information

- Information assessment
- Decision making
- Dissemination of decisions and information
- Good reliable communication systems for dissemination of orders.

The above will be possible if the present database in the Districts/Municipality or Municipal Corporation is fully updated and probabilistic assessments are made of the likely damages well in advance. Similar database should be available at the Wards/Division level. A review should be made Ward/Division and area-wise with actions required to be taken by respective officers of various departments.

5.14 Tasks and Responsibilities Matrix for Emergency & response Phase

A task and responsibility matrix for emergency response phase (for the first 72 hours of the incident) is given below.

5.14.1 Time Frame: 0-15 minutes after the occurrence of Earthquake

Time Frame	Task	Commissioners
0+ 15 Minutes	Report the occurrence of earthquake to CDM, PS (RD), CEO-APSDMA, Heads of all line departments, Chief Secretary and Chief Minister's Office and National Disaster Management EOC at MHA, GoI	**In-charge SEOC**

5.14.2 Time Frame: 0 to 30 minutes after the occurrence of Earthquake

Time Frame	Task	Commissioners
0+ 30 Minutes	Verify the authenticity of the incident from agencies like IMD, ISR, DEOCs, TEOCs, Police and Fire Brigade control rooms and find magnitude of disaster and immediate impacts	**In-charge SEOC**
	In case of L-2 level event, take overall management of SEOC Deploy Emergency Rescue Vehicles to affected areas for establishing communication link Activate ERCs for prompt mobilization teams and resources to affected areas Hold planning meeting of HODs (all line depts.) in SEOC Instruct duty officers of line departments to report in SEOC and hold meeting for further plan of action/ instruction Request for the services of NDRF and Armed forces, if required If required, inform GAD to ensure that all State Govt. employees report for emergency duties within half an hour Establish alternate communication link through Satellite Phones, HF/ VHF set, HAM Radio, VSAT, etc. in SEOC, DEOCs, TEOCs	**Revenue (DM)/Spl. CDM**
0+ 1 Hour	Mobilize Search& Rescue teams and equipment of Fire Emergency Services , Home Dept., R&B ,etc. to affected areas	**CDM**

	Deploy medical teams and paramedics to the affected areas Deploy rapid assessment tea to affected areas Make arrangements for aerial survey of the affected areas Contact, NRSC, ISRO and Ministry of Defence for aerial/ satellite imageries of the affected areas Instruct local administration to evacuate population at risk to safer sites Instruct concerned authorities or agencies to shut down critical operations Contact Chief Secretary for deciding on time and venue for holding Crisis Management Group (CMG) meeting at the earliest Inform all CMG members to attend CMG meeting in designated venue to assess situation and review emergency measures	
	Enforce evacuation from unsafe structures to pre-decided safe evacuation sites	**Home Dept., District Collector,**
	With help of local authorities, local agencies, volunteers, RWAs, ensure that people do not go back to unsafe structures unless instructed as safe Provide security in affected areas and maintain law and order situation to prevent incidents of thefts and stampede	**Municipal Commissioners**
	Establish alternate communication links through HF, VHF, HAM, Satellite Phones, etc. Issue alert for secondary shocks/ disseminate critical information by SMS through service providers	**Dept. of Science & Technology**
	Restore essential services like power, water supply, telecommunication of critical infrastructure like hospitals, SEOC, Secretariat, Raj Bhawan, Control Rooms, AIR, Doordarshan, relief camps &temporary shelters, etc. on priority basis Restore essential services or arrange for alternative facilities like power, water supply and tele-communication to the affected area	**CDM,GUVNL, APSWSSB,**
	Assess the conditions of road, rail and air communication link for quick mobilization of emergency responders and teams and resources to affected areas and take follow up actions	**Port & Transport, R&B Dept., Revenue (DM)**
	Establish media management / information cell for public information, guidance and rumor control Instruct district information officers to establish information centre near affected areas to provide guidance to volunteers and aid agencies	**Information Dept.**
0+2 Hours	Delegate responsibilities for organizing rescue and relief operations as per outcomes of CMG and planning meet Depute senior State Level officers to the affected areas	**Chief Secretary/ CDM**

	Inform Secretaries of all depts. to provide necessary logistic support to emergency operation task forces	
	Activate Operations Section of IRS for Emergency Response Operation If required, seek assistance from neighboring states, Central Govt. or external agencies Setup separate desks for each operation task force and NGO coordination desk in the SEOC for coordinating emergency operations Contact private /public sector agencies in the State to assist in emergency rescue and relief operations	**Revenue (DM)**

