Maharashtra State Disaster Management Plan

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Draft Copy

Disaster Management Unit
Relief and Rehabilitation Department
Government of Maharashtra

Part –I

- ⇒ General information of the State
- ⇒ Vulnerabilty Assessment and Risk Analysis
- ⇒ Preventive and Mitigation Measures
- ⇒ Response Mechanism
- ⇒ Partnership with Other Stakeholders
- ⇒ Recovery Plan
- ⇒ Financial Arrangement

Chapter -1

Introduction

1.1Background

India is prone to a large number of natural as well as man-made disasters. 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity; over 40 million hectares (12 per cent of land) is prone to floods and river erosion; of the 7,516 km long coastline, close to 5,700 km is prone to cyclones and tsunamis; 68 per cent of the cultivable area is vulnerable to drought and hilly areas are at risk from landslides and avalanches. Vulnerability to disasters/ emergencies of Chemical, Biological, Radiological and Nuclear (CBRN) origin also exists. Heightened vulnerabilities to disaster risks can be related to expanding population, terrorism, urbanization and industrialization, development within high-risk zones, environmental degradation and climate change to ensuring clarity about roles and responsibilities of the State, District and local authorities.

Disasters disrupt progress and destroy the hard-earned fruits of painstaking developmental efforts in quest for progress. Maharashtra State has a profile of varied hazards and was first in India to start a Disaster Management Unit (DMU) after the Latur earthquake. Since 1993, Disaster Management (DM) in Maharashtra is fast evolving from a reactive response oriented to proactive strategy based system. The state has witnessed the devastated disasters like Latur Earthquake in 1993, Mumbai Flood in 2005 and Cyclone Phyan in 2007.

Considering the consequences of past disasters priority has been given to preventive, mitigation and preparedness measures. Preparation of State Disaster Management Plan (SDMP) is a part of it. In the meanwhile the State based on its disaster experience has improved a lot in institutional, legal, financial and disaster infrastructures in the state. Thus, Maharashtra government is serious to deal the issues of DM on priority basis.

This DM Plan will be called as “Maharashtra State Disaster Management Plan” (MSDMP) and will be effective for the whole State.

1.2 Vision

To build a safe and disaster resilient State by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, and preparedness actions.

Priority is to save the lives of people and minimize the loss of property and environmental degradation. In this regard a well-defined plan makes disaster management more systematic and productive by developing well-coordinated response mechanism, properly mobilizing resources and ensuring clarity about roles and responsibilities of the State, District and local authorities.

1.3 Objective of the Plan

Section 31 of National Disaster Management Act 2005, makes it mandatory to have a disaster management plan for every State. SDMP shall include Hazard Risk and Vulnerability Analysis (HRVA), prevention, mitigation, preparedness measures, response plan and procedures. An indicative list with possible plan objectives is given below:

- to guide the State Authorities in operation of pre and post disaster activities that make the State disaster resilient.
- to bring together the information related to equipments, skilled manpower and critical supplies available in the State.
- to clear the role and responsibilities of every government line departments and other stakeholders with regard to disaster management including preparedness, mitigation, response and recovery.
- to assess state's own capacity in terms of available resources and get ready to mitigate any unexpected disaster effectively and to prevent the loss of human lives and property through preparedness, prevention & mitigation of disasters.
- to identify the areas vulnerable to major types of the hazards in the State.
- to reduce the loss of public and private property, critical facilities and infrastructure, through proper planning.
- to guide for setting up State Emergency Operations Centre (EOC) at the State level to coordinate in search, rescue, and response works and establish the early warning system with latest communication technology.
- to prepare the response plan following the Incident Response System and provide prompt relief, rescue and search support in the disaster affected areas.

The State Disaster Management Plan (SDMP) is a guide for achieving the above objectives addressed to mitigation, preparedness, response and recovery.

1.4 Themes

Themes underpinning the Plan

- Vulnerability assessment of various disasters in the State
- Measures to be taken for prevention, mitigation, preparedness and response of disasters,
- Steps that to be adopted for mainstreaming disaster in development plans/programmes/projects,
- Importance of addressing capacity building and preparedness measures
- Clear delivery of role and responsibilities of each department of the government and of stakeholders
- Regualr updating and reviewing DM plan annually.

1.5 Approach

The process adopted during preparation of SDMP has been holistic, integrative and participative. It is holistic as it covers all major hazards the State is prone to and makes the

Plan comprehencise and effective. The prevention, mitigation, preparedness and response measures have been well presented in the Plan. First time the Incident Response System (IRS) is included in response plan to make the emergency management more effective. Plan has also been built with rich inputs provided by the stakeholders, government line departments, expert organisations, district and local authorities. Thus, partipatory approach contributed a lot to update the plan with some changes.

1.6 Strategy

The basic strategy adopted for preparation of SDMP started with the study of the National Disaster Management Act 2005, guidelines of the State DM Plan, reports and publications of existing SDMP, suggestions and observations received from the government line departments and expert institutions. The existing plan which was developed in consultations with various stakeholders has been updated as per the quidelines of National Disaster Management Act.

1.7 Scope of the Plan

The State DM Plan provides a consistent, statewide institutional framework to enable state, local governments, Central government and the private sector to work together to mitigate, prepare for, respond to and recover from the effects of emergencies regardless of cause, size, location, or complexity. In accordance with the National Disaster Management Aurhority (NDMA), this plan is in effect at all times and applies to all levels of state government and its political subdivisions/Tehsils/Blocks/Villages. The plan incorporates and complies with the principles and requirements found in National and state laws, regulations and guidelines.

1.8 Authority and Reference

Under Section 23(1) of the DM Act 2005 - it is mandatory for every state to have a State Disaster Management Plan (SDMP) which shall be prepared by State Executive Committee (SEC) and approved by the State Disaster Management Authority (SDMA).

1.9 Level of Disasters

The National Disaster Management Authority (NDMA) has worked out Guidelines for the preparation of State Disaster Management Plan.

The Guidelines categorize the levels of disasters into L_0, L_1, L_2, & L_3 based on the ability of various authorities to deal with them. In short, in order to facilitate the responses and assistances to States and Districts, the level of disasters have been defined as follows.

L0 level denotes normal times which will be utilized for close monitoring, documentation, prevention and preparatory activities. Training on search and rescue, rehearsals, evaluation and inventory updation for response activities will be carried out during this time.

L1 level specifies disaster that can be managed at the District level, however, the State and Centre will remain in readiness to provide assistance if needed.

L2 level disaster situations are those which requires assistance and participation of State, mobilization of its resources for management of resources.

L3 level disaster situation is in case of large scale disaster where the State and District authorities have been overwhelmed and require assistance from the Central Government for reinstating the State and District machinery as well as for rescue, relief, other response and recovery measures. In most cases, the scale and intensity of the disaster as determined by the concerned technical agencies like IMD/ Indian National Centre for Ocean Information Services (INCOIS) are sufficient for the declaration of L3 disaster.

1.10 Plan Development and Activation

As per the Section 23(2) of the DM Act, the State Plan is to be prepared by the State Executive Committee (SEC) following to the guidelines laid down by the National Authority and after such consultation with local authorities, district authorities and the people's representatives as the State Executive Committee may deem fit.The State Plan prepared by the State Executive Committee under subsection (2) shall be approved by the State Authority.

Steps in a collaborative planning process while developing State Plan included – formation of core team, understand hazards, vulnerabilities and risk foot prints of the State, plan development (develop and analyse course of action, identify resources, identify information needs), plan preparation (write, review, approve and disseminate), plan implementation and maintenance (exercise, review, and maintain).

The plan would be activated considering the situation prevailing at a given point of time.

1.11 Review/Updation of DM Plan

The SDMP is a "living document" and the State Disaster Management Unit (DMU) will review and update it regularly in January every year taking into consideration: the resource requirements, updates on human resources, technology to be used and coordination issues.

An annual review meeting for SDMP update will be organised by DMU. All concerned departments and agencies would participate and give recommendations on specific issues. Besides, inputs received from different line agencies, drills and demonstrations, government revised plans and policies, and lessons learnt from best practices etc. should be included in it.

The following guidelines should be adhered to while updating the state SDMP:

- A procedure should be in place to update the plan on a regular basis, to ensure that the items requiring updation are considered and are current.
- When an amendment is made to a plan, the amendment date should be noted on the updated page of the plan.

- A senior official in every agency should be designated, to ensure that all plan-holders are notified of changes as soon as possible. Plan-holders should be requested to verify that they have received the changes.

As DM plan is a part of preparedness, priority is to make it updated and put in place within the above scheduled timeline.

1.12 Plan Testing

The State Disaster Management Unit (SDMU), Relief and Rehabilitation (R & R) Dept. shall prepare, review and update State Disaster Management Plan as provided for in the DM Act. It will also ensure that disaster management drills and rehearsals are carried out periodically. The plan must be thoroughly tested and evaluated on a regular basis once in a year. After plan testing and incorporation of lesson learnt, the SDMU should send a copy of the revised and updated plan to the concerned authorities and line departments.

The main objectives of plan testing are to:

a. Make concerned departments acquainted to their role and responsibilities.
b. Identify the core areas in the plan where due modification to be made.
c. Undertake all scheduled pre-disaster activities properly.
d. Identify and involve the new agencies/organisations working in DM.
e. Understand how the emergency communication system works and where it gets problems.
f. Know the response mechanism in terms of time, management and resource available.
g. Organise capacity building trainings, awareness programmes and mock drills as per the demand of the plan.

Plan testing is an important task in DM since it guides the whole management. For in-time response at the time of disaster a well prepared disaster management system works effectively. In this regard the DM plan needs to be tested in time and keep every stakeholder ready. The Plan testing also ensures that the disaster equipments, materials, critical supplies and manpower are updated and functional.

Chapter -2

Institutional Development

State Level DM Structure

The Disaster Management Act 2005 provides the legal and institutional framework for disaster management in India at the national, state and district levels. In the National policy of India the primary responsibility of disaster management vests with the State Governments. The Central Government lays down policies and guidelines and provides technical, financial and logistic support while the state and district administration carries out most of the operations in collaboration with central and state level agencies.

The primary responsibility for DM rests with the States. The institutional mechanisms put in place at the Centre, State and District levels will help the States to manage disasters in an effective manner.The DM Act, 2005 mandates the State Governments, inter alia, to take measures for preparation of state DM plans, integration of measures for prevention of disasters or mitigation into state development plans, allocation of funds, establishment of early warning systems and to assist the Central Government and other agencies in various aspects of DM.

2.1 State Disaster Management Authority (SDMA)

Section 14 of National DM Act 2005 mandates each State to establish State Disaster Management Authority (SDMA). At the State Level the SDMA, headed by the Chief Minister, lays down policies and plans for disaster management. It is also responsible to coordinate the implementation of the State Plan, recommend provision of funds for mitigation and preparedness measures and review the developmental plans of the different departments of the State to ensure integration of prevention, preparedness and mitigation measures. The Chairperson of the State Authority shall, in the case of emergency, have power to exercise all or any of the powers of the State Authority but the exercise of such powers shall be subject to ex post facto ratification of the State Authority.The Maharashtra State Disaster Management Authority was constituted in 2006. The present SDMA is as follows.

S#	SDMA Composition	Position
1	Chief Minister	Chairman
2	Minister, Revenue	Member
3	Minister, Finance	Member
4	Shri Sudhir Thakare	Member
5	Shri Nanda Kumar Wadnere	Member
6	Prof. Mahesh Kamble	Member
7	Prof. Smt. Jacquleen Josheph	Member

8	Chief Secretary	Ex Officio Member and Chief Executive Officer

2.1.1Powers and functions of State Authority

a. Lay down the State disaster management policy;
b. Approve the State Plan in accordance with the guidelines laid down by the National Authority;
c. Approve the disaster management plans prepared by the departments of the State Government;
d. Lay down guidelines to be followed by the departments of the State Government for the purposes of integration of disaster prevention measures in their development plans and projects and provide necessary technical assistance thereof;
e. Coordinate the implementation of the State Plan;
f. Recommend provision of funds for mitigation and preparedness measures;
g. Review the development plans of the different departments of the State and ensure that prevention and mitigation measures are integrated therein;
h. Review the measures being taken for mitigation, capacity building and preparedness by the the various government departments and issue such guidelines as may be necessary.

2.2 State Executive Committee (SEC)

In section 20 of NDM Act there is provision that the State Executive Committee will be formed under the chairmanship (ex-officio) of Chief Secretary with four secretaries to the government of the State of such departments as the State Government my think fit, ex officio, as committee members.

The Maharashtra State Executive Committee was established in 2006. The constitution of the SEC is as follows –

S#	Composition	Position
1	Chief Secretary	Chairman
2	Add. Chief Secretary, Home	Member
3	Add. Chief Secretary, Finance	Member
4	Principal Secretary, Public Health	Member
5	Principal Secretary, R&R	Member
6	DG, Police - Maharashtra	Member

2.2.1 Functions of the State Executive Committee:

(1) The State Executive Committee shall have the responsibility for implementing the National Plan and State Plan and act as the coordinating and monitoring body for management of disaster in the State.

(2) Without prejudice to the generality of the provisions of subsection(1), the State Executive Committee may-

a. Coordinate and monitor the implementation of the National Policy, the National Plan and the State Plan;
b. Examine the vulnerability of different parts of the State to different forms of disasters and specify measures to be taken for their prevention or mitigation;
c. Lay down guidelines for preparation of state/district disaster management plans;
d. Monitor the implementation of disaster management plans prepared by the departments of the Government of the State and District Authorities;
e. Monitor the implementation of the guidelines laid down by the State Authority for Integrating of measures for prevention of disasters and mitigation by the departments in their development plans and projects;
f. Evaluate preparedness at all governmental or non-governmental levels to respond to any threatening disaster situation or disaster and give directions, where necessary, for enhancing such preparedness;
g. Coordinate response in the event of any threatening disaster situation or disaster;
h. Give directions to any Department of the Government of the State or any other authority or body in the State regarding actions to be taken in response to any threatening disaster situation or disaster;
i. Promote general education, awareness and community training in regard to the forms of disasters to which different parts of the State are vulnerable and the measures that may be taken by such community to prevent the disaster, mitigate and respond to such disaster;
j. Advice, assist and coordinate the activities of the Departments of the Government of the State, District Authorities, statutory bodies and other governmental and non-governmental organizations engaged in disaster management;
k. Provide necessary technical assistance or give advice to District Authorities and local Authorities for carrying out their functions effectively; (Advise the State Government regarding all financial matters in relation to disaster management;
l. Examine the construction, in any local area in the State and, if it is of the opinion that the standards laid for such construction for the prevention of disaster is not being or has not been followed, may direct the District Authority or the local authority, as the case maybe, to take such action as may be necessary to secure compliance of such standards;

2.3 State Disaster Response Force (SDRF)

Maharashtra is a multi-disaster prone State. It is vulnerable to natural disasters like floods, cyclones, earthquakes, landslides etc as well as manmade disasters like fire, building collapses etc. The National Disaster Response Force has been constituted at the National level for effective response to such disasters. One battalion of the NDRF is posted in Sudumbre in Pune for responding to these disasters. However, this battalion is responsible for covering Maharashtra, Gujarat and Goa. Also as time is a crucial factor after a disaster has occurred for effective response, it is difficult for the NDRF to respond quickly to disasters that may occur in Vidarbha or Marathwada. It is also the mandate of the NDMA that every state has to become self-sufficient in this regard and constitute a SDRF of their own.

Accordingly the proposal for creation of a standalone SDRF was tabled before the Cabinet of Ministers and was unanimously approved. The following decisions in this regard were taken by the Cabinet.

1. Two Companies of the SDRF will be created in the State on the lines of the NDRF.
2. Every Company will consist of 3 teams. Every team will have 45 members. In order to handle the establishment matters for the force, additional posts will be created. In total the SDRF will consist of 428 members. This will include the field level officials as well as the support staff.
3. Initially the posts will be filled on deputation basis from SRPF for a period for 5 yrs. The selection criteria will be finalized by a committee consisting of the Secretary, DMU, DG Maharashtra Police and Commanant NDRF. The salary component will be borne by the SDMA with a 10% incentive to the members of the SDRF over their current salary.
4. The NDRF and State Reserve Police Force (SRPF) will impart trainings to the SDRF.
5. The other matters regarding the positioning of the force, establishment matters, location of headquarters, etc will be decided by the State Executive Committee of the SDMA

2. 4 State Emergency Operation Centre (SEOC)

Emergency Operation Centre (EOC) is an offsite facility equipped with communication system and manpower. It works round the clock during emergency and coordinates the overall emergency management. EOC at State level with Disaster Management Unit is working through out the year and stays in touch with district EOCs. In short, it closely works on coordination, communication and emergency information management. State EOC is seamlessly connected with National EOC on up-stream and with all District EOC on downstream and also other agencies who provide early warning.

2.4.1 Activation

The overall coordination and control of relief works (search and rescue) start in EOC during emergency response. The District Emergency Operation Centre (DEOC) wll be activated if level one (L1) disaster occurs, whereas the State Emergency Operation Centre (SEOC) will be activated in case of L2 disaster takes place along with DEOC.

2.4.2 Functions

- Receive, monitor, and assess disaster information.
- Keep track of available resources.
- Monitor, assess, and track response units and resource requests.
- Manage resource deployment for optimal usage.
- Make policy decisions and proclaim local emergencies as needed.
- Provide direction and management for EOC operations through Standard Operations Procedure (SOP), set priorities and establish strategies.
- Coordinate operations of all responding units, including law enforcement, fire, medical, logistics etc.
- Augment comprehensive emergency communication from EOC to any field operation when needed or appropriate.
- Maintain EOC security and access control.

- Provide recovery assistance in response to the situations and available resources
- Keep senior, and subordinate officials informed.
- Keep local jurisdictions (Village/town/City, district and State) informed.
- Operate a message centre to log and post all key disaster information.
- Develop and disseminate public information warnings and instructions.
- Provide information to the news media.
- Manage donation / aids.

2.4.3Command and Control

Being a key communication hub, EOC works under the direct control of Secretary, Disaster Management Unit at State level and District Collector at district level. Its involvement in coordination, monitoring and supporting the overall emergency situation instantly.

2. 5 Maharashtra Disaster Risk Management Program

For the first time a program known as the Disaster Risk Management Program was formerly initiated as the DRM Program in 2003 along with the UNDP as the facilitating partner. The Program covered 17 states & 169 districts in the country. The program was initiated in Multi hazard prone 14 Districts – 159 Talukas and 7 Muncipal Corporations in the state of Maharashtra and was implemented at the State, District, Taluka and Village levels.

DRM achieved considerable success in terms of institutional strengthening. It supported the Constitution of Maharashtra State Disaster Management Authority [MSDMA], Constitution of State Executive Committee, upgradation of State Emergency Operation Center and preparation of Disaster Management Plans with Yashada. The program enabled setting up of District Disaster Management Authorities at the districts and also in finalizing 59 Taluka Disaster Management plans.

DRM ended in June 2009. The Maharashtra Government took over the program and has continued it in the 14 districts in which it was being implemented. The program has also been initiated in all the remaining 21 districts in the state and in the Mumbai Municipal Corporation and is named as the Maharashtra Disaster Risk Management Program (MDRM).

MDRM program has three main components – Planning, Capacity Building and Awareness Generation. The implementation of the program is at all three administrative tiers – District, Taluka and Gram Panchayat Level.

Appointment of DDMCs and DDMOs

District Disaster Management Officer and Divisional Disaster Management Coordinator appointed in all districts and divisions under the program. The posts are on contractual basis for a period of 11 months as per the guidelines of the GAD

Initial time line of three years: 2010-11 to 2012-13.Program achieved considerable success and on the demand of the District Collectors and Divisional Commissioners the program and the posts had been extended upto 31st March 2015 by the Cabinent.

2.6 Regional Disaster Management Centres (RDMCs)

In order to take care of city administartions in terms of disaster management State government has set up 10 RDMCs in the state. These centres are located with 10 Municipal Corporations and provided budget to strengthen the EOCs and purchase SAR materials, organize capacity building trainings for various target groups as well as organize awareness programmes on different disasters in city areas.

S#	RDMC Headquarters	Associated Districts
1	Navi Mumbai	Mumbai, Mumbai Suburban district, Thane (Navi Mumbai BMC Area) Raigad
2	Thane	Thane, Mumbai, Mumbai Sub-urban district
3	Pune	Pune, Satara
4	Sangali	Sangali, Kohlapur, Sindhudurg, Ratnagiri
5	Solapur	Solapur, Osmanabad, Latur
6	Aurangabad	Aurangabad, Jalna, Beed
7	Nanded	Nanded, Hingoli, Parbhani
8	Nashik	Nashik, Dhule, Nandurbar, Jalgaon, Ahamadnagar
9	Amaravati	Amaravati, Buldana, Akola, Washim, Yawatmal
10	Nagapur	Nagpur, Bhandara, Gondia, Wardha, Chandrapur, Gadchiroli

2.7 District Disaster Management Authority (DDMA)

At the District level, DDMAs will act as the planning, coordinating and implementing body for DM and will take all measures for the purposes of DM in the respective Districts in accordance with the guidelines laid down by National Disaster Management Authority (NDMA). The DDMA, not exceeding seven members, headed by district collector will deal with all disaster management issues at district level including preparedness, mitigation, response and recovery works. At the time of emergency the district administration may take help of State administration for relief and rescue operation.