5.14.3 Time Frame: 0 to 3 hours after the occurrence of Earthquake

Time Frame	Task	Commissioners
0+3 Hours	Make suitable transport arrangement for mobilization of quick response teams to the affected areas	**Port & Transport Dept., Civil Aviation Dept.**
	Maintain constant touch with the control room of MHA, NDMA, ERCs, DEOCs and TEOCs	**CDM,SEOC**
	Arrange for press / media release for rumor control and public information and guidance	**Revenue, (DM) Information Dept.**
	Make necessary arrangement for treatment of injured and mass casualty management	**Health Dept.**
	Restore & ensure service ability of communication towers in affected area through respective service providers	**Dept. of Science & Technology, DOT**
0+6 Hours	Establish relief coordination centre at airport, railway station, etc. for arrival of Search & Rescue and Medical Teams coming for humanitarian aid Arrange for a logistic plan and warehouse for receipt & management of relief material	**Revenue (DM)**
	Instruct to cordon affected areas and setting up of check posts to control entry and exit Ensure mechanism to prevent human trafficking	**Home Dept.**
	Open access routes and manage traffic for mobilization of equipment ,machinery and volunteers to the affected areas	**Home Dept., Port & Transport Dept., R&B Dept.**
	If required, establish temporary access routes & disseminate route maps to all EOCs, control rooms and information cells	
	Conduct aerial survey to understand scale of damage and impacts	**CDM/ Head, Quick Assessment**
	Establish information centers at the arrival and departure points especially at the airports, railway stations and interstate bus terminus	**Task Force Information Dept.**
0+12 Hours	Hold review meetings with duty officers in every 12 hours Prepare rapid need assessment report for planning of relief operation	**Spl. Commissioner Revenue (DM)**

	Mobilization of resources to the affected areas	**Spl. CDM, District**
	Mobilize relief materials i.e. tents, food materials, water, essential medicines, blankets, etc. to the affected districts and Mandals	**Collectors, Municipal Commissioners,**
	Establish relief centers, temporary shelters and godowns near affected areas & ensure provision of basic facilities like food, water, medical aid, toilets, etc.	**Line Depts.**
	Provide food and other relief material to relief camps, community kitchens, etc.,	**Food & Civil Supply**
	Provide water tankers to affected areas, relief camps, temporary shelters, community kitchens, etc.	**Water Supply Dept**
	Arrange to shift people from evacuated sites to temporary shelters	**Port & Transport Dept.,**
	Arrange road, rail and air transport at State / District headquarters for dispatch of relief materials to the affected areas	
	Set up field hospitals near the affected areas	**Health Dept.**
	Arrange to shift injured persons to field hospitals	
	Ensure medical aid to injured cattle	**Animal Husbandry Dept.**
	Provide security to relief camps, godowns, evacuated structures, medical camps, etc.	**Home Dept.**
0+24 Hours	Instruct to setup coordination centers at the Resident Commissioner's Office In New Delhi and other Metro Cities as well	**Commissioner, Revenue (DM)**
	Prepare and circulate the situation report	
	Coordinate with Operation Task Forces mobilized to the affected areas	
	Organize media briefing twice a day at pre-determined Intervals	**Revenue (DM) Information Dept.**
	Depute additional officers and supporting staff to affected areas from non-affected areas	**Revenue (DM) Dept.**
	Identify and declare unsafe structures in earthquake affected areas	**R &B Dept.**
0+48 Hours	Ensure safety and security of personnel deputed in affected areas for emergency response operation	**Home Dept.**
	Arrange for Identification, photograph, Postmortem and maintenance of records for disposal of dead bodies	
	Earmark storage points for medical supplies at affected sites	**Home Dept.**
	Arrange information centre at shelter site for maintaining records of victims and to provide guidance to relatives, NGOs, etc.	**Revenue (DM Spl. CDM DM,**
	Ensure following procedures before disposal/ handing over of dead bodies:	**Revenue Dept., District Collector,**
	• Photographs of dead bodies are taken • Identification of dead bodies is done • Post mortem wherever necessary and possible is	**Municipal Commissioners, Health Dept &**

	carried out • Handing over dead bodies of persons known / identified to their relatives • Disposal of unclaimed and unidentified dead bodies	**Local Authorities**
	Ensure mechanism for complaints regarding missing persons and initiate search in shelters, hospitals and police records	**Home Dept., Revenue (DM)**
	Arrange for transportation of dead bodies to their native places if so required	**Port & Transport Dept., Health**
	Arrange for transportation of injured animals	**Dept., Animal Husbandry Dept.**
0+72 Hours	Arrange for disposal of unidentified and unclaimed dead bodies Arrange for disposal of unidentified and unclaimed animal carcasses	**Home Dept.**
	Arrange for transportation of injured from field hospitals to base hospitals	**Health Dept., Transport Dept.**
	Activate short and interim relief measures	**Revenue (DM), Line Depts.**
	Arrange for distribution of cash doles to the victims	**CDM**

5.15 Immediate relief

5.15.1 Short-Term Relief Measures

1. Provide temporary shelter to affected people
2. Evacuation site should be safe and easily accessible
3. Continue to provide essential services to the affected people i.e. food, water, clothing, sanitation and medical assistance
4. The Commissioner, Revenue (DM) to ensure the following in the relief camps:
   - Special emphasis on Hygiene and sanitation aspects should be given in relief camp sites.
   - Separate area should be earmarked within the relief camp for storage of relief materials
   - Adequate manpower and transport facilities for the camp site
   - Arrangements to be made for trauma management
   - Mobile medical units to be sent to remote areas with a view to provide medical assistance to the victims and injured
   - Information centre should be established by the administration

5.15.2 Interim Relief Measures

1. Arrangements to be made for identification and maintenance of the records of disposal of dead bodies in the affected areas.
2. Arrangements to be made to record the complaints of all persons reported missing. Follow-up action in terms of verification of the report also needs to be made.

3. Sub-divisional magistrates to be empowered to exempt the requirement of post-mortem in case of mass casualties. Revenue Dept. may depute additional Senor Staff to expedite disposal of the dead bodies.
4. Unclaimed/unidentified dead bodies to be disposed of at the earliest after keeping their records.
5. Additional manpower to be deployed in the affected areas for supplementing the efforts of the local administration.
6. Separate Cell to be established at state/district/Mandal level to coordinate with the NGOs and outside donor/aid agencies.
7. Regular meetings of the different stakeholders/departments should be organized at state level for sharing of information, developing strategies for relief operations.
8. Information & Broadcasting Dept. to coordinate with the media to play a positive role in disseminating appropriate information to public and the government in order to facilitate the speedy recovery.

5.15.3 Assessment of Damage/ Loss and Relief Needs

1. The Commissioner, Revenue (DM) to issue instructions to the district collectors for the need and loss assessment
2. Adequate manpower, vehicles, stationery etc., should be provided to supplement the efforts for need/loss assessment
   - Identification and demolition of dangerous structures in the affected areas to minimize further loss of life and injuries
   - Arrangements for debris removal and its appropriate disposal
   - Arrangements for distribution of gratuitous relief and cash doles
3. Arrangements to be made for survey of human loss and distribution of ex-gratia relief to the families of deceased persons
4. Teams to be formed and dispatched to the affected areas for detailed assessment of houses and property assessment
5. As reconstruction of houses will take a long period, arrangements to be made to provide interim shelters to the affected
6. Identification of the site for interim shelter
7. Allocation of areas to the affected families
8. Providing essential services at the interim shelter sites such as water, power, drainage/ sanitation, PDS shops, etc.
9. Distribution of shelter materials to individual families

5.16 Duties of various departments

The duties will be more or less similar for all departments with differences in the actual details and particulars to the area concerned.

5.16.1 Revenue Department

The Revenue Department at all levels in the State should be the controlling department for all the "Response and Relief" oriented operations following an

earthquake disaster. They will be responsible for actions listed above. They should prepare in advance a Village profile regarding the population, infrastructure, types of vulnerable houses and communities. This information should be included in the Wards/Division Level Computer network of Hazard Mitigation Information (HMI) and may be linked to the Relief Commissioner's office. This data should be updated once in six months.

This should earmark teams for rescue, evacuation, shelters or relief camps, transport for teams, warning public and disseminate information to all concerned about the relief operations/ plans including the Non-Governmental Organizations taking part in the operations or like to take part on arrival from outside the district. Reception and briefing arrangements for Army coming in for relief work and to provide map and/or guides should be arranged. Organize relief camps, emergency feeding, clothing and household supplies and provision of temporary shelter assistance. The actions to be performed by various departments are listed under the respective departments as guidelines.

5.16.2 Information Dissemination

The Public Relations Officer (PRO) should arrange to educate the public about the earthquake hazard and steps that are to be taken by them. This can be done through the local news, by posters, handbills exhibited at prominent public places like bus stands, railway stations, post offices, cinema halls, street plays. People should be encouraged to listen to the Air programs on earthquake which should be organized by the I&PR Department at the State level. Slides on important aspects of the "Dos and Don'ts" should be shown in the cinema halls. This should be done on cyclic basis 2/3 days every week, every 2 months. Community Radio sets should be checked by the Sarpanch of the Gram Panchayat /Executive Officer / Village Revenue Officer (VRO) or Gram Panchayat (GP) Secretary / Head Master of the Elementary School. PRO / CPRO should also carry out media liaison and prepare approved information in suitable form for issuing warning signals.

5.16.3 Medical and Health Department

The District Medical and Health Officer (DM&HO) is responsible for providing emergency medical treatment to the victims, maintenance of public health, and check uality of drinking water, maintain sanitary conditions in the disaster affected area, undertake first-aid training to selected volunteers in the villages, coordinates utilization of medical teams, medical supplies, ambulances and issue of medical certificate for deaths.