The Maharashtra State Disaster Management Authority was established on 1/6/ 2006 vide GR no CR 10/DM- 1.

Composition of DDMA

District Collector	Chairman
Chairman, Zilla Parishad	Dy. Chairman
CEO, Zilla Parishad	Member
District Superintendent of Police	Member
District Civil Surgeon	Member

Executive Engineer, PWD	Member
Executive Engineer, Irrigation	Member
Additional Collector / Resident Deputy Collector	CEO
Municipal Commissioner	Special Invitee
Police Commissioner	Special Invitee
Commandant, SRPF/ NCC, Homeguard, Civil Defence	Special Invitee
NGO representative	Special Invitee

2.8 Local Authorities

Local authorities like Panchayati Raj Institutions (PRIs), Municipal Corporations, Municipalities, District and Town Planning Authorities are duly associated in disaster management process. These bodies will prepare DM Plans in consonance with the Guidelines of NDMA, SDMAs and DDMAs and will ensure capacity building of their officers and employees for managing disasters, carry out relief, rehabilitation and reconstruction activities in the affected areas.

2.9 Stakeholders of the State DM plan

At State level the State Disaster Management Authority (SDMA) and the Relief and Rehabilitation Department of government of Maharashtra are the apex bodies to deal with all disaster related issues. The major stakeholders of State Disaster Management plan are district collectors, local self governments, technical agencies, NGOs, and community people**.**

All these stakeholders can play an important role in each and every phase of disaster management. Preparedness, mitigation, response and recovery phases are basically participatory in nature. So, direct involvement of line agencies, local NGOs and community people along with government bodies in any disaster management programme is more affective.

2.10 Fund Provision

For Disaster Management, the state government has made provision of following budget heads.

State Budget.
Natural Calamity Relief Fund 2245 is used for relif purpose for disaster victims in the state. If people get affected by any natural disasters the government provides them relief under this head for human loss, animals death, repairing of damaged houses, crops, purchasing of utencils, food items, clothes and necessary household goods.

State government also provides **State Disaster Mitigation Fund** to all 35 districts and 10 Regional Disaster Management Centres (RDMCs) working for city areas for strenghthening EOCs and purchasing search and rescue equippments, organizing capacity building trainings and awareness programmes for various target groups.

Chapter -3

Hazard, Risk and Vulnerability Profile

3.1 State Profile

Maharashtra at a Glance

S#	Items	2012-13
1	**Geographical Area** ('000 sq. km.)	308
2	**Administrative Setup**	
	Revenue Divisions	6
	Districts	36
	Talukas	355
3	**Local Self Government Institution**	
	Zilla Parisads	34
	Gram Panchayats	27,873
	Panchayat Samitis	351
	Municipal Councils	220
	Municipal Corporations	26
	Nagar Panchayats	12
	Contonments Boards	7
4	**Population as per Census 2011 in ' 000**	1,12,374
	Male	58,243
	Female	54,131
	Rural	61,556
	Urban	50,818
	Scheduled Caste	13,276
	Schedule Tribes	10,510
	Density of population per sq km	365
	Literacy rate in percentage	82.3
	Sex ratio (Females per thousand males)	929
	Percentage of urban population	45.2
	Slum population (in crore)	1.18
5	**Education**	
	Primary School	1,02,128
	Secondary School	18,505
6	**Health**	

	Hospitals	1,393
	Dispensaries	3,087
	Birth Rate	16.6
	Death Rate	6.3
	Infant Mortality Rate	25
7	**Forests**	
	Total forest area in sq. km	61,369

(Source Economic Survey of Maharashtra 2013-14)

3.1.1 Location, Area and Population

Maharashtra occupies the western and central part of the country and has a long coastline stretching nearly 720 km along the Arabian Sea. The Sahyadri mountain ranges provide a physical backbone to the State on the west, while the Satpuda hills along the north and Bhamragad-Chiroli- Gaikhuri ranges on the east serve as it's natural borders. The State is surrounded by Gujarat to the north west, Madhya Pradesh to the north, Chattisgarh to the east, Andhra Pradesh to the south east, Karnataka to the south and Goa to the south west. Mumbai, the capital city of the State and the financial capital of the country.

Maharashtra covers an area of 307,713 km^2 (118,809 sq mi) or 9.84% of the total geographical area of India.

3.1.2 Administartive Division

The State has 36 districts which are divided into six revenue divisions viz. Konkan, Pune, Nashik, Aurangabad, Amravati and Nagpur for administrative purposes, with effective machinery for planning at the district level. For local self-governance in rural areas, there are 34 Zilla Parishads, 351 Panchayat Samitis and 27,873 Gram Panchayats. The urban areas are governed through 26 Municipal Corporations, 220 Municipal Councils, 12 Nagar Panchayats and seven Cantonment Boards.

3.1.3 Demography

Maharashtra is the second largest state in India both in terms of population and geographical area (3.08 lakh sq. km.). The State has a population of 11.24 crore (Census 2011) which is 9.3 per cent of the total population of India. The State is highly urbanised with 45.2 per cent people residing in urban areas.

3.1.4. Climate, Temperature and Rainfall

Maharashtra has typical monsoon climate, with hot, rainy and cold weather seasons. Tropical conditions prevail all over the state, and even the hill stations are not that cold.

The average annual rainfall is around 1300mm. The maximum rain is received by Konkan, Sahyadrian and eastern Vidarbha region, while the central region receives less rainfall. The Vidharbha region usually gets rainfall when weather system like low pressure area or depression moves westward from the Bay of Bangal through Odisha, Chhatishgarh and

Vidharbha region. The annual average rainfall in Thane, Raigad, Ratnagiri and Sindhudurg districts is around 200cm. On the other hand, cities like Nasik, Pune, Ahmednagar, Dhule, Jalgaon, Satara, Sangli, Solapur and parts of Kolhapur receive less than 50 cm rainfall every year.

Temperature varies between 22°C-45°C during summer season and 12°C-34°C during winter season.The highly variable rainfall in Maharashtra ranges from 400 to 6000mm and occurs in a four month period between June – Sept. About 85% rainfall is from the south-west. The number of rainy days generally vary from 40 in the scarcity zone to 100 in the heavy rainfall zone.

3.1.5 Major Rivers and Coastline

Godavari River:
The Godavari River originates near Nashik in Maharashtra and flows nearly around 1,465 km before joining to the Bay of Bengal. Its principal tributaries are the Parvara, the Purna, the Manjra, the Penganga, the Wardha, the Wainganga, the Indravati and the Kolab.. Asia's largest Lift irrigation project is constructed on the river just 5 km away from Nanded city.

Krishna River:
The Krishna River rises from a place with an elevation of 1337m north of Mahabaleshwar. The Ghataprabha, the Malaprabha, the Bhima, the Tungabhadra and the Musik are the major tributaries joining Krishna.

Bhima River
The river is prone to flooding due to heavy rainfall during the monsoon season. In 2005 there was severe flooding in Solapur, Bijapurand Gulbarga districts.

Tapi River: Tapi River starts from a place with an elevation of 752m near Multai in the Betul district of Madhya Pradesh. It flows for about 724 km before out falling into the Arabian Sea through the Gulf of Cambay. The Purna, the Girna, the Panjhra, the Vaghur, the Bori and the Aner are the principal tributaries of Tapi.

Rivers flowing from the Western Ghats
Maharashtra has more than 11 important west flowing rivers including Damanganga
Surya, Vaitarna, Ulhas, Savitri, Kundalika, Patalganga, Vashisti, Shastri, Karli, and Terekhol.There are numerous smaller rivers joining the creeks

Coastline
Maharashtra is bordered by the Arabian Sea to the west and has a long coastline stretching nearly 720 kilometers along the Arabian from Goa to Gujarat.

3.1.6 Socio-Economic Status

Maharashtra is the second most populous state and third largest state by area in India. At the 2011 census, Hinduism was the principal religion at 82.5% of the total population, while Muslims comprised 13.4% of the total population, being the second-largest community and the largest minority group; Sikhism, Christianity, Jainism and other

religions comprised 4.1% of the total population of the State. Around 58.3% – 73.4% of the total Buddhists in India reside in Maharashtra. The gender ratio in Maharashtra was 925 females per 1000 males, which was below the national average of 940. The density of Maharashtra was 365 inhabitants per km^2 which was lower than national average 382 per km^2. Since 1921, the populations of Ratnagiri and Sindhudurg shrank by – 4.96% and – 2.30% respectively, while the population of Thane grew by 35.9%, followed by Pune at 30.3%.

Maharashtra is the wealthiest State in India contributing 15% of the country's industrial output and 13.3 % of its GDP. It is also the most industrial State. Mumbai is the capital of the state and the financial capital of India.State's per-capita income is 40% higher than the all India average. The agriculture and allied activities sector contribute 12.9% to the State's inocome. The industial activities in State is concentrated in four districts – Mumbai, Mumbai Suburban, Pune and Thane. Nashik and Pune contribute more in agriculture and allied activities sector. Apart from agriculture and industry, banking, insurance, real estate and public administration contribute a lot to the State economy.

3.1.7 Agriculture

The State has 231 lakh ha of land under cultivation and area under forest is 52.1 lakh ha. Many irrigation projects are being implemented to improve irrigation. A watershed mission has been launched to ensure that soil and water conservation measures are implemented speedily in the unirrigated area.

Rice is the dominant crop of the state, but cashews, mangoes, cotton, oilseeds, and tobacco are also important. Beides, animal husbandry is an important agriculture related activity. The agriculture & allied activities sector contributes 12.9% to the State's income. The State's share in livestock and poultry population in India is about 7% and 10% respectively. Maharashtra is also a leading state in horticulture. It stands first in fruit production and seventh in vegetable production in India.

3.1.8 Industry

Maharashtra is the most industrialised State and has maintained leading position in the industrial sector in India. It is a pioneer in Small Scale Industries and continues to attract industrial investments from both, domestic as well as foreign institutions. It has become a leading automobile production hub and a major IT growth centre and has largest number of special export promotion zones.

It has one of the largest industrial economies in the country and is a primary financial centre. Its economic dominance is in large part due to the contributions of Mumbai, the country's financial and industrial capital that accounts for 35 per cent of the state's domestic product.

Approximately, 25% of the top 500 companies in the IT sector are situated in Maharashtra. State accounts for 28% of the software exports of India. The state houses important financial institutions such as the Reserve Bank of India, the Bombay Stock Exchange, the National Stock Exchange of India, the SEBI and the corporate headquarters of numerous Indian companies and multinational corporations. It is also home to some of

India's premier scientific and nuclear institutes like Bhabha Atomic Research Centre (BARC), Nuclear Power Corporation of India Limited (NPCIL), Indian Rare Earths Limited (IREL), Tata Institute of Fundamental Research (TIFR), Atomic Energy Regulatory Board (AERB), The Atomic Energy Commission (AEC) , and the Department of Atomic Energy (DAE).

3.1.9 Transport and Communication

The State has well spread road network of 2.43 lakh km (maintained by Public Works Department and Zilla Parishads). All weather roads and fair weather roads connect more than 99 per cent villages. The surface transport facilities and connectivity with sea ports and airports have resulted in good transport system. With high installed capacity and generation of electricity, the State is the most favoured destination for investment.

Air: Mumbai, Pune and Nagpur have international airports while Mumbai, Pune, Nagpur, Aurangabad, Kolhapur and Nanded have domestic airports.. Sahar (International) and Santa Cruz (Domestic) are the two airports in Mumbai. Flights are operated by both private and government airline companies.

Waterways & Ports: There are nearly around 48 minor ports in Maharashtra. Most of these handle passenger traffic and have a limited capacity. The two principal ports, Jawaharlal Nehru Port and Mumbai Port, which are at Mumbai, are under the control and supervision of the government of India. Maharashtra has approximately 720 km of coastline.

Railways: Indian Railway has train stations even in almost all the small and remote villages of Maharashtra.The total length of railway tracks in the State including the Konkan railway is 5,902 km.

Following lists the chief rail routes in the State:

1. Mumbai-Delhi (Central railway)
2. Mumbai-Delhi-Ahmadabad (Western railway)
3. Mumbai-Kolkata
4. Mumbai-Chennai
5. Mumbai-Secunderabad
6. Mumbai-Kolhapur
7. Delhi-Chennai (Grand Truck)
8. Bhusaval-Surat
9. Mumbai-Panaji(Konkan railway)

Road Transport: Maharashtra State Road Transport Corporation's buses ply on over 19,000 routes in the state, covering 1.2 million km. The Corporation has nearly 15,500 buses. In addition to the government services, cities have private and non-private taxis, auto-rickshaws, and intra-city buses, which run efficiently. List of National Highways crossing the State.

Name of the Highways	Highway No	Name of the Highways	Highway No

Mumbai-Nashik-Agra	3	Mumbai-Ahmadabad-Jaipur- Delhi	8
Mumbai-Pune-Bangalore-Chennai	4	Pune-Solapur-Hyderabad-Vijaywada	9
Nhavasheva-Kalamboli-Palaspe	4B	Solapur-Bijapur-Chitradurg	13
Hazira-Surat-Dhule-Nagpur-Kolkata	6	Nizambad-Jagadalpur	16
Vanarasi-Nagpur-Hyderabad-Bangalore (Kanyakumari Highway)	7	Panvel-Goa-Mangalore	17
Pune-Nashik	50		

Communication

The State is well connected with telephone and postal networks. The urban and rural areas are covered with telephone netwrorks provided by government. and private agencies. The entire State is also well accessed to postal services and State transport networks.

3.1.10 Health

The health care infrastructure in Maharashtra is generally considered to be above the national average. Medical care is provided through hospitals, district and sub-divisional hospitals, other special hospitals, rural hospitals and Public Health Centres (PHCs). The district hospitals form the core of medical care available from the State Government The rural hospitals are usually located at the taluka headquarters or larger villages and serve the population of the urban centres in which they are situated as well as the adjoining rural areas, unlike the PHCs, which serve only the rural areas. The few available studies on private health care institutions show that they have penetrated to the remotest of areas. The district hospitals and most of the Community Health Centres are self sufficient in terms of water, electricity, vehicle and operation theatre facilities. The district hospitals have most of the essential medical equipments.

3.1.11 Education

The State has given importance to primary education, which has resulted in consistent improvement in literacy rate. The literacy rate of the State is 82.3 per cent against 73 per cent at national level as per Census 2011. Free education is provided to girls upto XII standard. Excellent higher educational institutions in the fields of engineering, medical and management are located here.Maharashtra has some renowned universities and is played a pioneering role in the development of the modern education system in India. It is also home to such notable autonomous institutes as Indian Institute of Technology Bombay, Dr. Babasaheb Ambedkar Technological University, Institute of Chemical Technology, Homi Bhabha National Institute and Veermata Jijabai Technological Institute(VJTI). The University of Pune, the National Defence Academy, Film and Television Institute of India, National Film Archives, Armed Forces Medical College and National Chemical Laboratory were

established in Pune after the independence of India. Maharashtra has hundreds of other private colleges and universities, including many religious and special-purpose institutions.

3.1.12 Religious Places

Maharashtra has many religious sites and pilgrimage places for different faiths. Four important religious places are;

Kumbha Mela, Nashik
Nashik is the holy city for Hindus. Kumbh Mela is organized here once in every three years and Maha Kumbh Mela once in every twelve years.

Pandharpur
Pandharpur preserves Lord Vithoba's image in a grand temple. Vithoba is a form of Krishna. Pandharpur is located in a place, which is 65 km away from Sholapur on the banks of river Bhimarathi.

Shirdi
Shirdi, a small village in Kopargam Taluk, in Ahmadnagar, Maharastra is regarded to be an important pilgrimage place in India as sage Sai Baba lived here till his death.

Sidhi Vinayak Temple
Siddhivinayak Temple is in Mumbai, Maharashtra. Siddhivinayak Lord Ganapati/Ganesh is worshipped in the temple.

Shri Hazur Sahib
Takhat Sachkhand Shri Hazur Abchalnagar Sahib is the most important Gurdwara situated in Nanded, Maharashtra. It is one of the four high seats of Authority of the Sikhs. Guru Gobind Singh, the 10th Sikh Guru died in Nanded and his ashes are buried in the Sach Khand Shri Huzur Gurdwara on the side of the river Godavari.

3.1.13 Tourism

Monuments such as Ajanta, Ellora and Elephanta caves, Gateway of India and architectural structures like Viharas and Chaityas attract tourists from all over the world. It has produced many important personalities covering almost every aspect of human development. The State has sizable contribution in sports, arts, literature and social services. The world famous film industry, popularly known as “Bollywood” is located in the State.

3.2 History of Disasters in the State

Natural Disasters	Past History	Vulnerable Area
Floods	33 districts in 2005 and 31 districts in 2006	All districts of the State
Cyclones	No major history	Six coastal districts including Mumbai

Hail Storms	Occasional	Some parts in the State, Specially Marathawada and Vidarbha.
Etreme heavy rainfalls, sometime resulting cloud bursts	26th July 2005 Mumbai 2006 Chiplun & Mahad 2007 Amravati &Chiplun	Entire State especially Konkan
Heat wave	Vidarbha region and Nashik region	Marathwada, Vidarbha and Nashik Divisions
Drought	2001,2002, 2003, 2004, 2008, , 2011, 2012, 2013	Drought Prone districts especially Marathwada and parts of Vidarbha
Sea Erosion	Konkan, 720kms of coast	Konkan Division districts
Earthquakes	1967 Koyna earthquake 1993 Latur earthquake	High risk : Ratnagiri. Raigad, Satara, Thane, Latur
Land slides & Mud flow	2005 Mumbai, Mahad 2006 Ratnagiri	High risk : Ratnagiri. Raigad, Satara, Thane, Nashik, Mumbai, Sindhudurg
Dam failures / Dam Bursts	1961 Panshet	106 major dams across State May be a secondary disaster

Manmade Disasters

Unnatural and manmade disasters such as road accidents, industrial accidents, fires, accidents in quarries and mines, drowning, explosion etc. may occur due to some technical blunders or man made changes in the environment.

Terrorist Attacks

Date	City	Fatalities	Injured
March 12, 1993	Mumbai bombings	259	713
January 27, 2003	Mumbai bombings	1	
March 13, 2003	Mumbai train bombings	11	
July 28, 2003	Mumbai bus bombings	4	32
August 25, 2003	Mumbai bombing	52	
July 11, 2006	Mumbai train bombings, Series of 7 train bombings during rush hour	209	500
Sept. 29, 2008	Maharashtra (Malegaon) and Gujurat bombing	10	80
Nov. 26, 2008	Mumbai Terrorist attacks	171	239
Feb.13, 2010	Pune bombing	17	60
July 13, 2011	Mumbai bombing	26	130

Road Accidents

Road accidents are common on National highways that have about 107 accident prone spots (107) with maximum spots at NH 4 i.e. Mumbai-Pune highway (51) and State highways have 50 of such spots. This highway has the maximum traffic density and the main cause of accidents on this highway apparently was due to carelessness of drivers especially during overtaking

Industrial Accidents

Industrial hazards occur mostly due to accidents during chemical processing, manufacturing, storage, transport and disposal of toxic waste. Thousands of industries are involved in the manufacturing, processing or storage of hazardous goods. Many of the storage godowns are in the close proximity of the residential and industrial estates, which increased the risk of fires and chemical explosions in these areas. Districts with a large number of Major Accident Hazard Units in Maharashtra are Thane, Mumbai, Nashik, Pune, Raigad and Ratnagiri. Maximum number of accidents in industries manufacturing chemical and chemical products were in Nashik, Mumbai and Thane divisions. The number of accidents recorded in the manufacture of non-metallic mineral petroleum is almost half of those recorded in the other two categories. Raigad division shows the maximum number of accidents due to gassing. Thane and Aurangabad had the maximum number of explosions, while fire related accidents were the highest in Nashik. The major concentration of the hazardous industries is seen in the Chembur-Trombay belt, spread over an area of about 10 sq.km, having major chemical complexes, refineries, fertiliser plants, atomic energy establishment and thermal power station. Clustering of various operating units make them highly vulnerable. This area is also in close proximity to the port activities of Mumbai Port Trust (MPT), which handles hazardous cargo. MPT has identified 32 hazardous chemicals, require frequent handling and storage during loading and unloading operations.