5.16.4 Public Works Department and Urban Engineering Department

Survey of weak structures, roads, bridges, buildings for strengthening, carry out survey and assessment of damaged structures, arrange for heavy equipment like dozers, excavators, cranes, pulleys, power saws, gas cutting equipment etc. Undertake clearance of roads and debris of collapsed houses; and, restore damaged buildings and public infrastructure.

5.16.5 Police Department

Responsible for Law & Order, safeguard property, help in evacuation, control movement in disaster areas and at key points for access control, assist in search and rescue, provide required number of radio sets with operators, position mobile VHF Sets as per district plans, ensure speedy delivery of messages received on police net and help in disposing dead bodies.

5.16.6 Education Department

Ensure that earthquake drills are practiced by students in all the schools and colleges, and include earthquake awareness aspects in school curriculum, make available School/College buildings as temporary shelters for evacuation or use as treatment centers besides providing staff for assessment of damages and popularize awareness campaigns in the villages.

5.16.7 APGENCO/APTRANSCO

As disaster preparedness measures suggest, power lines and installations are to be kept free of obstructions, maintain power supply at the best possible level during earthquake particularly for relief camps and the hospitals/treatment centers, adopt public safety measures for plan installations damaged, provide generators as per the district plan including the generators available locally. During the Hudhud Cyclone in October 2014, Electric power supply was disconnected in the port city of Visakhapatnam and the neighborhoods as a precautionary measure to ward off man-made tragedies.

5.16.8 Fire Services Department

Fire Services Department should help in fire-fighting, rescue and other appropriate operations as and when required in the wake of an earthquake disaster.

5.16.9 Forest Department

The Forest Department should help provide construction material for temporary shelters to the public to help construct or repair the fully or partially damaged houses.

5.16.10 Transport Department

Road Transport Officer (RTO) should provide the required number of vehicles to the departments or teams as per the allocations made by the Municipal Commissioner. Pertinent Data of available transport facilities in the District are to be maintained and updated. The department should coordinate use of transport in the emergencies.

5.16.11 Posts & Telecommunications Department

This Department should help provide additional telephones for purpose of relief and rehabilitation operations as requisitioned by the Municipal Commissioner and ensure speedy repairing of damaged Telecommunications Systems.

5.16.12 Counter-Disaster Staff Training

All the Government Officials who are likely to be drafted for duties of earthquake management should be given orientation training at the State level Training Institutions like ATIs. And their services be used as a pool of trained personnel for enlarging the resource pool in the district under the Municipal Commissioner's guidance and supervision. Over a period of time, there will be a sizeable number of earthquake-aware officers, who will be able to coordinate their own department's efforts in fulfilling the various responsibilities in all the phases of the earthquake management. Experts from the Scientific Organizations/ Departments in the State and elsewhere shall be available for such training in the districts as well.

5.16.13 People's Participation

People's participation has been acknowledged as the key to sustainable development, and the success of this initiative has been provided in the State in recent times. Just as people are able to understand the developmental projects initiated by the Government and are actively participating in the planning and executing stages, disaster and its related activities could also reach the same status as that of response of the people to the development oriented projects. But to achieve this, extra efforts have to be made by the officials.

5.17 Actions in Earthquake Disaster

5.17.1 At the advent or onset of an Earthquake

As is well known, practically no warning is possible for an earthquake occurrence; and, this gives rise to some unusual problems in an earthquake situation as opposed to other disasters like floods, cyclones and drought. The concerned areas include:

- Severe and extensive damage, creating the need for urgent counter-measures, especially search and rescue and medical assistance.
- Difficulty of access and movement.
- Widespread loss or damage to infrastructure, essential services and life support systems.
- Recovery requirements (restoration and rehabilitation) may be very extensive and costly.
- Uncommonness of occurrence in some areas may cause some problems for decision making in counter-disaster measures and in public awareness efforts by the Government.
- Communication systems may be damaged or rendered ineffective
- First Information systems may perhaps be vague and exaggerated.

5.17.2 Dissemination of Information on Earthquake

Once the vulnerability assessment has been carried out and the actual areas are identified officials and volunteers should be nominated to pass on the information of the tremors noticed in their respective areas to the Collector/Deputy Commissioner's office by the fastest means. This information should be passed on to the NGRI, and GSI to enable them set up seismic station immediately. The Collector/Deputy Commissioner should simultaneously pass on the information to the Office of Municipal Commissioner, who should record the message and pass on the Information to the Chief Secretary to Government/ Commissioner, Disaster management (CDM) and other concerned officials.

In case the tremors are intense enough to reason damage, the nominated persons if they are not themselves affected should pass on the Information to the Deputy Commissioner's office for further transmission on the revenue wireless net to the Control Room located at the Office of Municipal Commissioner. Then the message should transmitted to the Command & Control Room at the Secretariat and Commissioner, Disaster Management.

5.17.3 Activation of Control Room

All officials and team members should concentrate at nominated places for taking

stock of the situation and to proceed to their respective areas after final check on their tasks, equipment and briefing by the team leader. All communication sets should be opened and establish contact with the local control room.

Without waiting for further orders, the teams nominated for rescue should swing into action and start rescue work to the extent possible in their designated areas with equipment such as crowbars, hooks, ropes, shovels, material for improvised stretches etc. Control Rooms should be activated immediately and actions by the task forces should commence as per the plan. It should be remembered that in the case of earthquakes, there is no early warning. The Deputy Commissioners should, therefore, be ready and well equipped to start rescue / relief operations immediately without waiting for executive orders from above. This type of reaction would be only be possible, if detailed groundwork assessment was carried out. This would lead to allocation of personnel and resources to the various tasks to be performed in the immediate aftermath of earthquake at the site / area of the calamity.

5.17.4 Access Control

It must be also remembered that an earthquake may take place in the wee hours as it happened at Killari village in Latur District of Maharashtra in September-October 1993. This had compounded the problem, and, the outside help took that much longer time to respond. The first rescue / retrieval operation ought to have invariably started by the villagers themselves. With the passage of time, there was an influx of a large number of people from outside. Soon people from outside had converged at the affected village and in the vicinity. In such cases, while the immediate rescue actions and controlling actions were underway with the local teams/officials, additional Police posse force rushed on priority to establish as the task forces from outside start converging as per the plan. The Deputy Commissioner of Police should post pickets and arrange continuous patrolling in the affected areas and relief centers to prevent anti-social activities.

5.18 Response Phase

Initially the resources would be limited and rendering the pace of rescue and relief operations rather slow. There would be difficulty in extricating people who were trapped under the debris of collapsed structures without suitable equipment. This fact has to be explained to the public not only to reassure the victims but also instill confidence in them. All actions will be started simultaneously by the concerned teams / officials, which include the following:

- Opening of control room, concentration of the staff manning it and opening up of additional wireless sets and getting in touch with the various team leaders.
- Move HAM Radio teams to earmarked locations.
- Bid for additional wireless sets from other districts or the State control room.
- Rescue work for victims trapped under the debris and retrieval of dead bodies. Movement of bulldozers, excavators, jeeps with winches, cranes, power saws, gas cutting equipment, drilling equipment etc., should be moved on the orders of the District Control Room. Municipal Commissioner should speak to the Chief Secretary and Commissioner, DM for the aid required from outside place of the calamity.
- Clearance of debris on the roads should be accorded top priority, besides keeping the road communication open for arrival of teams and agencies

with relief materials for distribution amongst the affected.

- Treatment to the injured and placing the dead bodies at an appropriate place for identification by relatives for further disposal. The seriously injured cases requiring surgery should be dispatched to the nearest hospital.
- Construction of temporary shelters in areas selected should be taken up. If possible, relief camps should not be erected more than 2 to 3 Kms away the location of their homes. And in case, this is unavoidable some transport arrangements should be made.
- The survivors should be kept together and evacuated to the nearby safe havens like shelters, relief camp area where the space allotted is commensurate with the requirement of the category of victims i.e., old and sick persons, handicapped persons, pregnant ladies require more space in the camp.
- Food and water should be arranged for the survivors and someone should talk to them to give them confidence and get the details of the missing members of their family. This task should be organized by the officer-in-charge of the relief camps. Clothing and blankets as per Government orders should be issued. Water may not be available freely therefore tankers should be used. Army water trailers could also be used. Water chlorination and water sterilizing tablets must be arranged.
- Civil supplies as per the estimated quantities should be moved to the nominated locations. Salt, matches and kerosene may be added to the inventory of items to be supplied.
- Locations for the treatment centre, relief camps, reception centre, parking areas for relief supplies from the Government and NGO and the information centre should be occupied as per the plan only to avoid confusion later as the pace of operations increases.
- Use of Air Force Helicopters should be made to carry out aerial reconnaissance of the affected areas to assess the extent of damaged area and to bid for additional resources required or to modify the application of resources. This is in the case of Municipalities. But in the case of bigger corporations, you have a number of hospitals nearby.
- Enumeration work for human casualties, damages to property and public infrastructure should be compiled and verified with the census data of the vulnerable area.
- Establishing a Base Depot for receiving, storing and distribution of relief materials from within and outside the district. Transport and labor for loading, unloading, sorting and repacking for transporting to sub-depots must be organized under a senior responsible officer with communication and staff.
- Bid for support from the Army, based on the reports from the Wards/Divisions / team leaders / aerial reconnaissance by the Municipal Commissioner / Commissioner in the case of a Corporation.
- Establishment of a small information centre in the District control room / Corporation control room to provide statistical data about any of the affected areas for decision making and also keep updating the enumeration data as it is reported by various teams / departments / NGOs / Media. This will help in giving out the near correct figures to the Government agencies / Press and Media by the PRO of the District.