Among industrial hazards, oil and gas industry is one of the major culprits. Some of the industries are receiving crude oil through underground pipelines. These include, NOCIL, HPCL, BPCL and Patalganga. There have been incidents of underground leakages and fires

Fire Accidents

The fire risk can arise either from industrial processes, accidents in storage godowns or closely built timber framed buildings. Many areas in the State have faced fire accidents in godowns, during manufacturing in factories, short circuits and festival seasons.

3.3 Hazard, Risk Assessment and Vulnerability Mapping

A **hazard represents** an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural losses, damage to the environment, interruption of business, or other types of harm or loss. Earthquakes, floods and wildfire hazards represent the pervasive and primary events that result in disaster losses. Secondary hazards include dam failure, landslide and tsunamis.

Vulnerability indicates the level of exposure of human life and property to damage from natural and manmade hazards. In Maharashtra, people are vulnerable to a wide range of hazards that threaten communities, businesses, government and the environment in each State.

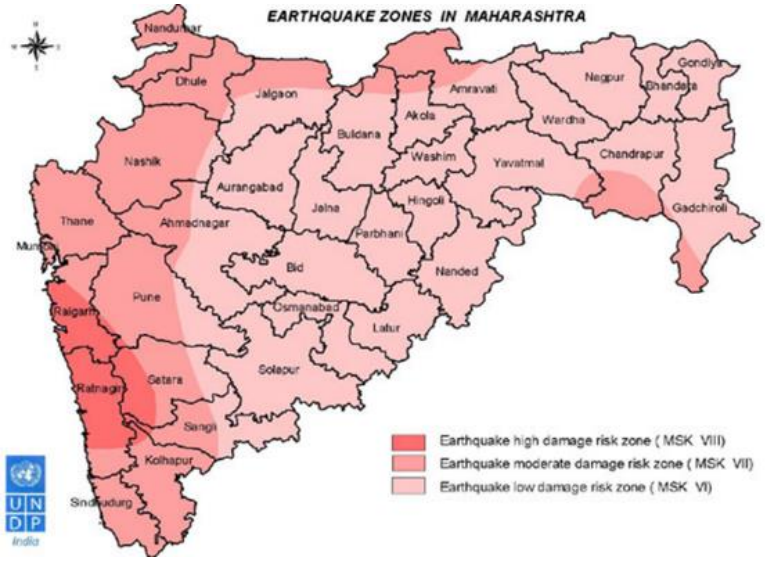
Below are examples of the hazards and vulnerabilities faced in the state:

3.3.1 Earthquake

The west coast - Western Ghats seismogenic region is the most active area in the Maharashtra state. The Koyna-Warna and the Bhatsa areas are located in this region. Even before the occurrence of the Koyna earthquake of 11 December, 1967, with magnitude 6.5 on Richter scale earthquakes with magnitude of about 6.0 are known to have occurred in this region. Earthquakes in Maharashtra show major alignment along the west coast and Western Ghats region. Seismic activity can be seen near Ratnagiri, along the western coast, Koyna Nagar, Bhatsa and Surya areas of Thane district.

The north-south trend further continues deep inside Gujarat. The striking characteristic of this narrow region is its alignment with the hot spring belt. It appears that the off - coast activity is associated with submerged faults along the west coast of Maharashtra.In North Maharashtra, the seismic activity near Dhule, Akola, Jalgaon and Amravati could be due to movements on the faults present in the area associated with the complex system of Narmada, Tapi and Purna lineaments. In north-east corner of Maharashtra, the earthquake activity in Nagpur and Bhandara districts may be associated with Deolapar thrust or sheared and faulted zones of Ramtek and Sakoli Basins. This needs to be confirmed. Isolated activity is seen near Beed, Nanded, Ujjani and Solapur in eastern Maharashtra and Uran, Kolhapur and Sindhudurga in south-west Maharashtra. Isolated activity has also occurred in Latur-Osmanabad districts in south-east Maharashtra.

The impact of earthquakes differ for urban and rural areas, primarily because of the nature of infrastructure, quality of housing and occupational differences. In rural areas, it is primarily the housing and physical structures (including irrigation infrastructure) which may suffer extensive damage, without necessarily destroying the crops. In urban areas, in addition to housing and physical infrastructures, it may also disturb the service infrastructure such as water supply, sewage, telephones, electricity, piped gas supply etc., which are essentially underground installations and hence exposed to a direct impact. The disruption in urban areas and consequent investments for rehabilitation becomes a major challenge.



3.3.2 Flood

Maharashtra is largely vulnerable to floods.It may be noted that there are many man-made reasons for the occurrence of floods. Analyzing the floods in Maharashtra, one observes that most floods in Maharashtra are flash floods due to nallah-overflows and poor drainage

systems. Very few floods, like the one in Konkan in 1983, are due to heavy rains in the region.

The floods of 2005 and 2006 have shown that almost all the districts in the State are vulnerable to floods. All districts in the State except Ahmednagar, Beed, Solapur, Latur, Osmanabad, Jalna, Aurangabad, and Buldhana are flood prone. Floods kill by destroying houses, crops and food stocks. They strip farm lands, wash away irrigation systems and erode large areas of land or make them unusable otherwise.

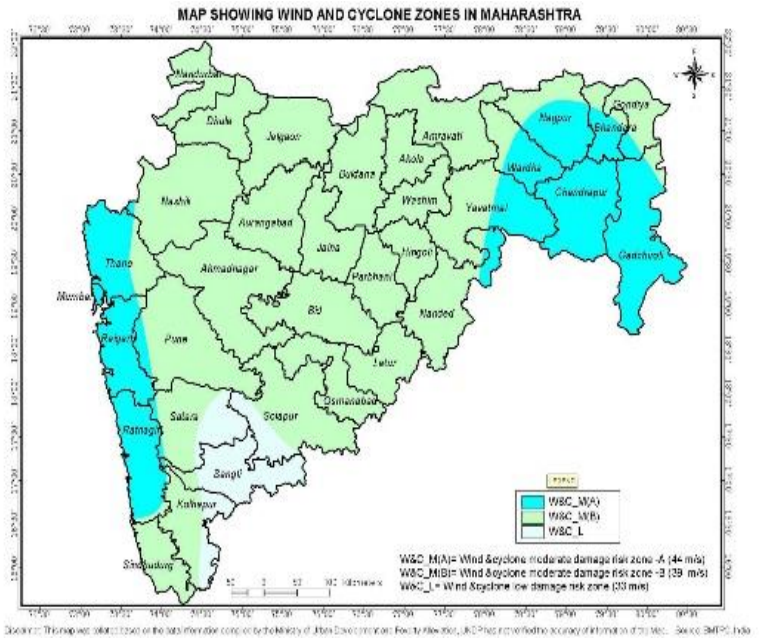
The following table, the places which are frequently subjected to floods are enlisted.

Sr.No	**Place**	**River**	**Nearest Dam**
1.	Pandharpur	Bhima	Ujjani
2.	Nira-Narsingpur	Nira	Vir
3.	Pune	Mutha	Khadakwasla
4.	Daund	Bhima	Ghod
5.	Sangli	Krushna	Warna
6.	Karhad	Koyna	Koyna
7.	Paithan	Godavari	Jayakwadi
8.	Nanded	Godavari	Vishnupuri Barrage
9.	Nashik	Godavari	Gangapur
10.	Akola	Morna	Katepurna
11.	Beed	Bindusara	Bindusara
12.	Mahad	Savitri	
13.	Panvel	Gadhavi	
14.	Chiplun	Vashishti	
15.	Raipatan		
16.	Rajapur		
17.	Devade		
18.	Digras	Arunawati	Dhawanda weir
19.	Prakashe	Tapi	Prakashe barrage
20.	Miraj	Krushna	
21.	Karadha	Wainganga	Pujari Tola

22.	Rajegaon Kati	Bagh	Bagh
23.	Chandori, Saikheda,	Godavari	Nandur Madhmeshwar weir
24.	Niphad	Kadava	
25.	Villages in Miraj/ Tasgaon/ Walwa talukas of Sangli Dist.	Krushna/ Warna	
26.	Villages in Rahuri/ Newasa talukas in Ahmednagar Dist.	Mula	Mula
27.	Villages in Shrirampur/ Newasa/ Rahuri Talukas in Ahmednagar Dist.	Pravara	Bhandardara
28.	Nagothane, Pen	Amba	

3.3.3 Cyclone

The coastal areas are risk prone to cyclones. Maharashtra has a coastal belt of over 720 kilometers between Gujarat to Goa. Thus the Konkan region including Mumbai becomes prone to cyclones. There are a large number of marine fishing villages / hamlets with fishing boats, engaged in fishing in this coastal belt. Cylcones make impact by killing people, damaging property, crops and infrastructure. In the rural areas, the damage is primarily to lives, crops and to housing. It may also affect the irrigation infrastructure. The damage to forest and plantations, when it occurs, has a long term effect, and also takes a much longer period for restoration. In urban areas, both transport and communication receive a serious damage, in addition to loss of life and shelter. In the Arabian Sea, severe cyclonic storm have been recorded in past which have affected Maharashtra - Goa coast. Mumbai is a coastal city which has faced many threats of cyclones in the recent past. It has faced peripheral impact in 1982, 1988 and October 1996,



and has been hit on two occasions by cyclones (1948 and June, 1996). The data indicate that the city is prone to cyclones. The most recent to hit the State was cyclone Phyan in 2009 which had affected the coastal districts in the State.

Traditionally, it has been the eastern coast of India that has been majorly vulnerable to cyclones. Its geographical location (western coast), climatological conditions and other natural factors put Maharashtra under the moderately vulnerable category as far as cyclones are concerned.

3.3.4 Drought

Maharashtra has traditionally remained a drought-prone state. Almost 70 percent of the State's geographical area lies in semi-arid region rendering it vulnerable to water scarcity. Almost all the districts in Pune, Aurangabad, and Nashik divisions experience drought frequently. Most of the state's 148 Drought Prone Area Programme (DPAP) talukas are in these districts. These talukas receive 600 to 750 mm rains from the southwest monsoon (June to October). Failure of 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. The evaporation rate is high, and only in September the precipitation exceeds evaporation. In many parts, hard basalt rock in the region does not allow filter or storage of water. So when there is scanty rainfall, the scarcity of water both for drinking water and cultivation is acute.

3.3.5 Landslide

In Maharashtra, often landslides are triggered by heavy rains in the Western Ghats. Major landslide major incidents have occurred in monsoon seasons due to anthropogenic development along the landslide prone regions. Landslide have primarily results in loss of life and property, but has more importantly led to secondary and tertiary impacts such as chemical accidents, road accidents, rails accidents, flood, fire, gas leaks, etc.

The Konkan region – districts of Raigad, Ratnagiri and Sindhudrg and parts of Pune area are vulnerable to landslides. The foothills of the Sahyadris are dotted with many small and big villages all along the Konkan region which are vulnerable to landslides.

The urban areas located in hill slopes at Vikroli, Kanjurmarg and Mulund in Mumbai are also vulnerable to landslides during monsoon.

Malin Landslide

On 30 July 2014, a landslide occurred in the village of Malin in the Ambegaon taluka of the Pune district in Maharashtra. The landslide, which hit early in the morning while residents were asleep, was believed to have been caused by a burst of heavy rainfall, and killed at least 134 people.

Chapter -4

Prevention and Mitigation Measures

Prevention consists of actions that reduce risk from natural or human made disaster incidents. Prevention includes actions or measures taken to cover or shield assets from exposure, injury or destruction.

Prevention activities designed to provide permanent protection from disasters. Not all disasters, particularly natural disasters, can be prevented, but the risk of loss of life and injury can be mitigated with good evacuation plans, environmental planning and design standards. These activities are designed to minimize loss of life and damage.

Mitigation, with its focus on the impact of a hazard, encompasses the structural and non-structural approaches taken to eliminate or limit a hazard's exposure; impact on people, property and the environment.

Under prevention and mitigation phase the structural and non-structural measures are basically taken up to reduce the risk from natural and unnatural disasters.

Common structural measures for disaster risk reduction include construction of dams, flood walls, ocean wave barriers, earthquake-resistant structures, and evacuation shelters. In short, the engineering measures, construction of hazard resistant structures, and protective infrastructures are the major structural measures. And common non-structural measures refer to awareness and

education, policy, techno-legal systems, building codes, land use planning, and practices, training, capacity building etc,.

4.1 Elements of Mitigation Strategy

A mitigation strategy however, cannot be successful unless it has the backing and support of all concerned - the administrative machinery, the research institutions, the non-officials and the community. So, it also becomes imperative to have built-in institutional arrangements and/or legislative backing to oversee the mitigation strategy over a period of time.

The main elements of mitigation strategy therefore, are:

- Risk Assessment and Vulnerability Analysis
- Applied Research and Technology Transfer
- Public Awareness and Training
- Institutional Mechanisms
- Incentives and Resources for Mitigation
- Land Use Planning and Regulations

4.1.1 Risk Assessment and Vulnerability Analysis

Before embarking on any specific mitigation measure, it is essential to have a proper understanding of the risks and vulnerability of the community. This basically means carrying out a risk assessment and vulnerability analysis. Such an activity will have to be carried out in each district, resulting in identification of hot-spot areas or areas of prime concern. While such assessments would be administrative exercises, it is essential that the local community is also involved in such exercises as this gives them a better understanding of their risks and vulnerabilities.

A comprehensive vulnerability analysis should be undertaken in all hazard prone areas, taking into account past disaster events, the socio-economic conditions of the population living in the area, the infrastructure and other structural facilities for cyclones, floods, storm surges, geological hazards etc. Risk assessment should be undertaken for all hazards, and should include the following:

(a) areas of influence (b) frequency (c) intensity (d) impact and (e) time to return to normalcy

Hazard mapping can then be undertaken to delineate causative source areas and areas exposed to hazards, as well as the potential risk levels for different hazards. Geographical Information Systems (GIS) can also play a crucial role in the gathering and analysis of information needed for disaster management. The GIS can give higher quality results than can be obtained manually, regardless of the costs involved. It can facilitate decision making and improve coordination among agencies when efficiency is at a premium. In general, there are three categories of information to be assembled:

- Natural Hazards information
- Information of natural ecosystems
- Information on population and infrastructure.

Valuable information on individual hazards in a study area may appear on maps with varying scales, coverage, and detail, but these disparate maps are difficult to use in risk analyses or in deciding on suitable mitigation strategies. Information from several of them can be combined in a single map to give a composite picture of the magnitude, frequency and area of effect of all the hazards.

The GIS can be used for hazards management at different levels of development planning. At the State level, it can be used in hazard assessments for resource analysis and project identification. At the district and local level, it can be sued to formulate investment projects and specific mitigation strategies.

The assessments of risks and vulnerabilities will have to be constantly revised and therefore a regular mechanism should be established for this. The use of GIS in this regard would be highly beneficial, as the primary data can be easily updated and corresponding assessments can be made. MRSAC has been working in this field and GIS based information will be available and incorporated in HRVA study of the state by DMU.

A special effort will have to be undertaken to provide for hazard assessment in highly urbanised locations and look at the existing infrastructure and systems in terms of their capacity to sustain the increasing demands and their vulnerability to various disasters.

4.1.2 Applied Research and Technology Transfer

Emphasis should be placed on expanding observation and monitoring systems, especially in areas of the region where the data is scarce and risk is high. Reliable feedback information on warning systems, public reception and response and susceptibility of the warning system, to damage should also be collected.

There is a great need to

- Establish or upgrade observation equipment and networks
- Monitor the hazard properly
- Improve quality of forecast and warning
- Disseminate warnings quickly through the warning systems.
- Undertake disaster simulation exercises.

Space technologies such as remote sensing, satellite communication and Global Positioning Systems (GPS) have been widely used in monitoring the occurrence of different types of disasters and in evaluating the losses and the impact.

Remote sensing is useful to hazard management for focusing on priority areas, verifying small-scale data, interpretations and providing information about features. It is possible through remote sensing to identify areas of potential exposure to hazards, so that measures to reduce the social and economic impact of potential disasters can be introduced in the planning process. Remote sensing can be used for mapping of areas susceptible to disasters.

Apart from monitoring and observations through use of GPS and remote sensing, (basically activities carried out by State or Central government institutions like Bhaba Atomic Research Centre (BARC), Meteorological department, MERI etc.), applied research on formulating various mitigation strategies specific to a district or a local area, can be carried out through educational institutions or universities located in the region.

Universities or technical educational institutions should be encouraged to include disaster mitigation as a part of graduate training programmes. The contents of such a course can be location-specific to the institution. For example, institutions located at areas of high seismic risk (like the Deccan Plateau) can have earthquake mitigation as a specialisation, whereas more flood-prone areas (like the Konkan region) can have flood mitigation topics. Existing engineering and architectural colleges can incorporate these elements in their syllabus.

Research and studies should be undertaken on various aspects of disasters and their reduction, with national and international assistance if required, on such topics as: the assessment and mapping of hazards, early warning systems, the effects of deforestation, effects of changing land-use patterns and urbanisation and specific vulnerabilities of various systems such as power, sewer, transport etc., on the incident and damage caused by disasters and the countermeasures required; and the application of remote sensing and GIS technologies in hazard, forecasting, warning, assessment and management. Non-structural approaches, social and developmental policies, institutional arrangements, community preparedness and response capacity are some of the areas in which research can be undertaken.

Such steps would lead to the formulation of specific mitigation measures, more appropriate to the area. Community based mitigation measures combined with scientific knowledge would expand the existing knowledge of the local community, as well as the students due to the increased interaction. A comprehensive database on mitigation measures can also be generated in this manner.

At the same time, it is essential that this database on the mitigative measures are communicated to, and understood by the local self - governments and local administrators, who might be involved in giving clearances and permissions for various projects.

4.1.3. Public Awareness and Training

The Disaster Management Action Plan for Maharashtra State intends to influence the present institutional arrangements to the extent that the capacity of each of the components, within the institutional arrangements, is improved. This is proposed to be done through capacity building of the line departments on the one hand, and providing an organisational structure such as EOC at the state level and DCRs at the district level. The efficiency of such an exercise will largely depend on the type of preparedness measures, coupled with necessary training inputs undertaken. The State Disaster Management Unit has taken initiatives to undertake the following activities seriously.

- Training of trainers
- Standardisation of training courses and materials
- Accrediation of training institutions and individuals

- Development of training calendar

4.1.3.1 Training Needs Assessment

One of the most critical components of the Mitigation Strategy is the training to be imparted to the officials and staff of the various departments involved at the state and the district level. Through the training inputs it is visualised that both information and methodology will be shared with the concerned actors. The training activity will be undertaken both at state level through YASHADA and at the district level through NGOs, government training institutions and institutions affiliated to universities and research centres.

The need for action and intervention in a disaster situation is at multiple levels and cuts across various sectors. The quality of intervention depends a lot on the inter-sectoral, inter-departmental coordination and efficient teamwork Thus, it is pertinent to assess the specific training requirements of the key personnel to be involved in the intervention.

Training Needs Assessment (TNA) exercises for different categories and levels of functionaries, will enable identification of the gaps that need to be attended to through training activities. These will be done by assessment of the level of knowledge, attitudes and skills, with respect to the task to be undertaken and the expected levels of knowledge, attitudes and skills. Preparation of training modules and materials based on such TNA exercises will be undertaken by the training institutions.

4.1.3.2 Training

YASHADA

The premier administrative training institution, YASHADA, at Pune, has a Centre for Disaster Management, established with the assistance from UNDP, to play a pivotal role both at the state level and at the national level.

Upgrading and strengthening of the Centre for Disaster Management at YASHADA is to be therefore, considered as a part of overall mitigation strategy. It is intended that the Centre will organise training for state level and district level officials, officials from line departments, as well as major NGOs, and private sector organisations.

The implementation strategy envisages that the NGOs, private sector organisations and other government training institutions will, in turn, organise training and simulation exercises at the district and community level, in order to ensure preparedness from the grass-roots.

The efforts at the Centre would include

- Upgradation of training technology.
- Refining the methodologies for Training Needs Assessment and Community Needs Assessment.
- Updating Risk Analysis and Vulnerability Assessment.

- Development of training materials and preparation of training modules.
- Refining the methodologies for training and simulation both at the Centre as well. as at the
  community level.
- Undertaking training programmes and simulation exercises, Simulation exercises can be carried out once every year under both real time and compressed time conditions.
- Introduction of GIS at district levels.
- Establishing system of plan upgradation based on GIS.
- Development of State Resource Centre for disaster information and documentation

- **NGOs, Private Sector, Government Training Institutions**

The non-governmental organisations play an important role in disaster management and provide valuable resources and expert manpower. Their strength lies in the choice of their manpower, the informality in operations and flexibility in procedures. Their capacity to reach out to community groups and their sensitivity to local traditions of the community, gives them an added advantage during a disaster situation. Some of the agencies, both from within and outside the state have evolved technical expertise and capabilities which can be brought into managing typical issues. These organisations enjoy a fair degree of autonomy and flexibility and hence, can respond to changing needs immediately.

NGOs generally work on well-defined problems and issues and hence, the resources are generally ear-marked for specific activities and programmes. Particularly, in the mitigation efforts, it may therefore, be necessary that special efforts are made towards capacity building of NGOs to enable them to carry out disaster management activities. These could include their contribution for community preparedness, and actors in the management of disaster situations. Apart from orienting these NGOs towards Disaster Management Action Plans, the mitigation strategy will consider capacity building of these NGOs as resource groups for community preparedness by providing necessary inputs for improving their infrastructure and communication capabilities, particularly in vulnerable areas, thereby integrating them with the communication network of the district.

Private sector, including the Sugar Cooperatives in Maharashtra, with their strong resource base, professional competence and infrastructure facilities, will be very consciously brought into the mitigation strategy. Institutional arrangements such as MARG, may have a significant role to play within a well-defined geographical area. Sugar Cooperatives in Maharashtra have an added advantage of their contacts with the villages around. Currently, most of the sugar cooperatives are engaged in providing various services such as education, health, recreation, credit facility to the communities and therefore have built a good rapport. However, possibilities of private sector or involvement beyond the local geographical area cannot be overlooked. Efforts will, therefore, be made to look at some of these actors in the mitigation strategy.

While at one level, training will be concentrated on providing information regarding disaster management, efforts will also be made to involve private sector contribution towards the mitigation strategy.

- **Community Efforts for Mitigation**

Mitigation through development policy and planning and appropriate steps through line departments in mitigation efforts, will have to be backed up through community efforts to ensure its effectiveness. Particularly in marginalised communities, with high concentration of poor, the capacity of the administration to intervene with mitigation efforts will be undermined if the community does not appreciate the linkage of these interventions with vulnerability reduction. Administrative intervention alone, therefore, will not be adequate.

At the community level, apart from households the stakeholders include, the local self governments (LSG), community based organisations (CBOs), NGOs and private sector initiatives providing services. It is these stakeholders who will have to define their role with respect to mitigation, that is, reduction of risk and vulnerability.

There is evidence to show that the local communities, in spite of their limitations and inadequacy of resources, have sufficient motivation, backed up by traditional knowledge to minimise and counter the impact of disasters through individual as well as collective actions.

Local governments, NGOs, private sector organisations, businesses, and individuals each have important roles to play in mitigating the impacts of hazards. A conscious effort therefore, on the part of community level actors, that is the LSGs, CBOs, NGOs including private sector, to adopt community based mitigation strategies, will strengthen and stabilise the efforts of development administration to evolve a comprehensive mitigation strategy. They must lead by example, adopting and practising the best mitigation techniques for all actions affecting its facilities and employees, thereby providing leadership and coordination.

Since most mitigation occurs at the local level, partnerships must be formed among all levels of government and the private sector to develop consensus on mitigation issues.

The district administration should encourage and support initiatives from LSGs, CBOs, NGOs and Private Sector for promoting community based mitigation strategies through Community Needs Assessment (CNA) Exercises. The review and updating of District Disaster Management Action Plan should include continuous review and planning of all such community mitigation efforts.

One of the pre-requisites before development of such strategies, would involve the training and orientation of these community level actors to appreciate and understand the importance of grass-root initiatives, methods and techniques of mobilising such initiatives. Their appreciation of the capacity of the poor will further enhance their capabilities to reach out to those who are the most vulnerable and at risk within the system.

- **Community Level Training and Public Awareness Activities**

Before organisations, communities and individuals can reduce their risk from hazards, they need to know the nature of the threat and its potential impact on them and the community. Achieving widespread public awareness of hazards, the options for reducing risk or impact and how to carry out specific mitigation measures, will facilitate informed decisions on where to live, purchase property, or locate a business. Local decision makers will know where to locate and

appropriately construct critical facilities, to reduce potential damage from hazards. Communities must be fully aware of its vulnerability to natural hazards as also means to reduce their impacts, before it can insist upon and support actions to mitigate the impacts and take the individual steps necessary to protect lives and property. Generating this level of awareness is perhaps the most challenging task. The public must view hazard mitigation as a basic component of civic responsibility. Much is already known about the potential for and impacts of natural hazards and the preventive actions that can be taken to mitigate those impacts.

The community awareness and training activities will basically be carried out in the form of training programmes through NGOs, Private Sector, Government Training Institutions. Apart from spreading awareness of disasters, the focus will essentially be on community capacity building, including formation of MARG and CERTs. These organisations will also organise simulation exercises on a regular basis in identified disaster prone areas, as a part of mitigation strategy.

Techniques for articulating this knowledge in a way that impels action by individuals, private sector organizations, NGOs and local governments must be developed, refined, and put into practice. This would entail developing a strategic all-hazards awareness, training, education plan and an evaluation of the most effective methods and messages, involving hazard-resistant planning, designing safety programs and community risk - reduction activities. Additionally, this would include communicating the achievements, progress and success of the mitigation strategy and evaluating and updating tools (documents, plans, training courses, and other mitigation guidance materials) to reflect state-of-the-art technology and engineering practices.

- A programme targeted at State and local elected officials, to encourage the development of legislation and administrative policies that support hazard mitigation.
- A programme to encourage public-private partnerships, to educate employees and customers about mitigation.
- Providing a training programme for teachers to ensure that they understand disasters, their likely effects and the precautions that should be taken.
- Include in the academic curriculum information about disasters and the precautionary measures to be taken.
- Organise disaster simulations within schools to review, with staff and students emergency procedures to be followed in the event of a disaster.
- Promote publicity and educational sessions through use of mass media including television.

- **Mobilising Community Efforts for Mitigation Measures through LSGs, CBOs, NGOs and Private Sector**

The community should be helped to determine ways to avoid or reduce the impact of the next disaster. The following activities are a suggestive list of mitigation efforts which need to be promoted, by encouraging local communities to undertake either at individual, household or community level to avoid loss of life, damage to property and crop.

- Assist in disposal of properties located in disaster-prone areas flooding areas, landslides

prone areas etc., and purchase of safe sites in return.

- Technical guidance to rebuild or retrofit houses that can sustain the shaking of an earthquake or high winds and ensuring availability of appropriate materials through local government, hardware dealer or private building contractors.
- Encourage households to undertake not only corrective repairs, but also preventive repairs.
- Explain options for flood - proofing houses, like elevation, drainage etc.
- Encourage compliance in construction with local building codes that pertain to seismic, flood, fire and wind hazards. Encourage compliance by the contractors and inspection by local authorities. Organise community level training with respect to these.
- Determine ways to prevent hazards such as securing light fixtures, moving heavy or breakable objects to low shelves, etc.
- Provide information specific to the community and encourage community exercises for Community Needs Assessment (CNA) and analysis of vulnerability and risk. Make source documents such as local disaster management plan, zoning and building norms, DDMAP available to local communities.
- Promote appropriate climate for disaster insurance for life, property and crop.

Demonstration Houses : At vantage points in villages or blocks, demonstration of housing units indicating the various technology features and options should be built by the Government/ NGOs/Community. Put them into use in all the community buildings of public importance. This can be done in buildings like village offices, primary health centres, community centre, anganwadi, balwadi, etc. That way these buildings of high visibility and frequent local use would themselves be the medium for demonstrating the right level of strengthening features needed. At the same time, it would also emphasise the importance of having essential installations in buildings, schools where children are most vulnerable protected. National School Safety Programme (NSSP) is specially designed for school children and teachers, under this programme 400 schools both in Pune and Satara districts have been covered in Maharashtra. Through this programme the following activities have been incorporated.

- Training of teachers
- Organsiation of mock drills
- Preparation of School Disaster Management Plan
- Awareness activities

4.1.4 Institutional Mechanisms

- **Disaster mitigation: strengthening institutional frameworks**

Perhaps the most important need at the State level is to strengthen or develop capacity to undertake disaster mitigation strategies. After assessing and mapping natural hazards experienced in the past, and analysing possible future risks and their potential social and economic effects, the adequacy of the existing disaster reduction measures can be evaluated.

Based on the guidelines of Disaster Management Act 2005, the Maharashtra government has constituted the State Disaster Management Authority, the State Executive Committee, and District Disaster Management Authorities at district level. Formation of State Disaster Response Force is in process in the State. All these policy level steps are strengthening the institutional process of disaster management in the State.

Disaster vulnerability assessment should be incorporated in the state development process so that projects and future investments reduce, rather than increase vulnerability. Areas frequently exposed to severe hazards should seriously consider investing an appropriate portion of the state revenue in disaster reduction activities for sustainable development. In order to overcome resource constraints and to be effective, the action plan for disaster reduction should be incorporated in the overall economic and social development plans. The development programmes can be monitored to ensure that hazard reduction components are applied, such as building up the infrastructure and increasing the resilience to disaster in the long term.

No matter which loss-reduction strategy is used, major reductions in losses of life and property come only when the emphasis shifts from reaction to anticipation. That is, the emphasis must be on proactive pre-disaster measures rather than post-disaster response.

Therefore, it becomes essential for a permanent administrative structure which will monitor the developmental activities across departments, providing suggestions for incorporating necessary mitigation measures. The State Disaster Mitigation fund may be used to take up mitigation activities at district level.

At the same time, professionals like architects, structural engineers etc., and risk managers in business organisations dealing with hazardous chemicals, can be asked to form consortiums which will look into, and incorporate mitigation aspects for all projects in their field. Existing bodies like the Chamber of Commerce, Confederation of Industry, Agriculture Produce Market can also be asked to promote mitigation measures amongst their members.

- **Disaster Management Legislation, Relief and Rehabilitation Policy**

Over the years, the efforts of the government to regulate relief and rehabilitation, (R & R) with respect to various disasters have resulted in a number of policy guidelines and omnibus orders including some GRs. It is therefore necessary to take stock of these existing instruments and bring them under the purview of Disaster Management Legislation and R&R policy. The existing ad-hoc measures will have to be replaced to the extent possible with more definite arrangements. This would help in communicating the expectations of the administration.

Apart from intent and overall objectives, the policy statement should specifically emphasise the need for reaching out to the poor and the marginalised. The R&R policy can incorporate various packages for R&R specific to disasters and extent of impact on the community, and the family implying entitlement to families and communities to R&R. The R&R policy should also include resettlement and development of safe sites. Both directly and indirectly impacted families should be brought within the purview of R&R.

Disaster Management Legislation should be primarily aimed at operationalising Disaster Management Action Plan documents at the state and the district levels. The scope for community participation should be clearly emphasised and given a legal mandate.

Strengthening of line departments, developing training capabilities, partnership with NGOs and private sector, disaster funding, insurance, mitigation requirements etc are some of the critical areas which must find appropriate expression in the legislation. The legislation should affirm the value of mitigation.

4.1.5 Incentives and Resources

The continued development and application of hazard mitigation measures will depend largely on the existence of stable funding sources and effective incentives that encourage mitigation in both the public and private sectors. Mitigation must become a primary consideration in all State actions and linked with grants and loan programmes.

More emphasis is needed on pre-event planning, action and on the development of state funding mechanisms.

Incentives and funding should include

- Developing mechanisms to provide stable sources of funding for preparedness and mitigation activities at all levels of government. This may include setting up of Vulnerability Reduction Fund at the state level.
- A review of the current incentives and disincentives for undertaking both pre and post-disaster mitigation actions will determine what additional incentives and disincentives are required to ensure cost-effectiveness. This should include the review of certain policies which are actually subsidising risk.
- Incentives for relocation of commercial and residential activities outside the hazardous and disaster - prone areas.
- Incentives for retrofitting of commercial and residential structures located in disaster - prone areas.
- Providing resources for state and local governments to ensure adequate levels of coordination and effective implementation of mitigation activities.
- Introducing disaster insurance, based on community rating systems that recognize adoption and enforcement by communities of building codes, that contain all-hazards building standards.
- Establishing Disaster Relief Fund at the state level for meeting the requirements of immediate relief.
- Encouraging the formation of partnerships among private industry, academia, and the state and local governments to maximize resources for mitigation activities. Major business organisations like the Chamber of Commerce, Merchants' Chamber, and Agriculture Produce Market should be contacted for introducing mitigation measures in all their projects and also providing funds for state sponsored mitigation activities. Such activities can he provided with tax incentives if necessary.
- Credit finance and housing finance companies should make it mandatory for structures to follow specified building codes or zoning regulations as part of loan requirement

3.5.1 Insurance

Insurance is a mechanism for spreading the cost of losses both over time and over a relatively large number of similarly exposed risks. The introduction of disaster linked insurance should be actively pursued and insurance cover should be available not just for life but also for household goods, cattle, structures and crops.

Since insurance premiums are based on the location of a structure within the disaster-prone areas, and are determined primarily by the extent of risk, higher rates may be applied to structures subject to high risk.

Strategies for introducing disaster insurance for structures will include

- More stringent enforcement by lenders of the mandatory purchase requirements
- Increasing public awareness of the hazard
- Imposing risk disclosure requirements on real - estate agents
- Offering special insurance coverage and policy riders
- Maintaining premiums at affordable levels.

One of the difficulties in promoting disaster insurance is that those who are at highest risk have the least capacity to pay the premiums. Possibilities of group/community insurance should also be available, particularly for the marginalised communities. The incentive can be a reduction in insurance premiums for policyholders within communities that take approved actions to reduce disaster losses.

4.1.6 Land-use planning and regulations for sustainable development

The physical impacts of hazards can be reduced by preventing or modifying the occurrence of the hazard, such as in the case of floods. This can be done very effectively at relatively small catchments by land-use planning and management, particularly in areas where structural measures would be too difficult or, too expensive to implement.

Rapid urbanization has led to higher concentrations of people living in hazardous areas and consequently to higher losses when disasters occur. As urbanization also alters the response of a watershed to rainfall, many large cities of the region are becoming increasingly vulnerable to flooding.

Long-term disaster reduction efforts should, therefore, aim at promoting appropriate land use in the disaster-prone areas, by harmonizing land suitability with agricultural development strategies. High investment industries and installations, as well as important infrastructural elements, should not be located in areas that are susceptible to disaster impact.

Fire and industrial accidents can be reduced if the land-use planning ensures separation of industrial units from residential areas, and/or fire - prone industries from other industries. Licensing authorities of industries should examine these locational aspects.

The measures to promote proper land' use should include both legislative and economic inducements and creation of public awareness of proper land practices. Formulation of land-use policies for long-term sustainable development is therefore imperative.

Proper long-term land use planning by incorporating all geology-related data available, would identify and allocate hazard-free areas for industrial and urban development, and thus be by far the most effective way of dealing with disasters.

Large concentrations of people living in hazardous zones, not capable or willing to be moved to safer areas, deserve to have at least a fighting chance of survival in the event of a disaster. Authorities in charge of disaster management should therefore have at their disposal reliable estimates of the type, severity, and location of the damage likely to occur. Damage to property can be limited, it, for example, building codes are enforced.

Introduction of the legal enforcement of property insurance against damage inflicted by disaster events may be considered as one of the most efficient ways to ensure that building codes are followed, and properly allocated according to realistic criteria based on actual geological conditions.

Regulations have a potentially greater impact on loss reduction than any other single management tool and have been widely used. Development that conforms to regulations is less prone to damage than pre-existing development. Regulation is largely a local government responsibility. Effective enforcement often requires more training, personnel, and financial resources than many communities can provide. Regulations cannot provide full protection for, they have a limited impact on existing buildings and infrastructure prone to hazards.

The minimum regulations vary depending upon the risk studies and mapping that have been done in the community.

- **Siting and Safety**

Building safely begins by choosing a safe site. A lot of protection can be gained by careful location. For some hazards, like floods or land instability, siting is the most important protection measure. For other hazards, like earthquakes or cyclones, where a building is sited is less critical than how well it is built, but location can still be important in determining how strongly the hazard is experienced and the potential for follow-on hazards causing damage.

The degree of choice that people have in siting their structures is highly variable: some may have little or no choice, others may have a large area within which to choose a site. The hazard considerations of a site are outlined so that those with some freedom of choice can exercise it protect themselves, to existing sites, to reduce their hazard potential.

Siting can be considered on a number of scales- at a community scale, where perhaps there is a building improvement programme to locate or relocate a community within a geographical area, and at individual scale - when choosing a site for a building within a locality.

- **Safe siting for a new settlement**

In locating a new town, village or housing estate, the hazard content is only one of the many factors that should be taken into account to make a successful settlement. It should therefore be considered at an early stage of site selection. The penalties of siting on ground with possible hazard problems should be balanced against the advantages of locating these for other reasons.

When a large site is needed, it is possible that some areas within the land chosen will be safer than others. Therefore, sensitivity to the use of land within the settlement will be important.

4.2 Specific Disaster Mitigation Measures

4.2.1 Flood Mitigation

Modifying susceptibility to flood damage and disruption is the floodplain management strategy of avoiding dangerous, uneconomic, undesirable, or unwise use of the floodplain. The tools used to implement this strategy are regulations, development and redevelopment policies, flood roofing and elevation.

4.2.1. 1 Regulations

This would include

- Not permitting unrestricted new development in the hazard prone areas
- Anchoring and flood proofing structures to be built in known flood prone areas
- Built-in safeguards for new water and sewage systems and utility lines from flooding
- Enforcing risk zone, base flood elevation, and floodway requirements
- Prohibition on development in wetlands
- Prescribing standards for different flood zones on flood maps.

To meet these requirements, local governments will have to adopt specific floodplain management or storm water management regulations into zoning and subdivision regulations, housing and building codes, and resource protection regulations,

4.2.1.2 Safe siting in flood hazard areas

In low-lying areas, close to the coast, and on flat land in river valleys, there may be a potential for coastal or river flooding. In geologically younger river valleys, in mountains, and foothills there may be a potential for flash-flooding,

It is important to check the history of flooding in the area. Wherever possible

- Map the extent of land covered by past floodwaters
- Get an indication of the depth of past flood waters
- Find out about the severity of past floods; how much damage they have caused, how fast they flowed and how much debris they left behind and
- Find out how often flooding has happened, over at least the past 20 years.

Land morphology is the main factor in determining how safe a site is against flood waters.

4.2.1.3 Development and Redevelopment Policies

In some cases, the only way to preclude future uses incompatible with the flood risk is to permanently evacuate a portion of a floodplain and to obtain full title on its development rights. Although this process (called "acquisition") is expensive, the long-term benefits in reduced floodplain losses, protection of natural resources, and public use of the land, may make it worthwhile.

Most redevelopment relating to flood loss reduction occurs after one or more major floods. Usually, a temporary moratorium is imposed to allow evaluation and planning. Unfortunately,

legislative and regulatory requirements often encourage a quick return to the preflood status quo, wasting opportunities to mitigate and revitalize the area.

4.2.1.4 Flood proofing and Elevation

Floodproofing is the use of permanent, contingent, or emergency techniques to either prevent flood waters from entering buildings or to minimize the damages from water that does get in. Some of the techniques involve using water-tight seals, closures or barriers, using water resistant materials, and temporarily relocating the contents of a building. Elevating a structure means raising it on fill, piers, or pilings so that it is above expected flood levels.

Most new floodplain structures should be designed to incorporate f1oodproofing and/or elevation. Floodproofing could be applied retroactively ("retrofitted") to existing structures.

4.21.5 Modifying Flooding

Modifying flooding is a floodplain management strategy of using structural means to divert the flood water. Structural measures dams, reservoirs, dikes, levies, floodwaIls, channel alterations, high flow diversions, spiIlways, land treatment measures, shoreline protection works, and storm water management facilities - permit deliberate changes in the volume of run-off, peak stage of the flood, time of rise and duration of flood waters, location of flooding, extent of area flooded, and velocity and depth of flood waters. The effectiveness of these measures for protecting property and saving lives has been well demonstrated. Flood control projects can save people from anxiety, injury, and death and prevent economic losses.

One of the issue, that needs consideration, is how to deal with the ageing inventory of existing flood control structures. Many dams and reservoirs may be nearing or even past their design lives, and the flood control capacity of many reservoirs has been reduced by sedimentation. The financial resources are not available to undertake all required remedial actions.

- **Dams and Reservoirs**

Storing flood water in reservoirs can modify floods by reducing the speed at which the water flows, limiting the area flooded, and reducing and altering the timing of peak flows. However, misconceptions about or lack of understanding of dams can create an exaggerated sense of security. Reservoir sedimentation can significantly reduce flood control capacity. Competing uses of the reservoir can impair flood control. In addition, most dams are designed for purposes other than flood control, although they do have the temporary effect of flood reduction through storage.

The availability of water or power associated with dams, therefore, often attracts new developments, regardless of the flood risk or the ability of the dam to provide flood protection. Over time, without adequate land use regulations, encroachment onto the floodplain downstream of dams, can increase exposure to flooding. Once signs of dam failure become visible, breaching

often occurs within minutes or a few hours, leaving little or no time for evacuation. The massive volume of water and its high velocity will cause severe damage.