5.19. Aid from Overseas

Once the earthquake takes place, the event will be noticed by International Agencies providing aid. In order to achieve smooth coordination between the Donor Agencies and the State Government, it would be appropriate if the Central Relief Commissioner is made responsible for coordinating the formalities of receiving aid by necessary liaison with the concerned Ministries and get the required clearance.

5.20. Recovery and Rehabilitation after an Earthquake occurrence

5.20.1 Recovery

Response, which covers the urgent actions, is basically a short-term expediency. Recovery follows response and is more general and long-term in nature. Response is covered under the orders of the Government, which gives freedom of action to be the officials and Recovery does not have this flexibility. Recovery covers restoration, reconstruction and long-term community rehabilitation. It is complex, extensive and can generate a number of problems.

As in the case of planning for the disasters, information once again plays an important role for proper recovery actions to be initiated. Information from the response operations will give a lot of inputs for the recovery plans and these could be obtained from:

- Damage surveys and need assessment survey (to be done as post-disaster activity).
- After action reports by team leaders / departments.
- Information available with the control rooms.
- Reports from the NGOs (they should be requested to give copy of their reports sent to their higher headquarters).
- Reports of the international aid agencies.
- Information from the Media.
- Reports of the Nodal Officers covering the disaster.
- Development program of the region or area.

5.20.2 Recovery / Rehabilitation / Programs

Based on the data collected from the sources mentioned above, a list of activities required for recovery can be prepared and prioritized. The needs will fall under the following categories:

- Resettlement of displaced persons in new settlements arranged for victims.
- Provision for temporary shelters till new settlements are ready for occupation.
- Resettlement of orphaned children and widows.
- Restoration of public utilities.
- Rehabilitation of persons incapacitated due to serious injuries sustained in the quake.
- Provision of constructed homes with suitable technology and based on traditional design.
- Provision of livelihoods or employment opportunities.

- Rehabilitation of artisans.
- Counseling for victims suffering from Post-Traumatic Stress Disorder (PTSD).

5.20.3 Settlements at the New Environs

Land for new settlement may have to be selected when the damage is extensive. This could be done by earmarking Government lands. By using the remote sensing facility, areas away from major lineaments could be selected and care taken not to select along riverbeds, as these are prone to liquefaction. These sites should be closer to favorable ground-water zones.

The affected population would be averse to moving to totally new areas far away from their lands and do not readily accept the modern RCC construction designs which are smaller than the space they were used to inhabit. It is in this context awareness building of the improved technology among the displaced for their added safety is required and the affected households are persuaded to participate in the planning and construction of the new settlements. The local leaders, voluntary organizations, etc., should be motivated to mobilize people's participation. The layouts of the new relocated villages should be based on traditional designs, preferably a cluster type being the basis for planning. The structures should be earthquake resistant, traditional, low cost and safe. Use of local materials should be made as far as possible and where this is not possible, building materials and elements should be cast on site using proven cost-effective technologies.

State Housing Corporation together with other construction organizations in the State and in the country should establish building centers to carry out suitable training for training of construction workers. Grassroots level planning through involvement of members of the community and trained construction workers will be able to hoist the new settlements and thereby fully satisfying the expectations of the affected.

5.20.4 Temporary Shelters

Number of shelters required will be guided by the pre-earthquake assessment of the total population likely to be rendered homeless and within such population the distinct categories of old and sick, pregnant ladies, lactating mothers and handicapped persons, should be in focus. The stores required for these shelters will have to be arranged, their availability, present location, transport required to move them to the sites selected and the manpower required will have to be worked out before in the preparatory period. Resources as identified will have to be included in the plans in sufficient detail and made known to all.

5.20.5 Orphaned Children & Widows

There could be a sizeable number of persons in this category including the old aged, who have none to look after, and, a provision has to be made for them. Such victims should be looked after by the Government through specific arrangements about their future shelter. This could be done by construction of hostels with a provision of personnel for their management. Compensation money as eligible may be held and operated by a trust created for the purpose of looking after them and may not be given to relatives who are likely to misuse money. Such children ought to be given priority in admission to Government hostels/ residential schools.

5.20.6 Restoration of Public Utilities

The first task at hand to restore normal life in the society would be to restore all the essential public services as early as possible. The concerned line departments, with manpower and material resources, should take up this responsibility. Additional resources may have to be transported from neighboring areas unaffected by the earthquake.

5.20.7 Rehabilitation of Incapacitated Persons

There may be some persons of this category due to time taken for the heavy engineering equipment to arrive at the sites and begin the extrication work. This situation may generally arise in multi-storied residential complexes in moderately dense sections of urban centers. A higher compensation may be granted in such cases.