- **Dikes, Levees, and Flood walls**

Dikes, including levees and flood walls, can be thought of as dams built roughly parallel to a stream rather than across its channel, or parallel to the shorelines of lakes and other water bodies. Levees are generally constructed of earth, flood walls of masonry or steel. Although they can be effective in reducing flood losses, they are poorly designed and maintained.

Areas behind levees and flood walls may be at risk of greater than normal flood damage for several reasons. Many floodplain residents in those areas believe that they are protected from floods and do not think it necessary to take proper precautions. Development may also continue or accelerate, based on expected flood protection. A levee breach or flood wall failure, like a dam 'break, can release a large wave of flood waters with high velocity. After a breach, the downstream portion of the levee system may also act like a dam, catching and prolonging flooding of the once-protected area.

- **Channel Alterations**

Channel alterations increase the flow-carrying capacity of a stream's channel and thereby reduce the height of a flood. The various types of alterations include straightening, deepening, or widening the channel, removing debris, paving the channel, raising or enlarging bridges and culverts, and removing other obstructions.

Alternative designs now developed include less straightening of channels, employ more gradual slopes, and use natural vegetation or riprap rather than concrete-lined channels. This minimizes destruction of fish and wildlife habitat, helps maintain water quality, and avoids undesirable downstream impacts.

- **High Flow Diversions**

Diversions intercept flood waters upstream of a damage-prone or constricted area and convey them around it through an artificial channel or a designated flow-way. Diversions may either completely reroute a stream or collect and transport only excessive or potentially damaging flows. A negative aspect of such diversions is the false sense of security that may prevail in the protected areas along with a lack of awareness that the floodway actually exists.

- **Stormwater Management**

Stormwater management is the removal of water that falls directly onto properties, as opposed to flood water, that flows onto the property, from upstream sources or an ocean surge. Stormwater networks have historically been constructed in urban and agricultural areas to remove these waters. A significant problem occurs when an agricultural zone with an adequate Stormwater system is urbanised. Large areas are paved with roofs, roads, and parking, contributing to additional run-off. Often, shopping centres and other developments are placed on natural drainage ways. The pre-existing stormwater network becomes inadequate for its new urban use. Localised flooding then occurs. In an alternative approach often used in new developments today, run-off may be retained on the site, within a regional system, and total run-off within a

watershed may be managed, so that discharges from different units reach the main channel, at different times to reduce peak flows downstream. Natural drainage systems may be used, instead of concrete-lined channels or enclosed pipes.

- **Coastline Protection**

Quasi-natural methods such as beach nourishment, or artificial sand dune building, are often used, to attempt to restore an eroding beach, as well as protect development. However, these methods provide only temporary solutions, to chronic long-term erosion caused by the diminishing supply of sediment in the littoral system. They also require periodic renourishing during their 15 to 50 year Iife span.

Structures like seawalls, bulkheads, and revetments protect development, but are not intended to renourish or widen the beach. Erosion can occur in front of them because the natural movement of the shoreline gets affected. Such structures as breakwaters and jetties, which are designed, to protect harbours and navigation channels from wave action or to stabilise inlets, can also cause erosion on the down drift side, if they do not include a sand bypassing system.

- **Watershed Management**

Watershed Management measures reduce overland run-off from agricultural lands to streams or other waters by improving infiltration of rainfall into the soil, slowing and minimising run off, and reducing the sedimentation that can clog stream channels or storage reservoirs. These techniques are most commonly, used in agricultural areas. They include maintaining trees, shrubbery and vegetative cover, terracing, slope stabilisation, using grass waterways, conservation tillage, and strip farming. Some measures involve building structures to retain or redirect run-off. Several land treatment measures involve little additional costs to the farmer, and some, such as no till or minimum tillage, actually reduce costs. Technical and financial assistance is provided through government and international development organisations. Although the impact of an individual measure is limited, extensive watershed management programs can effectively reduce flooding in small headwater areas.

4.2.2. Earthquakes

4.2.2.1 Zoning and Building Codes

After the Latur earthquake, MERI in its report has recommended rezoning of the state in view of the seismic activity observed in certain parts of the state. The mitigation strategy must review the existing seismic zoning to facilitate adoption of building codes for new constructions in various areas. Further, ways and means will have to be evolved to enforce compliance to recommended building codes in all new constructions through 'local planning bodies and municipal authorities. Additionally, compliance to building codes can be ensured by linking property insurance to such compliance.

4.2.2.2 Safe siting in earthquake areas.

- Build structures on rock or stiff soil.

- The most important element of safe siting in earthquake prone areas is to avoid being affected by land instabilities.
- Different types of ground do shake with different severity in an earthquake. Softer soils and those with high water content generally shake more than rocky sites. Wherever possible site structures on firmer ground. This will reduce the severity of vibrations experienced in an earthquake.
- Earthquakes sometimes cause liquefaction of soils. Loose soils on flat land, usually with a high water content can suddenly lose their strength with strong vibrations earthquakes. Soil temporarily turns to liquid, causing structures that are built on them to sink or overturn.
- Capital intensive infrastructure, hazardous facilities and materials, and other important buildings should not be located in the vicinity of a known fault.

4.2.2.3 Retrofitting

It is essential to undertake studies of designs and materials used in existing conventional housing and structures in each of the seismic zones and examine the same in the context of recommended building codes. This would enable identification of the need for retrofitting of the existing structures and dwellings. The earthquake rehabilitation cell of GOM has prepared a manual for restructuring of non-engineered structures, which would be useful for the rural areas. This report indicates the potential of similar exercises in other parts of the state. The system of retrofitting should also be explored as a part of mitigation strategy, including linking with property insurance as in the case of new constructions.

4.2.2.4 Instrumentation

Since early warning is not possible in case of earthquakes, the best choice is to ensure that seismicity is monitored and integrated with the GIS. Maharashtra situation indicates that some parts of the state have been adequately provided with the instrumentation. It is necessary that mitigation strategy considers instrumentation of all other areas in order to have a total assessment of the seismic activity. This would enable reconfirmation and upgradation of microzonation activities. The government may consider setting up of a technical team comprising scientists to look into the aspects of instrumentation and prepare instrumentation plan for the state. The specific instruments required for these purposes include:

a. Microgravimeter : The delineation of minor faults, regionally and locally, needs sophisticated instruments which can detect the minor mass displacements. The microgravimeter can monitor minute mass changes due to minor faults on a continuous basis.

b. Telemetered seismic array: The seismic activity in certain areas will be constantly monitored and telemetered to a central laboratory.

c. Electromagnetic Tomography System : The system deals with continuous monitoring of naturally occurring electric and magnetic signals at various places near the active fault zones.

d. Electromagnetic Radiation during earthquake:

4.2.3 Cyclones

4.2.3.1 Safe siting in cyclones prone areas

- Certain factors can make some sites more exposed than others.
- Coastal areas are particularly prone. Cyclones originate out at sea and become hazardous when they come ashore. They also drive the sea level up to cause coastal flooding.
- Estuaries and river deltas will flood during heavy rainfall associated with the cyclone.
- Exposed sites on the tops of hills or cliff tops. Winds can be up to 15 % stronger on elevated sites.
- Valley necks or open-ended valleys, through which winds may be channelled.
- When siting in areas that suffer from high winds:
- Select a sheltered site. Use any topographical effects or natural defences that may protect the building or settlement from the prevailing wind.
- Consider the orientation of the site. Shelter behind hills from prevailing wind directions.
- Create wind breaks by planting trees or making strong bush fences. Settlements with many trees experience lower wind speeds.
- The layout of the building on the site can also influence the way winds affect them. Generally, settlements that are built in close clusters are known to suffer more damage than those that have reasonable spacing between buildings. Large buildings can be used to shelter smaller buildings.
- A guide to safer layout would include:
- Site buildings some distance from adjacent structures (at least three times the plan dimension of the building).
- Site buildings in staggered formations rather than straight lines.
- Keep buildings away from tall trees that might fall down.
- Maximise street widths. Where possible they should be wider than 6m.
- In cyclone prone areas it is also important to site to minimise damage from floods, and landslides.

4.2.3.2 Shelter Plantation

This covers the sea coast protection through coastal to avoid sea erosion, construction of earth bunds along coast, development of shelter plantation all along the coast line to provide a buffer or cushion against the onslaught of high speed cyclonic storms of 150 to 250 Km/hr. The shelter protection plantation belt of Casuarina trees, which are fast growing recyclables, have substantially helped to protect the human settlements provided in the leeward side of cyclones, due to the resistance of the trees to withstand the force.

4.2.3.3 Drainage

It is important to provide adequate storm water drainage to the sites, and maintain the system through periodic inspections, so that the system does not obstruct flow in natural courses and cause inundation in periods of cyclones. For settlements in low-lying areas this assumes great importance. Roads are required to be provided with camber, side drains and culverts to carry away water into the next level of drains of the drainage system.

Another important aspect is to ensure that settlements are not provided in natural hydraulic flood paths. Cleaning and widening/deepening of natural drainage paths, which get affected due to silting and other causes, should be taken up, on a regular basis, as part of periodic maintenance work.

4.2.3.4 Shelter options for Cyclone Resistance

House design

In addition to the various measures that can be covered under pre-disaster activity, another major initiative that can be taken is to ensure that least amount of damages are caused at the time of occurrence of a cyclone. This can be done by providing appropriate strengthening and construction resistant features in housing and building programmes to be taken up in different vulnerable areas.

The country is divided into various wind pressure zones, and the coastal areas with the frequent visitation of high velocity cyclones are specially identified, and there are specific design codes to provide the needed wind protection and cyclonic effects. The ABC of cyclone protection housing are:

A - Anchorage
B - Bracing
C - Connection

The methodology to ensure all the three facets of cyclone resistant construction have been identified for various elements, and if these are provided for, the houses/buildings built with these measures, are able to substantially mitigate the damage during the occurrence of natural disaster. The large amount of coastal housing constructed over the last decade with various cyclone resistant features, have been able to inputs for various elements of construction have been able to give up the necessary protection.

There are several considerations to be made while designing a house in its three dimensional form, which are related to shape, orientation, height-and positioning of openings in a building, for ensuring the least extent of damage during cyclonic storms.

The cyclone resistant shelters can be built at individual level or at community level.

At individual level there are three kinds of shelter options:

- The first option is where a new house built, to be totally cyclone resistant, with specific design standards and construction methods.
- The second option is, where only the frame and roof are designed to be cyclone resistant and permanent (partial). The occupants can then progressively upgrade the house as and when feasible.
- The third option is, to make a part of the house cyclone resistant either by making a new addition, or reinforcing an existing room (retrofitting). It is called an 'in-house' shelter. During a cyclonic storm, the occupants seek shelter in this part. This option reduces the cost of cyclone-resistant construction and extensive modification of traditional designs is not necessary.
- The key principle underlying cyclone resistant building construction is the secure tying up of all elements in the buildings from foundation to roof.

4.2.3.5 Cyclone shelter

At a community level, the local administration has to provide temporary cyclone shelter. At the time of cyclone to the nearby villages. These shelters, with built-in safety against high wind velocity and heavy rainfall, should be at specially selected sites and within easy reach of the

people most affected. It should have an all-weather access. Educational buildings or places of worship may also be designed as cyclone shelters, for evacuation and temporary occupation.

As a means to evacuate and shelter the people likely to be affected, the most important among the various action programmes is, designing and constructing special multi-purpose anti cyclone community relief shelters, for providing safe and secure accommodation to vulnerable population. The cyclone relief shelters can take care of populations ranging from 50 to 300 people (men, women and children). These are provided as multipurpose community facility spaces to be used as adult education, primary health centres, primary schools, vocational training centres, and community centres. These will be at elevated areas to be protected from floods and also with proviso for community kitchens, ensuring water supply, sanitation, battery operated electric supply and in some cases helipad landing facility on roof for relief supply etc.

Initiative can also be taken to develop a low cost, anti-cyclone core unit, designed to provide safe secure deposit of personal belongings during cyclones, to each family in the existing villages. This would help to resume economic activity soon on return.

National Cyclone Risk Mitigation Project (NCRMP)

The National Cyclone Risk Mitigation Project (NCRMP) is a pioneer project drawn up by Ministry of Home Affairs (MHA)/Union Territories (UTs) Government of India (GOI) to be implemented in 13 Cyclone prone coastal States/UTs with World Bank assistance. In Maharashtra, the project will be implemented in Coastal Districts i.e. Thane, Ratnagiri, Sindhudurg, Raigad, Mumbai and Mumbai Suburban.

The purpose of NCRMP is to build capacity by creating suitable infrastructures to mitigate the effects of cyclones. The project also aims to promote a culture of sustainability through efforts towards conservation of coastal ecosystems. The objective of the project is to strengthen structural and non-structural mitigation measures to reduce the risk and vulnerability of the coastal States/UTs prone to cyclone.

The core components of this project are;

Component A – Last Mile Connectivity for the dissemination of cyclone warnings and advisories from district/ sub-district level to communities, to be implemented by NDMA in consultation with participating States

Component B - Construction of physical infrastructures for cyclone risk mitigation to be implemented by the States

Component C – Technical assistance for capacity building on hazard risk management to be implemented by States

Component D – Project Management and Monitoring applicable to all implementing agencies

As cyclone mitigation measures some physical infrastructures will be developed in coastal area under component B. The major proposed construction of physical infrastructures are;

- multi-purpose cyclone shelters (MPCS),

- underground cabling,
- saline embankments and
- Set up of EOCs at State, District level

Dept. of Economics affairs (DEA), Govt. of India, has recommended Rs. 542 Crores (75% World Bank funding and 25 % state Contribution) to World Bank for this project. The allocation for Maharashtra from Word Bank Funding will be 406.49 Crores and State Contribution will be 135.63 Crores (25%).

4.2.4 Epidemics

The Public Health Department (PHD) is the nodal agency responsible for monitoring and control of epidemics. Local governments and municipal authorities also have a responsibility for taking appropriate steps in this context. Therefore, success of mitigation strategy for control of epidemics will depend on the type of coordination that exists between the PHD and local authorities.

Mitigation efforts for control of epidemics would include

- Surveillance and warning
- Preventive and promotive measures
- Strengthening institutional infrastructure.

4.2.4.1 Surveillance and Warning

Situation analysis indicates the need for strengthening surveillance programmes and warning system. Inadequacy of testing laboratories, and access to existing laboratories make the surveillance of epidemics a difficult task. As a part of mitigation, this would require

- Identification of areas endemic to certain epidemics must be routinely updated to access field requirements
- Identification of appropriate locations for testing laboratories
- Ensuring continuous flow of field data from both government establishments and private medical personnel
- Collating and analysing the data at regular intervals to assess epidemiological monitoring requirements.

In addition to the surveillance it is necessary to keep the general population informed about the health situation in the state, which would encourage communities to take necessary promotive and preventive steps in controlling epidemics. As a part of mitigation strategy, therefore, the Public Health Department should develop a system of issuing health bulletins through mass media, particularly television on the lines of weather bulletin.

4.2.4.2 Preventive and Promotive Measures

In order to mitigate the possibilities of the outbreak of epidemics, the public health department should encourage the local authorities and the communities to undertake certain preventive and promotive measures. The mitigation strategy would include

- Piped drinking water supply and water quality monitoring

- Vector Control programmes as a part of overall community sanitation activities
- Promotion of personal and community latrines
- Introduction of sewage and drainage systems
- Enforcement of FDA norms on edibles and production and sale of these
- Solid waste management systems
- Surveillance of water bodies and canal distribution network for control of malaria

4.2.4.3 Strengthening Institutional Infrastructure

- Promoting and strengthening community hospitals with adequate network of para professionals will improve the capacity of the Public Health Department (PHD) for surveillance and control of epidemics.
- Establishing testing laboratories at appropriate locations in different divisions within the state will reduce the time taken for diagnosis and subsequent warning.
- Establishing procedures and methods of coordination between PHD and local authorities.

4.2.5 Road Accidents

Unlike in the case of railways, road accidents are not investigated into. Findings of accident investigations will provide useful guidelines for evolving mitigation measures and developing safety standards appropriate to the ever-changing road traffic scenario.

Mitigation Measures

If the current provision of Motor Vehicle Act and other related legislations and regulations, including regulations on transport of hazardous and toxic materials, are strictly enforced, the number of road accidents will reduce drastically. The mitigation strategy therefore assumes that enforcement of such regulations will precede the measures suggested.

4.2.5.1 Strengthening Institutional Capability

- Strengthening the enforcement wing in Transport Commissionerate.
- Creation of adequate highway/traffic aid posts. At every major intersection on the highway, traffic aid posts should be set-up.
- Trauma care centres should be established at every 100 kilometres on the national and state highways.
- Every traffic aid post should have a hotline telephone connection with the nearest trauma care centres.
- Modern technology including speed monitoring equipments and computerisation of movement of vehicles with adequate checkpoints on the national highways should be introduced.
- Equipments for removal of accident vehicles from the highways should be easily accessible to the RTO, and the police.
- Considerable confusion exists because of multiple authorities and agencies involved in the regulation and monitoring of movement of vehicles on all roads. It is necessary to coordinate the roles of all such agencies through a single agency.
- Identify and designate routes for transportation of hazardous chemicals. Such routes should not pass through highly populated areas.

4.2.5.2 Strengthening Road Infrastructure

- Parking of vehicles on national highways and even on state highways should be strictly prohibited.
- Excavations on roads must be protected well, particularly in the night, with barricades, fluorescent signs and red lights.
- Special bays for parking of vehicles on trunk routes should be provided at strategic points with provision for food and other facilities.
- Public works department should concentrate on removal of bottlenecks on national and state highways in particular. Bridges should be widened before roads are widened.
- Efforts should be made to provide road dividers on all national and state highways on a priority basis.
- Efforts should be made to light up all national highways carrying excessive vehicle load.
- All unmanned railway crossings should be manned with signal facilities.
- All ghat roads should have adequate embankments on the valley side.
- The speed breakers and tipplers must have standard designs.
- Provision of lay byes for all bus stops must be made mandatory with authority given to RTO to clear them off all encroachments.
- Information sign-boards should be provided giving the location of the nearest village, police station, hospital, ghat traffic position, petrol pump etc. at every traffic aid post.

4.2.5.3 Improving Regulations

- Insurance claims should be linked with compliance of all regulations related to vehicles and transport restrictions.
- All two wheeler drivers, including pillion riders must, always wear right kind of protective head-gear.
- As the inter-state transport of goods has been increasing over the years, there should be a uniform national regulation on permissible loads.
- All vehicles carrying school children must be registered and provided with flashlights signs and designated halts. Regulations for overtaking such vehicles when they are stationary should be introduced.
- Vehicles with break-down on the highway must display a plate on a stand with a danger sign painted thereon in the front and rear. Every goods vehicle must have such plates with the stands and should be inspected either at the octroi points or by the RTOs.
- Simulation aided training should be adopted for drivers carrying hazardous and toxic materials.
- Every vehicle must be provided with hazard lights (blinking lights) which would warn drivers of other vehicles of the stationary vehicle.
- Reflectors and tail lamps should be made compulsory for handcarts, cattle driven carts, tractors, tractor and jeep trolleys, cycles, cycle-rickshaws and such other non-motorised vehicles not falling under Motor Vehicles Act, 1988.
- Simplify the procedure under Section 140 of the Motor Vehicles Act, 1988, for compensation to accident victims

4.2.6 Fires

Fire brigades are essentially under the control of municipal authorities and hence, are discouraged from crossing the municipal limits. Industrial safety departments also have fire

fighting equipments for on-site emergencies. It is therefore, seen that rural sector by and large, is totally deprived of any fire fighting assistance.

As a part of mitigation strategy, efforts should be made to

- Make fire fighting services available to rural areas outside the local municipal limits.
- Assisting municipal authorities not having fire brigade to establish such a service.
- Encourage agricultural marketing committees and cooperatives in rural areas to establish their fire services.
- Evolving methods of coordination between municipal fire services and industrial safety departments.
- Undertake community education and preparedness for fire fighting In areas where fire services will not easily available.
- In industrial towns, fire services should be equipped with protective clothing and fire fighting devices including masks, gloves etc. for dealing with chemicals and toxic materials.
- Special burns wards should be established in every civil hospital and in the hospitals near the industrial estates.
- Equipping fire services with communication facilities like wireless etc. and wherever such facilities exist, these should be upgraded.
- Computerised data management system should be introduced to keep the record of all fires including frequency, extent, fatality, economic losses etc.
- The roles and responsibilities of district administration, police, fire services and medical services should be clearly laid down.

4.2.7 Industrial and Chemical Accidents

- All industrial concentrations should be encouraged to establish MARG for management of industrial accidents.
- Industries involved in the production or transportation of inflammable, hazardous and toxic materials should have a mandatory responsibility for preparing an off-site plan and communicating the same to the District Collector. Simulation exercises should be undertaken in the adjoining communities.
- Poison centres should be established in every civil hospital and in the hospitals near the industrial estates with facilities for detoxication.
- All transport of hazardous and toxic materials should be communicated to the RTO.
- All pipelines carrying hazardous and toxic materials should be equipped with devices to check any leakage or metal fatigue.
- Small scale industries releasing toxic waste water should be encouraged to set up common effluent treatment facility.
- A common format for chemical data sheets should be devised which should be used by DISH to collect information from all industries in the state and the same should be available with fire brigade & police.

4.3 Preventive and Mitigation Measures and Responsible Line Departments

4.3.1 Flood

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	➢ Revenue Dept. ➢ Secy. R & R ➢ Irrigation Dept. ➢ PWD Dept. ➢ All line Dept.
2	Development of catchment area	➢ Development of catchment area of the flood plain • forestation • land sloping • small reservoirs/check dams/ponds etc.	➢ Revenue Dept. ➢ 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
5	Forecasting and warning	➢ Strengthening and upgradation of existing flood forecasting system ➢ Establish infrastructure for flood warning and dissemination	➢ Director DMU ➢ 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. ➢ Director DMU ➢ Irrigation Dept ➢ Line Dept.
2	Awareness	➢ 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 DMU ➢ Irrigation Dept ➢ SDMA ➢ Information Dept. ➢ Line Dept.

		➢ Motivate all families in flood prone areas to prepare the family kit of emergency materials.	
3	Review of rules	➢ Review of operational rules for reservoirs	➢ Irrigation Dept

4.3.2 Earthquake

Structural Measures			
S#	**Task**	**Activities**	**Responsibilities**
1	Micro-zonation planning in seismic zone	➢ Conduct micro-zonation study in earthquake prone locations ➢ Prepare map on seismic prone areas ➢ Identify the vulnerable structures ➢ Plan development works accordingly ➢ Strictly adapt the planning suggested in micro-zonation study.	➢ Revenue Dept. ➢ Director DMU ➢ UD Dept. ➢ PWD Dept. ➢ Gram Panchayats ➢ Local Urban Bodies ➢ Housing Dept.
2	Adapt of Earthquake Resistant Structures	➢ Incorporate the seismic resistant design features in all residential buildings and public lifeline structures in earthquake belts. ➢ Ensure that all houses construct by govt. line depts. through various projects/schemes are built with earthquake resistant designs	
3	Retrofitting the weak structures	➢ Develop a database of existing private and govt. building in the State ➢ Identify the buildings need retrofitting ➢ Prepare a project/scheme for retrofitting	➢ Revenue Dept. ➢ Director DMU ➢ UD Dept. ➢ PWD Dept. ➢ Gram Panchayats ➢ Local Urban Bodies ➢ Housing Dept.
4	Use Restriction of Risk Structures	➢ Develop a database of existing private and govt. building in the State ➢ Identify the very weak/old structures ➢ Put notice not to use and vacate	
5	Monitoring of Seismic Activities	➢ Set up seismic recording stations in seismic prone areas ➢ Take regular study and research work ➢ Ensure dissemination of data and information to all concerned.	➢ Science & technology dept. ➢ Local Urban Bodies ➢ Secy. DM
Non-Structural Measures			
1	Capacity Building	➢ Prepare departmental earthquake contingency plan, action plan and SOP ➢ Incorporate earthquake engineering course in engineering syllabus ➢ Organize trainings on earthquake resistant structures for engineers,	➢ Education & technical Education Dept. ➢ Revenue Dept. ➢ SDMA ➢ Line dept. ➢ YASHADA

		architects, masons and others working in construction industry.	
2	Awareness Activities	➢ Organize school programmes, public awareness campaigns on earthquake safety. ➢ Organise Drop. Cover and Hold demo in schools. ➢ Develop IEC materials and distribute	➢ SDMA ➢ Information Dept. ➢ DDMA

4.3.3. Cyclone, Storm and Tsunami

Structural Measures			
S#	**Task**	**Activities**	**Responsibilities**
1	Shelterbelt	➢ Shelterbelt plantation and mangrove regeneration	➢ Revenue Dept. ➢ Forest Dept.
2	Construction of Cyclone Shelters	➢ Construction of cyclone shelters in cyclone prone areas ➢ Plan underground electricity connectivity in cyclone prone cities	➢ SDMA ➢ Secy. DM ➢ PWD Dept.
3	Development of Infrastructure	➢ Construction of all weather roads and bridges in cyclone prone areas. ➢ Construction of missing roads and bridegs, strengthening/repairing of existing roads and bridges in cyclone belt. ➢ Strengthening of dams and canals ➢ Saline embankment – construct new.repair of existing	➢ SDMA ➢ Secy. R & R ➢ PWD Dept. ➢ Irrigation Dept
4	Forecasting and Warning	➢ Strengthening and upgradation of existing cyclone and tsunami forecasting system. ➢ Establish infrastructure for cyclone and tsunami warning and dissemination to the on shore and off shore coastal areas. ➢ Develop specific warning dissemination system for ports, beach. salt workers and fishermen	➢ IMD, Mumbai ➢ SDMA ➢ Director DMU ➢ Tourism Dept.
Non-Structural Measures			
1	Capacity Building	➢ Departmental contingency plan ➢ Cyclone/tsunami related departmental action plan and SOP ➢ Providing trainings to the stakeholders involved in cyclone mitigation and management	➢ SDMA ➢ YASHADA ➢ Line Depts.
2	Awareness	➢ Organize awareness campaigns on cyclone/tsunami safety ➢ Disseminate cyclone. Tsunami warning to general public in coastal areas.	➢ SDMA ➢ Tourism Dept. ➢ Information Dept.

4.3.4 Drought

Structural Measures			
S#	**Task**	**Activities**	**Responsibilities**
1	Construction	➢ Construction of dams, reservoirs, lift irrigation, water sheds, tube wells and canals for surface irrigation ➢ Construction of percolation tanks, check dams, farm ponds, etc. ➢ Construction of warehouses and cold storages for preservation/storage of food grains.	➢ Revenue Dept. ➢ Secy. R & R ➢ Irrigation Dept ➢ Agriculture Dept. ➢ Civil Supply Dept.
2	Repair, upgradation and strengthening	➢ Repairs, upgrading and strengthening of dams, reservoirs, lift irrigation and canals for surface irrigation ➢ Repair, upgrading and strengthening of percolation tanks, check dams. farm ponds, etc.	➢ Revenue Dept. ➢ Secy. R & R ➢ Irrigation Dept ➢ Agriculture Dept.
3	Techno-legal regime	➢ Enactment and enforcement of laws regulating ground water level and exploitation of natural resources.	➢ Revenue Dept. ➢ Secy. R & R ➢ Irrigation Dept. ➢ UD Dept, Panchayat ➢ Urban Local Bodies
4	Adaptation of new technology	➢ Application of advanced agro-science technology and agro-engineering inputs to improve agriculture production	➢ Revenue Dept. ➢ Secy. R & R ➢ Agriculture Dept.
5	Forecasting and Warning	➢ Strengthening and up gradation of existing drought forecasting system ➢ Establish infrastructure for drought warning and dissemination	➢ Revenue Dept. ➢ Director DMU ➢ Irrigation Dept ➢ IMD
Non-Structural Measures			
1	Capacity Building	➢ Departmental drought contingency plan ➢ drought related departmental action plan and SOP ➢ Imparting training to the stakeholders involved in drought mitigation and management ➢ Encourage people to use advance technology for drip and sprinkler irrigation ➢ Encourage water harvesting ➢ Encourage farmers to understand crop pattern to be adapted in their areas. ➢ Rational use of fertilizers and pesticides.	➢ Revenue Dept. ➢ Director DMU ➢ Irrigation Dept. ➢ Agriculture Dept. ➢ Forest & Environment Dept. ➢ Rural Development ➢ All line Dept.

		➢ Encourage the adaptation of technique for preservation of green folder	
2	Awareness	➢ Dissemination drought risk to general public residing in drought prone zones ➢ Campaign for drought tips for agriculture, general public and industries ➢ Motivate farmers to adapt the drought resistant crops, new technology and off-farming activities	➢ SDMA ➢ Revenue Dept. ➢ Director DMU ➢ Irrigation Dept ➢ Agriculture Dept. ➢ Information Dept. ➢ All line Dept.

4.3.5 Industrial/Chemical Hazard

Structural Measures			
S#	**Task**	**Activities**	**Responsibilities**
1	Land use planning	➢ Disaster prone areas should not allow for any factory/industry. Consider the land use planning in view of hazard, risk and vulnerability of the State.	➢ Industry Dept. ➢ MIDC ➢ Revenue ➢ Local Authority
2	Adaptation of advance technology	➢ In order to avoid any unaccepted industrial disasters advanced science and technology to be used.	➢ Industry Dept. ➢ Science and Technology
3	Techno-legal regime	➢ All industrial safety Acts and Rules to be reviewed and revisioned as and when required ➢ Implement the Acts and Rules related to industrial safety firmly.	➢ Industry Dept. ➢ MIDC ➢ Local Authority
4	Safety Audit	➢ Ensure structural safety inspection/audit by competent authority.	➢ Line Depts
5	Capacity Building	➢ Establish onsite and offsite warning dissemination system with latest technology. ➢ Set up/strengthen EOCs at all level. ➢ Purchase, store and keep functional all necessary industrial safety equipments.	➢ Nodal Authority ➢ MIDC ➢ Dist. Collector ➢ Municipal Commissioner
Non-Structural Measures			
1	Emergency Planning	➢ Prepare an onsite and offsite emergency plan ➢ Conduct mock drills as per the regulations ➢ Update the plan as per the requirement ➢ Monitor similar activities in all the factories/ industries	➢ Nodal Authority: ➢ MIDC ➢ Dist. Collector ➢ Municipal Commissioner
2	Organize Capacity Building	➢ Organize industrial safety trainings for officers and staff working in the factories. ➢ Set up a on-site and off-site monitoring team to check up all safety measures. ➢ Do mock drills in a regular interval. ➢ Encourage disaster insurance	➢ Nodal Authority: MIDC ➢ Dist. Collector ➢ Municipal Commissioner

3	Awareness Activities	➢ Organize community awareness programmes for the communities residing near the factories and let people know what to do what not to do in case of industrial disaster ➢ Develop IEC materials on local language and distribute them in schools and local communities. ➢ Organize school level awareness activities and ensure students participation in large number.	➢ Nodal Authority: MIDC ➢ Dist. Collector ➢ Municipal Commissioner ➢ SDMA

4.3.6 Structural and Non-Structural Measures for All Hazards

Structural Measures			
S #	**Task**	**Activities**	**Responsibilities**
1	Land use planning	➢ Develop Land use planning considering the hazard, risk and vulnerability of the State.	➢ Revenue Dept. ➢ Line dept.
		➢ Land use in development projects/schemes to be done considering the hazard, risk and vulnerability of the State.	➢ Line Dept. ➢ Dist. uthorities of line departments
2	Mainstreaming of DM in development programmes	➢ Ensure that each development programme /scheme in the State should be sanctioned / undertaken only if it meets the requirement of disaster management	➢ Line Depts. ➢ Dist. authorities of line departments
		➢ Ensure the programme/ scheme/ project is facilitated with the provision for adequate funds of disaster management	
3	Adaptation of advance technology	➢ Application of science and technology and engineering inputs to improve infrastructures including dams and reservoirs, building design, construction , etc.	➢ PWD Dept. ➢ Science and Technology ➢ SDMA
4	Tech-legal Regime	➢ Review and revision of building by laws and town planning Act and Rules, General Development Control Regulation (GDCR) /Coastal Regulation Zone (CRZ)etc.	➢ Revenue Dept ➢ UD Dept. ➢ Panchayat t. ➢ Urban Local Bodies and PRI
		➢ Ensure strict implementation of Code and Rules by concerned authorities	
		➢ Ensure regular monitoring of quality construction	
5	Safety Audit	➢ Carrying out structural safety audit of all Critical Infrastructures and Key Resources (CIKR)	➢ PWD Dept. ➢ UD Dept. ➢ Line Dept.

6	Capacity Building	➢ Construction/Strengthening of EOC. ➢ Organise Safe Construction Practice trainings for enineers, masons, builders and contractors	➢ Revenue Dept. ➢ PWD Dept. ➢ SDMA ➢ Fire
Non-Structural Measures			
1	Planning	➢ Prepare all-hazard disaster management plan ➢ Prepare hazard wise contingency planning ➢ Ensure hazard wise departmental action plan and SOP ➢ Conduct mock drills at regular intervals ➢ Update the plan as per the requirement ➢ Monitor similar activities at district & levels below.	➢ Revenue Dept. ➢ Director. DMU ➢ Line depts. ➢ Dist. Collectors ➢ Municipal Commissioner ➢ Tahsildar
2	Capacity Building	➢ Organize training programs, seminars and workshops ➢ Include disaster related topics in curriculum ➢ Encourage disaster insurance ➢ Encourage favorable taxation / incentive	➢ SDMA ➢ Information Dept. ➢ Education Dept. ➢ Dist. Collectors ➢ Municipal Commissioner ➢ Panchayats
3	Awareness	➢ Organize community level awareness activities on dos and don'ts. ➢ Develop IEC materials on various disasters for publication & distribution ➢ Awareness generation in general public through electronic and print media ➢ Organise school level awareness programmes ➢ Develop local community participation in disaster preparedness and response measures. ➢ Conduct HRVA study through Participatory Approach.	➢ Revenue Dept. ➢ Director. DMU ➢ SDMA ➢ UD, Panchayat & ULB

Mitigation activities that need policy level actions.

- **Town Planning Act:** Planning, adopting and enforcing stringent building codes, flood-proofing requirements, seismic design standards and cyclone wind-bracing requirements for new construction or repairing existing buildings.
- **Zoning Regulations:** Planning and adopting zoning ordinances that steer development away from areas subject to flooding, storm surge or coastal erosion.
- **Development Control Regulations:** Incorporate the disaster management concerns into development. This should include all Government Sponsored Developmental Programs and Schemes.

- **Undertaking retrofitting** work on public buildings to withstand ground shaking or cyclone-strength winds.
- **Land use regulation**: Planning and building cyclone safe community shelters, public buildings and schools in coastal areas.
- Creation of State mitigation fund to undertake the mitigation works at disaster prone locations and protect the development works from disasters.
- Creating awareness on disaster mitigation at all level and make all mitigation awareness activities public participatory.
- Developing preparedness among public through school programs, media and community level awareness activities.
- Appropriate amendments in the legislative and regulatory instruments along with strengthening of the enforcement mechanisms at different levels.
- Steps taken for human resource development and capacity building for effective disaster mitigation at State Level.
- Capacity building at local and regional levels for undertaking rapid assessment surveys and investigations of the nature and extent of damage in post disaster situation.
- Conducting micro zonation survey in earthquake prone area, flood affected locations, and other specific disasters.
- To ensure use of disaster resistant construction techniques in construction of houses, public lifeline buildings, towers, and underground structures.
- To incorporate the safe construction practice in engineering curriculum and disaster management in school syllabus.
- To create a research oriented data base on disaster and its impacts.
- To promote and encourage Research and Development activities.

(Source: SDMP, Gujrat)

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Preparedness Measures

Preparedness to any disaster makes the response situation effective. A well prepared society can encounter any emergency situation better. Thus, more priority has been given by government on preventive and mitigation measures rather than relief and post disaster works. The following disaster management activities may be taken into consideration under preparedness measures.

- Update the resource inventory
- Review and update the DM plans
- Develop DM policy, guideline and plan
- Establishment of EOC and early warning system
- Formation of DM committees and task forces
- Organise capacity building trainings
- Purchase/repair the search and rescue materials and critical supplies
- Identify disaster prone areas and complete the HRVA study
- Prepare the hazard maps
- Organise community-based DM trainings, orientations and awarenesss activities
- Make fund provision for disaster response, mitigation and relief works
- Implement all preventive and mitigation activities in disaster prone areas
- Conduct mock drills
- Mainstreaming of DM in development programmes/projects/scheme
- Develop coordination and net working with various stakeholders

5.1 Availability of Disaster Management Resouces

The available resources in the State have been uploaded in the IDRN web site.

India Disaster Resource Network (IDRN) IDRN, a web based information system, is a platform for managing the inventory of equipments, skilled human resources and critical supplies for emergency response. The primary focus is to enable the decision makers to find answers on availability of equipments and human resources required to combat any emergency situation. This database will also enable them to assess the level of preparedness for specific vulnerabilities. Total 226 technical items are listed in the resource inventory. It is a nationwide district level resource database. Each user of all districts of the state has been given unique username and password through which they can perform data entry, data updation on IDRN for resources available in their district. The IDRN network has functionality of generating multiple query options based on the specific equipment, skilled human resources and critical supplies with their location and contact details.

This resource inventory has been updating in every year at district level by District Disaster Management Officers (DDMOs).NIC has to provide the technical support to update this website.

5.2 Community-Based Disaster Management

Disaster management at community level needs community participation every time since it is the first responder to any disaster. Community participation in any disaster related activities is extremely inevitable. Community always plays an important role in preparedness, mitigation, response and recovery works. Considering its role and responsibility in every phases of disaster management, top priority will be given to build the capacity of community people and make them aware of various disasters.

Community-based disaster management largely believe in community's involvement in every phases of disaster management. The core activities where community people get involved are shortly outlined below.

- Identify the hazards and disaster prone communities.
- Ensure the people's participation in hazard analysis, formation of disaster management committees, task forces and development of community-based disaster management plans.
- Develop the community-based early warning system and its due dissemination in the vulnerable communities.
- Take all prevention, mitigation and preparedness measures to encounter any disaster.
- Organise capacity building trainings and awareness programmes
- Get participation in search and rescue operation, relief and medical assistance, reconstruction and rehabilation works, traum councelling and maintaining law and order in disaster affected locations.
- Provide support to conduct post-disaster assessment study, to implement socio-economic development programmes.

5.3 Capacity Building Trainings and Other Proactive Measures

5.3.1 Capacity Building Trainings

The following capacity building trainings are to be organized under disaster management programme in the State for various state holders.

Task	Activity	Responsibility
Capacity Building Trainings	➢ Training to civil Defence, Police and Home Guards personnels, NSS/NCC students in Search and Rescue (SAR), and various aspect of disaster management	➢ SDMA/DDMA ➢ Civil Defence ➢ Police ➢ Home Guard ➢ Education Dept.
	➢ Training to teachers, municipal corporation staff, district administration personel, Zilla Parisad staff, in various aspect of disaster management	➢ Education Dept. ➢ DDMA ➢ Municipal Corpo ➢ Zilla Parisad ➢ YASHADA
	➢ Training to civil society, Community Based Organisations (CBOs), Self-Help Groups (SHGs) members, community volunteers, PRI members and corporate entities in various aspect of disaster management	➢ SDMA/DDMA ➢ Municial Corpo ➢ YASHADA
	➢ Training to fire and emergency service personal, and traffic police in various aspect of disaster management	➢ SDMA ➢ Municiapl Corporation/Fire/Police
	➢ Training to State Disaster Response	➢ SDMA

	Force (SDRF) Teams in various aspect of disaster management	
	➢ Training to govt officers and media persons in various aspect of disaster management	➢ SDMA ➢ Information Dept. ➢ YASHADA
	➢ Training to engineers, architects, structural engineers, builders and masons in various aspect of disaster management	➢ SDMA ➢ UD Dept. ➢ PWD Dept.
Develop database for disaster management	➢ Develop Geographic Information System (GIS) based information system for different sectors viz. medical and health, civil supply, fire and emergency services, etc. ➢ Collection of information ➢ Generation of maps ➢ Regular updation of data	➢ SDMA ➢ Science & Tech. Dept. ➢ All line Dept. ➢ MRSAC
	➢ Develop Flood Disaster Management Information System ➢ Development of software ➢ Collection and feeding of basic data ➢ User's training ➢ Regular updation of real-time data	➢ Revenue ➢ SDMA ➢ Irrigation Dept ➢ Dist. Collector ➢ IMD ➢ All line Dept.
	➢ Create and disseminate database of contact details, resources, response agencies, NGOs, trained personnel, most vulnerable groups, evacuation routes, available shelters, relief centres, critical infrastructures, storage godowns, etc.	➢ Revenue Dept. ➢ SDMA ➢ Secretary DM ➢ All line Dept.

5.3.2 Techno-legal Regime

Task	**Activity**	**Responsibility**
Institutional Arrangement	➢ Constitution of State Disaster Management Authority	➢ Revenue Dept.
	➢ Formation of DM policy, guidelines and Act. ➢ Development of DM Plans at state, district, taluka and village level including HRVA ➢ PrepareHazard-wise Action Plans ➢ State Contingency Plans ➢ Prepare SOPs and ESF ➢ Departmental Disaster Management Plans	➢ SDMA ➢ All line Depts.
	➢ Formulation of professional Civil Engineers Act. ➢ Creation of regulatory body ➢ Revision of General Development Control Regulations (GDCR)	➢ UD Dept. ➢ Legal dept. ➢ UD Dept. ➢ Legal Dept.