5.20.8 Construction of Houses

This activity is one of the major post-relief activities and requires careful planning. Construction activity for rehabilitation of the people should be at two tiers: one for relocation in a new area; and the second for constructions in site, depending on the popular choice of people, i.e., whether they are prepared to shift to the new locations proposed or they would like to stay in the old villages. All families affected by earthquake should be sanctioned permanent houses under the existing housing schemes. Some of the major considerations in this activity could be:

- Government and voluntary organizations taking up construction work should establish training centers first to impart quake-resistant technology to the artisans, construction workers, field level supervisors, construction engineers and local leaders.
- Land as identified for relocation should be made available to the construction agencies.
- Partnerships should be established between construction agencies and Financing Institutions.
- Experts on earthquake engineering should be involved right from the planning stage with participation of community leaders.
- Survey of households should be conducted to ascertain the user's perceptions in maintaining traditional character of the dwellings.
- Old layouts and house designs of villages must be examined, and discussed with people's representatives before commencing to plan new layouts and adoption of unit designs.
- Spatial-functional relation should form the basis for design of dwelling units for different categories of the society. Separate entries for different uses must be provided.
- Cluster based layout should be the guiding factor in planning. This approach would find easier acceptance from the public.
- Generate employment through local participation of unemployed youth, labor and construction workers.

5.20.9 Provision of Construction Material

One of the damaged dwellings may require partial repairs for which the Administration could provide cement, CGI sheets, poles and other construction

material at concessional rates or as free supply as per the Government's decision. The assessment carried out after enumeration is finalized would indicate the quantum of items required to be provided for. These are going to be in large numbers and perhaps would have to be arranged, transported and delivered at the sites. This is complex in nature and will involve the following measures:

- Identification of the supplying agencies, their capacity to meet the quantities required at the earliest, their ability to transport them to the site areas.
- In case the collection is to be done by the construction agencies, their requirement of transport, the schedule of movement on the roads should be considered.
- If possible, movement by rail may be considered and necessary coordination be carried out with the railway authorities.
- Suitable organization has to be evolved for the above tasks and persons nominated for supervision and execution of the delivery to the public.

5.20.10 Provision of Employment and Rehabilitation of Artisans

Both these categories of activities can be dovetailed into the construction work and the other restoration /repair work undertaken by the line departments. It is essential that that priority should be accorded to the local semi-skilled and non-skilled potential before importing them from outside areas. Experience elsewhere indicates that the construction agencies bring with them labor inputs and materials; thus, leaving the local population without employment opportunities. Carrying out this coordination immediately after the earthquake would be rather difficult in the pressure created by a host of activities taking place at the same time with their attendant demands on resources and time of the Administration. This problem could be overcome by suitable Government instructions and establishing rapport with the voluntary agencies well before the disaster.

5.20.11 Counseling for Post-Trauma Syndrome Disorder

One of the important aspects of rehabilitation often not stressed enough is the technique oriented to coping with the stress by the victims. Some people may resort to committing suicide and some others may take to deviant conduct like consuming excess alcohol or drugs or gambling and so on.

- An acceptable measure could be counselling at individual and family / group level.
- This should be undertaken, as a continuous input to enhance the much needed social support to help the individuals to recoup themselves and to build up their self-confidence, self-control and the commitment to start life all over again. In other words, counseling process should aim at converting the stress situation to one of challenge to make the best use of whatever is available.
- Counseling should be undertaken by professionally trained social workers drawn from the Government Department of Social Welfare / Health / Extension and NGOs.
- Suitable training should be organized for these teams.

The magnitude of the earthquake and the damage to the property / loss of life would be brought immediately to the notice of the Central Government by the Commissioner (DM). In addition, Relief Department would send as soon as practicable, report to the Ministry of Agriculture (Department of Agriculture and Cooperation), with copies to the Department of Science &Technology, IMD and

the Ministry of Urban Affairs and Employment (Department of Urban Development). The State Control Room would keep the Control Room of the Ministry of Agriculture informed about the developments by telephone/ fax / telex. If the HPC consider that assistance of other organizations, under the control of Central Government or other State Governments is required, the Chief Secretary should bring the matter to the notice of the Central Relief Commissioner who would take appropriate action.

5.20.12 Survey of Existing Structures in the Earthquake-prone Areas

In an earthquake, building and structures suffer damages based on their inherent capacity to withstand the stresses created by the amplification of the ground motion. Earthquake measuring 5 and above on the Richter scale will cause considerable damage to property. The PWB (R&B) in Andhra Pradesh deals with construction of Major buildings, bridges and roads. In earthquake prone areas, the department should make a survey about the condition of existing structures and study about strengthening them so that human deaths could be reduced. This survey should also cover the domestic housing stock in the village.