	➢ Emergency Medical Service Act ➢ Formation of an Emergency Medical Services (EMS) ➢ Set up paramedic cadre through training programmes and accredit / license them ➢ Provide trainings to emergency service staff ➢ Make provisions for recognization and setting up of trauma centres in the state ➢ Standardize and license ambulance services ➢ Dedicate a statewide medical emergency toll free number ➢ Develop of guidelines for Emergency Care of special section of people like children, elders, Below Poverty Line (BPL) beneficiaries, citizens of remote and disaster prone areas	➢ Health & Medical Dept.
	➢ Revision of BIS codes ➢ Undertake studies, reviews and revision	➢ SDMA ➢ PWD Dept ➢ UD Dept. ➢ Fire & Emergency Services ➢ Irrigation & Water resources Dept.
	➢ Development of relief norms and packages	➢ Revenue Dept. ➢ Finance Dept. ➢ Agriculture Dept ➢ Other Line Dept.
	➢ Development and promotion of incentives, insurance, disaster bonds, tax rebate, etc. against the disaster	➢ Finance Dept. ➢ Revenue Dept.
	➢ Strengthening of Early Warning System ➢ Need assessment and feasibility study ➢ Implement the EWS ➢ Arrangement with service provider companies for multiple warning messages	➢ Revenue Dept. ➢ Science & Technology Dept. ➢ SDMA ➢ IMD
	➢ Hazard Risk & Vulnerability Assessment for different natural and man-made disasters prone to state ➢ Conduct study ➢ Analyse of data ➢ Hazard mapping ➢ Micro zonation	➢ Revenue Dept. ➢ SDMA ➢ Science & Technology Dept.
	➢ Ensure all safety measures ➢ Identification of locatios ➢ Put reliable alarm system in place	➢ Home Dept. ➢ Science & Technology Dept.

	➢ Arrangement of personnel protective equipments ➢ Promotion of life saving methods and techniques	➢ Revenue Dept. ➢ SDMA ➢ All line Dept.
	➢ Strengthening of relief distribution and accounting system at state and district level ➢ Identification of centralized system for receipt, storage and distribution of relief ➢ Rate contract, procurement and stockpile of relief material	➢ Revenue Dept. ➢ Secy. R & R ➢ Dist. Collector ➢ Municipal Commissioner ➢ Civil Supply Dept.
	➢ Strengthening of EOC at state, and district level ➢ Retrofitting of existing buildings in hazard prone zones ➢ Strengthening the DM committees, Task Forces, training oranisations, government line agencies. ➢ Establish the EOCs with latest communication system right from state to village level ➢ Organise mock drills on different themes and check the preparedness of line agencies ➢ Ensure the emergency logistics arrangement is in place	➢ Revenue & DM Dept. ➢ Secy. R & R ➢ Dist. Collector ➢ Municipal Commissioner ➢ SDMA

5.3.3 Awareness

Task	Activity	Responsibility
Information education and communication	➢ design and develop public awareness messages in local language ➢ Disseminate the messages through electronic and print media. ➢ Do wall paintings, hoardings, posters, booklets, leaflets, street plays, folk dances, local cable, Advertisement, hording, booklets, school programmes etc as core awareness activities	➢ Revenue Dept. ➢ Information Dept. ➢ Education Dept. ➢ All line dept. ➢ Dist. Collectors ➢ Municipal Commissioners ➢ Other Dist. Authorities

5.4 Medical Preparedness

Task	Activity	Responsinility
Medical Preparedness	➢ Develop the database of available health facilities in the state including public and private.	➢ Medical &

	➢ Collection of data, mapping of resources ➢ Analysis the gaps and identify the strength and develop the resource management plan ➢ List out the manpower, logistics, medical equipments, medicines, antidotes, personal protective equipments, disinfectant, vaccine ➢ Make provision of Nodal officers at State, Dist. and Disaster site ➢ Ensure the health department will work with IRS organisation ➢ Identification of each section head at each level • Operation • Planning • Logistic • Administration & Finance • Media and Public information ➢ Identification of key members of different task force ➢ Set up EOC/Control rooms at state, district and disaster site with trained manpower ➢ Appointment of liaison officers ➢ Preparation of medical management plan at State and Dist. Level ➢ Hospital preparedness plan ➢ Training and capacity building • Hospital preparedness, • Pre hospital care, • Mass casualty management, etc.	Health dept. ➢ Commissioner of Health ➢ Medical institutions

5.5 Knowledge Management

Task	Activity	Responsibility
Knowledge Management	➢ Disaster related activities carried out at different level to be documented and dissessminated to various government line departments, training agencies, private organisations, and community people through website, local electronic and print media so that disaster management will be mainstreamed. ➢ Advanced reseach works with regard to community-based disaster management to be taken up and the research outputs should be applied in practical field. ➢ Develop proper data-base of disaster resources available with various government and private agencies and help in disaster response and recovery efforts.	➢ Revenue Dept. ➢ SDMA ➢ Science & Technology Dept.

	➢ Adopt the advanced information and communication technologies in early warning dissemination and emergency management situations ➢ Record properly the best practices, lessons learnt, field reports, work experiences of disaster and share all these among different stakeholders in meetings, workshops and seminars.	

5.6 Communication System

Task	Activity	Responsibility
Set up safe communication and last mile connectivity	➢ Set up reliable communication system between state, district, taluka and village ➢ undertake research on latest emergency communication and information system ➢ Enhance the local communication mechanism and give priority on local language to disseminate the alert message. ➢ Form the Early Warning Teams at village level and train them on EWS. Ensure the teams are ready with communication equipments round the clock ➢ Ensure the most reliable and altervative EWS in disaster prone localities.	➢ Revenue Dept. ➢ SDMA ➢ Science & Technology Dept. ➢ Information Dept. ➢ Local and district authorities ➢ Municipal Commissioner
Mock Drills	➢ Organse mock drills as per DM plan guideline on Communication Practice ➢ Document the procedures of mock drills, record the weaknesses, identify the gaps, take the feedbacks. ➢ Update the communication plan	

Chapter -6

Disaster Response Mechanism

6.1 Response Strategy

A coordinated response mechanism makes relief and rescue operation effective as a result chances of loss of lives, damage of property and environment would be minimized. The goal of response strategy is obvious that to make maximum efforts to save more lives during disaster and use the limited available resource in proper planning in due coordination with all line departments at the time of emergency.

Disaster relief is a coordinated multi-agency response to reduce the impact of a disaster and its long-term results. Relief activities include rescue, relocation, providing food and water, preventing disease and disability, repairing vital services such as telecommunications and transport, providing temporary shelter and emergency health care.

The operational priorities with regard to response strategy are strongly outlined as follows.

- Dissemination of accurate and timely emergency public information and warnings to the public
- Law enforcement
- Intelligence gathering/situation analysis
- Resource allocation and coordination
- Fire and rescue
- Evacuation
- Medical care
- Coroner operations
- Care and shelter
- Access and perimeter control
- Public health
- Safety assessment
- Restoration of vital services and utilities

Along with goal and operational priorities, the operational strategy of response mechanism is also important at State level which includes,

- responsive and focused
- well functioning
- working together effectively
- proper use of resources

Institutional Arrangements

In order to respond to disasters the State Disaster Management Plan allows all disaster specific mechanisms to work together at the time of emergency. For this purpose the existing administrative set up at State level needs to be defined and make it more specific and operational in terms of emergency management. The Incident Response System (IRS) which has been taken as an effective disaster management system and customized in Indian context considering the administrative establishment proposes Chief Secretary as the head supported by the Secretary of Disaster Management Unit (DMU) at State level and district collectors at district level with Emergency Operation Centres (EOC).

6.2 Alert Mechanism

Early Warning

It is marked that the early warning message of a disaster declared by its concerned competent agency first through electronic media and print media. Based on such early warning or report from district collector on occurance of a disaster the State disaster response mechanism will be activated and kept on standby position to respond to the situation on priority basis.

The details of competent agencies work on early warning is given below.

Disaster	Competent Agencies
Earthquake	IMD, ISR
Floods	Water Resource Dept. Irrigation Dept. IMD
Cyclones	IMD
Tsunami	INCOIS, ISR, IMD
Drought	Agriculture Department
Epidemics	Health and Family Welfare Dept.
Industrial and Chemical Accidents	Industry, Director Industrial Safety and Health
Fire	Fire and Emergency Services

Early Warning Dissemination System

On occurrence of a disaster in the State the message will be communicated immediately to the concerned authorities and agencies at State and National level.

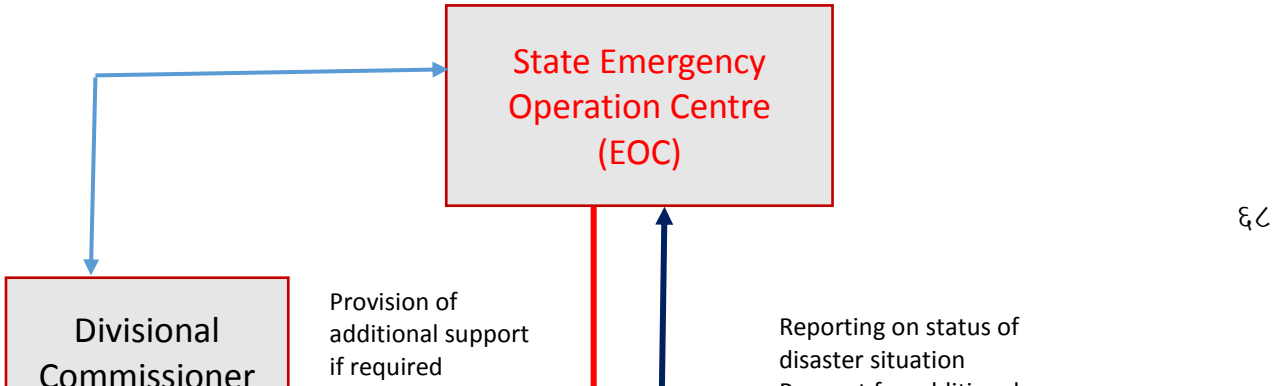
At State Level

- Governor, Chief Minister, Home Minister, State Cabinet, Guardian Minister of the district, and non-officials of the affected district namely MLAs and MPs.

At National Level

- PMO, Cabinet Secretary, Secretary Home and defense, NDMA and MHA

Flow of information between EOC, DCR and SOC during disaster conditions



Hazardwise Alert and Early Warning Mechanism

Cyclone

The Regional Meteorological Centre (RMC), Mumbai provides weather related services to the states of Maharashtra, Goa and Gujarat excluding Vidarbha region of Maharashtra State. RMC Nagpur provides weather related services to Vidarbha region. RMC Mumbai is also

responsible for the monitoring and issue of tropical cyclone related forecast and warning to the State of Maharashtra, Goa and Gujurat and to all concerned district administration.

In case of cyclones, the IMD announces 72 hours advance warning. The State EOC acts accordingly and disseminates the warning to the public and line departments. On receiving an initial warning the officer of the State EOC sends the warning to all line departments, and the district administrations. The district administration will forward the same to the taluka level control rooms through wireless, fax, e-mail and other effective communication system.

It is expected that the warning must reach the stakeholders who are more vulnerable and very close to cyclone belt. Ports, fishermen, salt workers, ships in the high sea and coastal line and public need the early warning on top priority basis.

Ports

The port warning messages are normally sent by fax and over telephone to the port officers regarding the weather forecast of their ports. In this connection police stations nearby ports are generally used and message is sent by their control room wireless set. Mahashtra Maritime Board also play an important role in dissemination of cyclone early warning in the State.

- On receiving cyclone warning the Maharashtra Maritime Board maintains effective co-ordination and liaison with Area Cyclone Warning Centre (ACWC), Mumbai during cyclone storm.
- Maharashtra Maritime Board deputes officers during cyclone to gather port warning messages and circulating the same to the ports expected to get affected by using own communication system.
- The port officials, on receiving warning, hoist the appropriate visual signals at ports to help the target stakeholders.
- Ports are warned 5 to 6 times a day during period of cyclonic storm.
- Warning includes information about location, intensity, expected direction, expected landfall point, and type of signal the Port should hoist.
- Light houses to be kept in preparedness position and maintain coordination with Mahashtra Maritime Board and district collector.

Fishermen

The fishermen are largely prone to cyclone since they work both on coastal line as well as in high sea. The high speed wind and strong storm are a threat to fishing boats and lives. Based on the early warning of cyclone disaster of the IMD and other competent agencies the same warning must be circulated to fishermen through ports, fisheries officials and AIR broadcasts daily three/four times in local language. The warning related to fishermen includes the following information - synoptic situation, signals hoisted and advice not to go out into the sea. The warning is generally issued for fishermen when one of the following conditions of weather is expected along and off any coast.

- Strong off-shore and on shore winds speed exceeding 45 km/hr.

- Squally weather – frequent squalls with rain, or persistent type of strong gusty winds (36km/hr) accompanied by rain
- Gales and
- State of sea very rough or above (wave heights are four metres or more)

Salt Workers

The salt workers in coastal districts will be protected from cyclone disasters. On receipt of cyclone warning the district collectors of coastal area will immediately warn the salt industries to look into the situation and take care of the salt workers for timely evacuation and safe shelter. In this connection the district collector will involve the officials of Labour Department and Industry Department.

Ship in the high sea

In order to help the ships in the high sea the Coastal Radio Station at Mumbai and the Department of Telegraph (DoT) broadcast two routine bulletins at fixed times and on fixed wavelengths for the Arabian Sea. The Area Cyclone Warning Centre (ACWC), Mumbai issues bulletin known as "Extra", "Storm" and "Special" as and when required during cyclone. The IMD Mumbai also publish alert bulletins for ports.

Coastal shipping

The ships roaming in coastal area up to 75 km far from coastline are provided the regular weather information through weather bulletins, The CWC Ahemedabad issues these routine bulletins twice a day and broadcasted by Coastal Radio Stations – Mumbai and Kandla. Durimg the cyclone situation bulletin known as "Extra", "Storm" and "Special" are issued as and when necessary by the CWC, Ahmedabad six times a day and broadcasted by Coastal Radio Stations at Mumbai and Kandla.

Public

The weather related information largely available by AIR in local language. Now the updated weather bulletins are also immediately circulated by electronic and print media. In case of cyclone warning the special bulletins are broadcasted by local radio and television for public information and preparedness.

Flood

IMD, Mumbai issues heavy rainfall forecast and warning. Since there is no Central Water Commission in Maharashtra State the Water Resources Department, Govt. of Maharashtra manages the floods. On receiving heavy rainfall warning the Water Resource Department assess the situation and issue flood warning if necessary and keep alert the nodal officers of every irrigation division and control rooms of district administration and police. The Krishna and Bhima Sub-division office, Pune has prepared its flood control plan. In every irrigation division the executive engineer is designated as nodal officer who will closely monitor the water level and discharge of dams alongwith rainfall during emergency situation.

Tsunami

A state-of-the art early warning centre is established at INCOIS with all the necessary computational and communication infrastructure that enables reception of real time data from all the sensors, analysis of the data, generation and dissemination of tsunami advisories following a standard operating procedure.

Seismic and sea level data are continuously monitored in the early warning centre using a custom-built software application that generates alarms/alerts in the warning centre whenever a pre-set threshold is crossed.

Tsunami warnings/watches are then generated based on pre-set decision support rules and disseminated to the concerned authorities for action, following a Standard Operating Procedure.

The National Institute of Ocean Technology (NIOT) has installed 2 Bottom Pressure Recorders (BPRs) deep in the Arabian Sea to confirm the triggering of a tsunami.

Dissemination

The National Early Warning Centre will generate and disseminate timely advisories to the Control Room of the Ministry of Home Affairs for further dissemination to the public.For the dissemination of alerts to MHA a satellite based virtual private network for disaster management support has been established. This network enables early warning centre to disseminate warnings to the the MHA, as well as to the State Emergency Operation Centre.

On receiving an initial warning at SEOC, immediately the same will be sent to all line departments, the district administration who are likely to be affected by reliable communication means.

Drought

A prolonged period of abnormally low rainfall, leading to a shortage of water causes drought. It severely affects the agriculture and economy of the State. Being a slow disaster it takes time to get declared by government considering the rainfall reports of the IMD. The drought situation in Maharashtra generally monitored from the progress of the onset and the withdrawal of the Southwest monsoon. The Agriculture department of the government of Maharashtra is the authentic agency to declare it. Drought situation reports are released by Agriculture department time to time.The IMD issues the rainfall report in this regard through AIR, Doordarshan and other print and electronic media.

Earthquake

Early warning on earthquake disaster is not predictable. On account of disaster history the people of earthquake prone areas are motivated to take up all possible structural and non-structural activities. As it is known that earthquake does not kill, but the unsafe structures do. So people should be encouraged to go for safe construction and retrofitting the old structures.

In case of earthquake, preparedness and migration measures play an imporatant role. In order to minimize the loss of lives from earthquake disaster only quick response activities are to be taken up.

Manmade Disasters

Prediction of occurrence of unnatural disasters is not possible. So, preparedness and mitigation measures are required to put in place and start immediate response to such disasters if it happens somewhere in the State. The chemical, biological, radiological and nuclear disasters need to be handled by trained people working in police, health and industry departments. So, CBRN related issues need professional group to organize awareness activities at State and district level.

6.3 Disaster Response Management at State Level

Disaster Response Management through Incident Response System (IRS)

With early warning or without it, if a disaster occurs either natural or unnatural then response activities start. In this phase search and rescue operations begin on priority basis. Based on location, size and severity of disaster the search and rescue operation has to be planned and implemented. Obviously it is a multi-disciplinary job so different stakeholders get involved. Due to lack of prior coordination and absence of role clarity among various stakeholders the disaster specific relief and rescue operation gets delayed. In order to avoid all these disorders the NDMA has given priority to adapt the **Incident Response System** in handling the emergency operation situation. However, Maharashtra State Disaster Management Authority has customized the IRS considering its administrative set up and will be implemented.

6.3.1 Defination and IRS Organisation

The Incident Response System (IRS) is an effective mechanism for reducing the scope for ad-hoc measures in response. It incorporates all the tasks that may be performed during DM irrespective of their level of complexity. It envisages a composite team with various Sections to attend to all the possible response requirements. If IRS is put in place and stakeholders trained and made aware of their roles, it will greatly help in reducing chaos and confusion during the response phase. Everyone will know what needs to be done, who will do it and who is in command, etc. IRS is a flexible system and all the Sections, Branches and Units need not be activated at the same time. Various Sections, Branches and Units need to be activated only as and when they are required.

State Level IRS Organisation

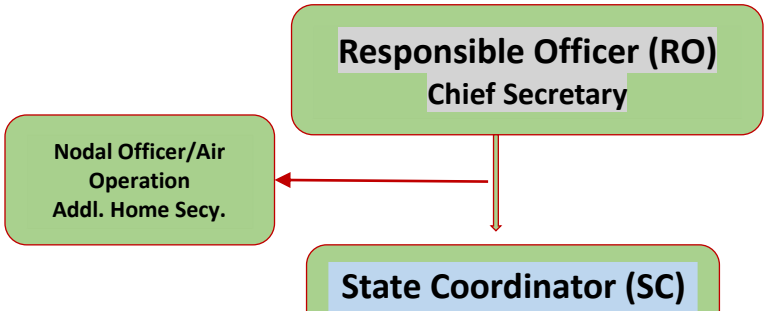


Fig -1, State IRS Organisation

The IRS functions through Incident Response Teams (IRTs) in the field. In line with administrative structure and DM Act 2005, Responsible Officers (ROs) have been designated at the State and District level as overall in charge of the incident response management. The RO may however delegate responsibilities to the Incident Commander (IC), who in turn will manage the incident through IRTs. The IRTs will be pre-designated at all levels, State, District, Su-Division and Taluka. Considering the administrative structure of the State, the Secretary, DMU, is designated as State Coordinator, who will coordinate between state and district administrations during emergency operation.

On receipt of Early Warning, the RO will activate them. In case of disaster occurs without any warning, the local IRT will respond and contact RO for further support, if required. a Nodal Officer (NO) has to be designated for proper coordination between the District, State

and National level in activating air support for response.Apart from the RO and Nodal Officer (NO), the IRS has two main components; a) CommandStaff and b) General Staff. The structure is shown in Fig.1.

However, at State level there is provison for appointing supporting staff including Information Officer, Liaision Officer, and Safety Officer.

6.3.2 Command Staff

The Command Staff consists of;

- Incident Commander (IC),
- Information & Media Officer (IMO),
- Safety Officer (SO) and
- Liaison Officer (LO).

The main function of the Command Staff is to assist the IC in the discharge of his functions.