5.20.13 Code of Good Practices for Low Rise Bearing Masonry Structures

- In order to counter horizontal acceleration of earthquake, ties have to be introduced at Silt, Lintel and Roof levels.
- Roofs of such masonry buildings shall be kept as light as possible.
- Roofing shall be designed and constructed as single diaphragm.
- In quake-prone areas, 50% walls shall be designed as shear walls minimizing openings.

5.20.14 Framed Structures

- In the case of stilt with free standing columns which do not have any other structural members like shear walls, etc., they shall be designed according to loads and moments.
- Design of corner members of the building shall be suitably strengthened.
- The structure shall offer balanced resistance. This should be achieved by keeping the centre of resistance close to the centre of mass of the building as far as possible.
- In the case of asymmetry, where the centers do not coincide, the members shall be suitably designed for the torsion generated by earthquake forces.
- In case of certain category of buildings having higher safety requirements suitable measures like the frames shall be duly braced on the periphery and shear wall shall be introduced.
- Symmetry of the structural systems may be maintained as far as possible even in the case of buildings where geometric symmetry is not there.
- All non-structural members like plumbing, false celling, air conditioning ducts etc., of the building shall be suitably anchored in the position so as to resist earthquake forces.
- Structural glazing / curtain wall shall be designed and constructed on the facade of the building so as to accommodate deflection in the structural members safely. Suitable glass like tempered glass and laminated glass shall only be used in the panels.

- In the case of piped gas supply, the pipes shall be embedded and passed through walls with adequate sleeves to avoid any ruptures.
- External cladding on the walls with heavy material like granite, marble etc., shall be suitably anchored with pins and their load shall be accommodated for.

5.20.15 Pre-cast Construction

- Panel to panel connection of framing members shall be ensured so as to enable the structure to resist earthquake load as a single unit.
- Suitable jointing procedure and workmanship shall be adopted between various interlocking prefab panels to avoid weak connections.
- Suitable anchoring systems like dowel bars, hooks etc., shall be used to prevent dislocation of panels under the action of seismic loads in the quake prone areas.

Isolation of the structure from its foundation may be achieved by using suitable rubber bearings so as to cut transmission of seismic forces to the structures from the ground. This method shall be employed for buildings of 3 to 15 floors to dampen earthquake loads. In such systems, the frames shall be suitably braced.

5.21 Main Mitigation Strategies

These include engineered structures (designed and built) to withstand ground shaking. Architectural and engineering inputs are put together to improve building design and construction practice. Analyze soil type before construction and do not build structures on soft soil. To accommodate on weak soils adopt safety measures . Buildings built on soft soil are more likely to get damaged even if the earthquake is not particularly strong in magnitude. Similar problem persists in the alluvial plains and conditions across the river banks. Heavy damages are observed when the ground is soft.

For construction of buildings, it is advised to follow the Indian Standard Codes. Enforcement of the Bye laws including Land use control and restriction on density and heights of buildings is a must. Strengthening of important lifeline buildings which need to be functional after a disaster should be taken up. Upgrade the level of safety of hospitals, fire service buildings, etc. Public awareness, sensitization and training programs for Architects, Builders, Contractors, Designers, Engineers, Financiers, Government functionaries, House owners, Masons, etc. Reduce possible damages from secondary effects such as fire, floods, landslides, etc., for e.g., Identify potential landslide sites and restrict construction in those areas.

Conclusion

Rapid on-set disasters like earthquakes have been happening all the time. We cannot avoid an earthquake from occurring, but disaster reduction based on involvement of communities in disaster mitigation efforts, can limit the scale of devastation. As a result, the role of the community participation in disaster management is imperative. When the community becomes a part of the decision making system, it ensures the ownership and accountability. Consequently, the most important objective of community based disaster management (CBDM) is to reduce the impact of natural disasters on living conditions of the vulnerable communities in the disaster-prone areas. Active participation of the communities is vital in disaster reduction measures. This could be achieved through ensuring that people are capable of withstanding the impact of a an earthquake initially during the post-disaster phase, until such time the external assistance reached them; and, a long-term sustenance of safety of people, livestock, critical infrastructure and livelihoods is achieved.

In spite of all the precautions taken through the available expertise in the Earthquake-prone locale, it is ultimately the community at the grassroots that is responsible for the speedy recovery once the situation improved following a catastrophe. That apart, Community Based Mitigation would help reduce the debilitating effects of Earthquakes. Consequently, community preparedness alongside public education is vital for mitigating the earthquake impact. Implementation of Earthquake drills and Public awareness programs are vital for preparedness and disaster risk reduction. A Community Based Earthquake Risk Management Project ought to be developed and attendant sustainable programs mounted. Retrofitting of schools and important buildings, purchase of emergency response equipment and facilities, establishing proper insurance can be the programs subsumed under this Earthquake Risk Management Project. A large number of local masons and engineers will be trained in disaster resistant construction techniques. Thus, a huge number of masons, engineers and architects can get trained in the process.