6.3.3 General Staff

The General Staff has three components which are as follows;

- Operations Section (OS)
- Planning Section (PS)
- Logistics Section (LS)

6.3.4 The Incident Response Teams (IRTs) at State and District Levels

In any disaster response, the initial efforts would always be taken by the District administration.However, when Districts are overwhelmed in any situation, the support necessarily has to come from the State and National level. While the IRS is mainly relevant at the basic functional level, it is absolutely necessary that the support functionaries from the State and the National level also conform to the principles of IRS in the emergency support duties. This will be greatly beneficial for the proper coordination of the various response efforts at the National and State level with that of the District. It is therefore necessary to clearly understand the structure of the IRS in the context of State response. The hierarchical representation of RO with State EOC, Headquarters IRT and its lower level of IRTs at District levels.

State Level IRTs

The IRT is a team comprising of all positions of IRS organisation as shown in Fig. 2 headed byIC.

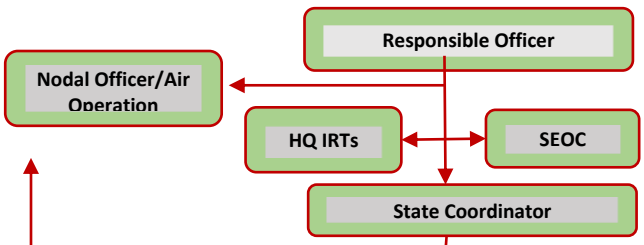


Fig. 2, State Level IRTs

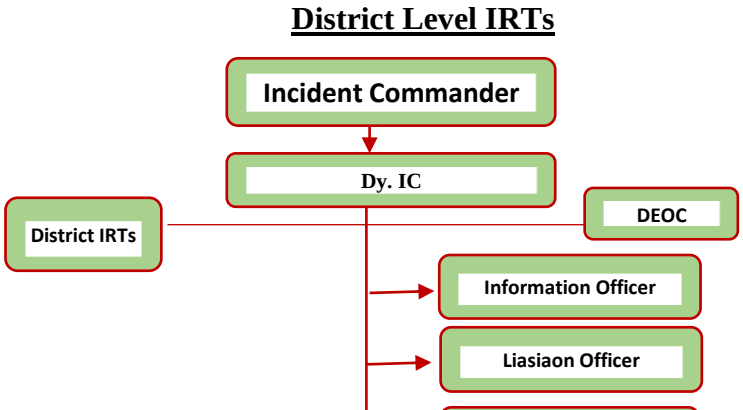


Fig. 3, District Level IRTs

The OS helps to prepare different tactical operations as required. The PS helps in obtaining different informations and preparing plans as required. The LS assesses the availability and requirement of resources and takes action for obtaining them.IRTs will function at State, District, Sub-Division and the Tehsil / Block levels. These teams will respond to all natural and man-made disasters.

The lowest administrative unit (Sub-Division, Tehsil or Block) will be the first responder as the case may be. If the incident becomes complex and is beyond the control of local IRT, the higher level IRT will be informed and they will take over the response management. In such cases the lower level IRT will merge with higher level IRT.

When a lower level of IRT (e.g. Block / Tehsil) merges with a higher level (e.g. Sub-Division, District or State) the role of IC of lower level of IRT will change. When the Block level IRT

merges with Sub-Division level IRT, IC of the Block level may play the role of Deputy IC or OSC or any other duty that the IC of higher authority assigns. This process will be applicable at all levels.

To sum up, IRS is a system of Management by Objectives through IAP. It takes care of any expanding incident through an organisational structure of Command Staff, Sections, Branches, Divisions, Groups, Units, resources and span of control. Through Unified Command (UC) it allows all agencies having jurisdictional or functional responsibilities to jointly develop incident objectives and strategies. It has a clear cut process for personnel accountability, resource management, integrated communications and transfer of command.

In line with the federal structure of the country, it should be clearly understood that response to any disaster will be carried out by the concerned States and Districts. The GoI will play a supporting role by way of assistance in the form of resources, manpower (NDRF, Armed & Para Military forces), quipment and funds. At the GoI level, the NCMC or NEC will coordinate and provide the required resources. NDMA will also help in monitoring the coordination of response.

6.4 Roles and Responsibilities of State Level Officers

6.4.1 Role and Responsibilities of Chief Secretary as RO of the State

The CS will:

1. the CS who is the head of the State administration and also chairperson of SEC and CEO of SDMA, will perform responsibilities laid down under clause 22 (2) and 24 of the DM Act, 2005;
2. the Section 22 (h) of the Act provides that the Chairperson of SEC will give directions to any department of the Government of the State or any other authority or body in the State regarding actions to be taken in response to any threatening disaster situation or disaster. Thus he will ensure active participation of all departments at State level;
3. ensure that IRTs at State, District, Sub-Division, Tehsil/Block are formed and IRS is integrated in the State and District DM Plan. This may be achieved by issuing a Standing Order to all istrict Magistrates/DCs, line departments to identify suitable officers for different positions in the IRTs as given in Annexure – XI;
4. issue a Standing Order in advance to different departments and agencies, so that in any emergency, mobilisation of both equipment and personnel happens smoothly;
5. ensure that a reasonable amount of imprest fund is sanctioned clearly delineating the procedure for emergency procurement;
6. ensure funds of 13th Finance Commission (FC) for capacity building of administrative machinery in DM is spent appropriately.
7. ensure effective communication and Web based / online Decision Support System (DSS) is in place in the EOC and connected with District, Sub-Division, Tehsil/Block level IRTs for support;
8. ensure that toll free emergency numbers existing in the State for Police, Fire and Medical support etc. will be linked to the EOC for response, command and control.

For e.g., if there is any fire incident, the information should not only reach the fire station but also to the EOC and the nearest hospital to gear up to attend to any casualties and to the emergency medical service for the mobilisation of ambulance service to reach the spot;

9. activate IRTs at State headquarters when the need arises and issue order for their demobilisation on completion of response;
10. set overall objectives and incident related priorities;
11. identify, mobilise and allocate critical resources according to established priorities;
12. ensure that local Armed Forces Commanders are involved in the Planning Process and their resources are appropriately dovetailed, if required;
13. ensure that when NDRF, Armed Forces arrive in support for disaster response, their logistic requirements like, camping ground, potable water, electricity and requirement of vehicles etc. are taken care of;
14. coordinate with the Central Government for mobilisation of Armed Forces, Air support etc. as and when required;
15. identify suitable NO to coordinate Air Operations and ensure that all District ROs are aware of it;
16. ensure that incident management objectives do not conflict with each other;
17. consider the need for the establishment of AC, if required;
18. establish Unified Command (UC) if required and get the approval of Chief Minister (CM);
19. ensure that telephone directory of all ESF is prepared and available with EOC and IRTs;
20. ensure use of Global Positioning System (GPS) technology in the vehicles (Police, Fire, Ambulance etc.) to get connectivity for their effective utilisation ;
21. keep the chairperson of SDMA informed of the progress of incident response;
22. ensure overall coordination of response, relief and other activities;
23. ensure that the Non-Governmental Organisations (NGOs) carry out their activities in an equitable and non-discriminatory manner;
24. conduct post response review on performance of IRTs and take appropriate steps to improve performance; and
25. take such other necessary action as the situation demands.

6.4.2 Roles and Responsibilities of Secretary (R & R) as State Coordinator (SC)

1. Keep the chairperson of SDMA and CS informed of the progress of incident response;
2. Ensure to set up the State EOC with advanced communication system and trained manpower.
3. Ensure that telephone directory of all ESF is prepared and available with EOC and IRTs;
4. Ensure overall coordination of response, relief and other activities;
5. Prepare/update the State DM plan, SOP of ESFs, training modules, and rule and regulations related to disaster preparedness and mitigation, relief and rescue operation, and rehabilitation.

6. Identify and involve the line agencies, resource institutes and other service providing agencies in disaster management works in the state.
7. Ensure that the Non-Governmental Organisations (NGOs) carry out their activities in an equitable and non-discriminatory manner;
8. Perform any other tasks as assigned by the RO.

6.4.3 Role and Responsibilities of Area Command

Area Command is activated when span of control becomes very large either because of geographical reasons or because of large number of incidents occurring at different places at the same time. Area Command may also be activated when an incident is beyond the control of a District administration or a number of administrative jurisdictions/districts are affected. It provides closer supervision, support to the IRTs and resolution of conflicts locally. When a number of Districts get affected, involving more than one Revenue Division, the concept of Area Command may be introduced Revenue Division wise by the State RO. In such cases the District Magistrate (RO) of the District will function as the IC. Similarly the District RO may introduce it Sub-Division wise when a large number of Tehsils / Blocks in different Sub-Divisions get affected. The RO will ensure adequate supporting staff for the AC.

The roles and responsibilities of AC are as follows.

The AC will:

1. ensure that incident management objectives are met and do not conflict with each other;
2. allocate critical resources according to identified priorities;
3. ensure proper coordination in the management of incidents;
4. ensure resolution of all conflicts in his jurisdiction;
5. ensure effective communications;
6. identify critical resource needs and liaise with the EOC for their supply;
7. provide for accountability of personnel and ensure a safe operating environment; and
8. perform any other tasks as assigned by the RO.

6.4.3 Unified Command

In an incident involving multiple agencies, there is a critical need for integrating resources (men, materials and machines) into a single operational organization that is managed and supported by one command structure. In the IRS, this critical need is addressed by thr UC. Unified Command is a framework headed by CM and assisted by the CS that allows all agencies with jurisdictional responsibilities for an incident, either geographical or functional, to participate in the management of the incident. This participation is demonstrated by developing and implementing a common set of incident objectives and strategies thar all can subscribe to, without losing specific agency authority, responsibilities and accountability.

6.5 Incident Commander and Command Staff

6.5.1 Incident Commander

The IC is the overall in-charge for the management of onsite response to any incident. He is appointed by the RO. He may have a deputy with him depending upon the magnitude and nature of the incident. For his assistance and management of the incident there are two sets of staff: a) Command Staff and b) General Staff. The command staff comprises IC, Information & Media Officer (IMO), Safety Officer (SO), and the Liaison Officer.

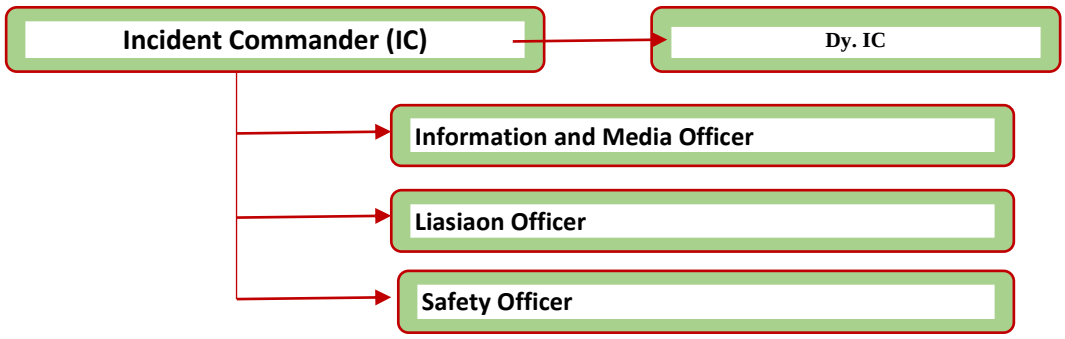


Fig 4, Composition of Command Staff

Roles and Responsibilities of IC

The IC will:

1. obtain information on:
   a. situation status like number of people and the area affected etc.;
   b. availability and procurement of resources;
   c. requirement of facilities like ICP, Staging Area, Incident Base, Camp, Relief Camp,etc.;
   d. availability and requirements of Communication system;
   e. future weather behavior from IMD; and
   f. any other information required for response from all available sources and analyse the situation.
2. determine incident objectives and strategies based on the available information and resources;
3. establish immediate priorities, including search & rescue and relief distribution strategies;
4. assess requirements for maintenance of law and order, traffic etc. if any at the incident site, and make arrangements with help of the local police;
5. brief higher authorities about the situation as per incident briefing form - 001 enclosed in Annexure-I and request for additional resources, if required;
6. extend support for implementation of AC and UC if considered necessary by the RO;
7. establish appropriate IRS organisation with Sections, Branches, Divisions and/or Units based on the span of control and scale of the incident;

8. establish ICP at a suitable place. There will be one ICP even if the incident is multijurisdictional.Even a mobile van with complete communication equipment and appropriate personnel may be used as ICP. In case of total destruction of buildings, tents, or temporary shelters may be used. If appropriate or enough space is not available, other Sections can function from a different convenient location. But there should be proper and fail safe contact with the ICP in order to provide quick assistance;
9. ensure that the IAP is prepared;
10. ensure that team members are briefed on performance of various activities as per IAP;
11. approve and authorise the implementation of an IAP and ensure that IAP is regularly developed and updated as per debriefing of IRT members. It will be reviewed every 24 hours and circulated to all concerned;
12. ensure that planning meetings are held at regular intervals. The meetings will draw out an implementation strategy and IAP for effective incident response. The decision to hold this meeting is solely the responsibility of the IC. Apart from other members, ensure that PSC attend all briefing and debriefing meetings;
13. ensure that all Sections or Units are working as per IAP;
14. ensure that adequate safety measures for responders and affected communities are in place;
15. ensure proper coordination between all Sections of the IRT, agencies working in the response activities and make sure that all conflicts are resolved;
16. ensure that computerised and web based IT solutions are used for planning, resource mobilisation and deployment of trained IRT members;
17. consider requirement of resources, equipment which are not available in the functional jurisdiction, discuss with PSC and LSC and inform RO regarding their procurement;
18. approve and ensure that the required additional resources are procured and issued to the concerned Sections, Branches and Units etc. and are properly utilised. On completion of assigned work, the resources will be returned immediately for utilization elsewhere or to the department concerned;
19. if required, establish contact with PRIs, ULBs, CBOs, NGOs etc. and seek their cooperation in achieving the objectives of IAP and enlist their support to act as local guides in assisting the external rescue and relief teams;
20. approve the deployment of volunteers and such other personnel and ensure that they follow the chain of command;
21. authorise release of information to the media;
22. ensure that the record of resources mobilised from outside is maintained so that prompt payment can be made for hired resources;
23. ensure that Incident Status Summary (ISS) is completed and forwarded to the RO (IRS form-002 is enclosed at Annexure-II);
24. recommend demobilisation of the IRT, when appropriate;
25. review public complaints and recommend suitable grievance redressal measures to the RO;
26. ensure that the NGOs and other social organisations deployed in the affected sites are working properly and in an equitable manner;

27. ensure preparation of After Action Report (AAR) prior to the demobilisation of the IRT on completion of the incident response.
28. perform any other duties that may be required for the management of the incident; ensure that the record of various activities performed (IRS Form-004 enclosed in Annexure-IV) by members of Branches, Divisions, Units/Groups are collected and maintained in the Unit Log (IRS Form-003) enclosed at Annexure-III; and
29. perform such other duties as assigned by RO.

Command Staff

6.5.2 Roles and Responsibilities of Information and Media Officer (IMO)

The IMO will:

1. prepare and release information about the incident to the media agencies and others with the approval of IC;
2. jot down decisions taken and directions issued in case of sudden disasters when the IRT has not been fully activated and hand it over to the PS on its activation for incorporation in the IAP;
3. ask for additional personnel support depending on the scale of incident and workload;
4. monitor and review various media reports regarding the incident that may be useful for incident planning;
5. organise IAP meetings as directed by the IC or when required;
6. coordinate with IMD to collect weather information and disseminate it to all concerned;
7. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV); and
8. perform such other duties as assigned by IC.

6.5.3 Roles and Responsibilities of Liaison Officer (LO)

The LO is the focal point of contact for various line departments, representatives of NGOs, PRIs and ULBs etc. participating in the response. The LO is the point of contact to assist the first responders, cooperating agencies and line departments. LO may be designated depending on the number of agencies involved and the spread of affected area.

The LO will:

1. maintain a list of concerned line departments, agencies (CBOs, NGOs, etc.) and their representatives at various locations;
2. carry out liaison with all concerned agencies including NDRF and Armed Forces and line departments of Government;
3. monitor Operations to identify current or potential inter-agency problems;
4. participate in planning meetings and provide information on response by participating agencies;ask for personnel support if required;
5. keep the IC informed about arrivals of all the Government and Non Government agencies and their resources;

6. help in organising briefing sessions of all Governmental and Non Governmental agencies with the IC;
7. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV); and
8. perform such other duties as assigned by IC.

6.5.4 Roles and Responsibilities of Safety Officer (SO)

The SO's function is to develop and recommend measures for ensuring safety of personnel, and to assess and/or anticipate hazardous and unsafe situations. The SO is authorised to stop or prevent unsafe acts. SO may also give general advice on safety of affected communities.

The SO will:

1. recommend measures for assuring safety of responders and to assess or anticipate hazardous and unsafe situations and review it regularly;
2. ask for assistants and assign responsibilities as required;
3. participate in planning meetings for preparation of IAP;
4. review the IAP for safety implications;
5. obtain details of accidents that have occurred within the incident area if required or as directed by IC and inform the appropriate authorities;
6. review and approve the Site Safety Plan, as and when required;
7. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV); and
8. perform such other duties as assigned by IC.

IRS Positions and suitable officers at District levels		
District Level IRT		
S#	***IRS Position***	***Suitable Officer***
	INCIDENT COMMANDER	*ADM/ Armed force/NDRF Reprentative*
	Dy. Incident Commander	*SDM/Dy. SP*
1	*Information & Media Officer*	*Control Room Officer / Emergency Officer or any other suitable position at District level as deemed by IC*
2	*Liaison Officer*	*Dy. Collector (Protocol) / District Public Relations Officer orany other suitable position at District level as deemed by IC*
3	*Safety officer*	*Fire Officer / Dy. SP (Police) / Medical Officer / Factory Inspector or any other suitable position at District level as deemed by IC*

6.6 General Staff

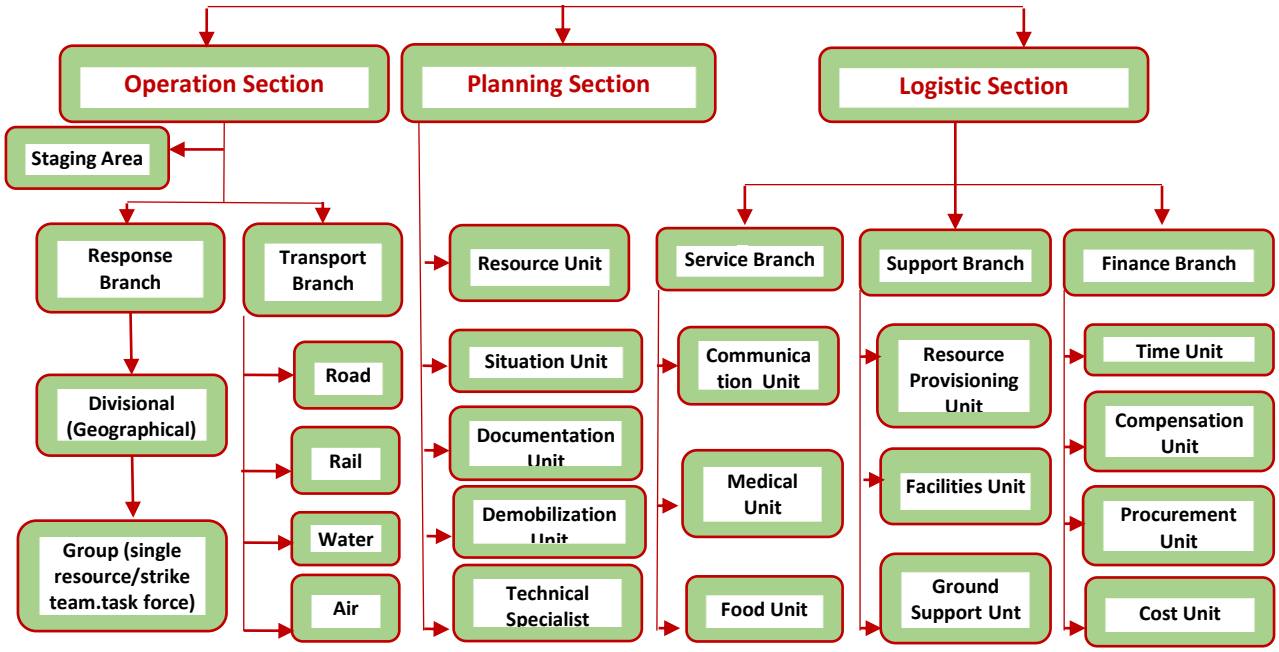


Fig 5, Composition of General Staff

The General Staff has three components which are as follows;

- Operations Section (OS)
- Planning Section (PS)
- Logistics Section (LS)

6.6.1 Operations Section (OS)

The OS is responsible for directing the required tactical actions to meet incident objectives. Management of disaster may not immediately require activation of Branch, Division and Group. Expansion of the OS depends on the enormity of the situation and number of different types and kinds of functional Groups required in the response management.

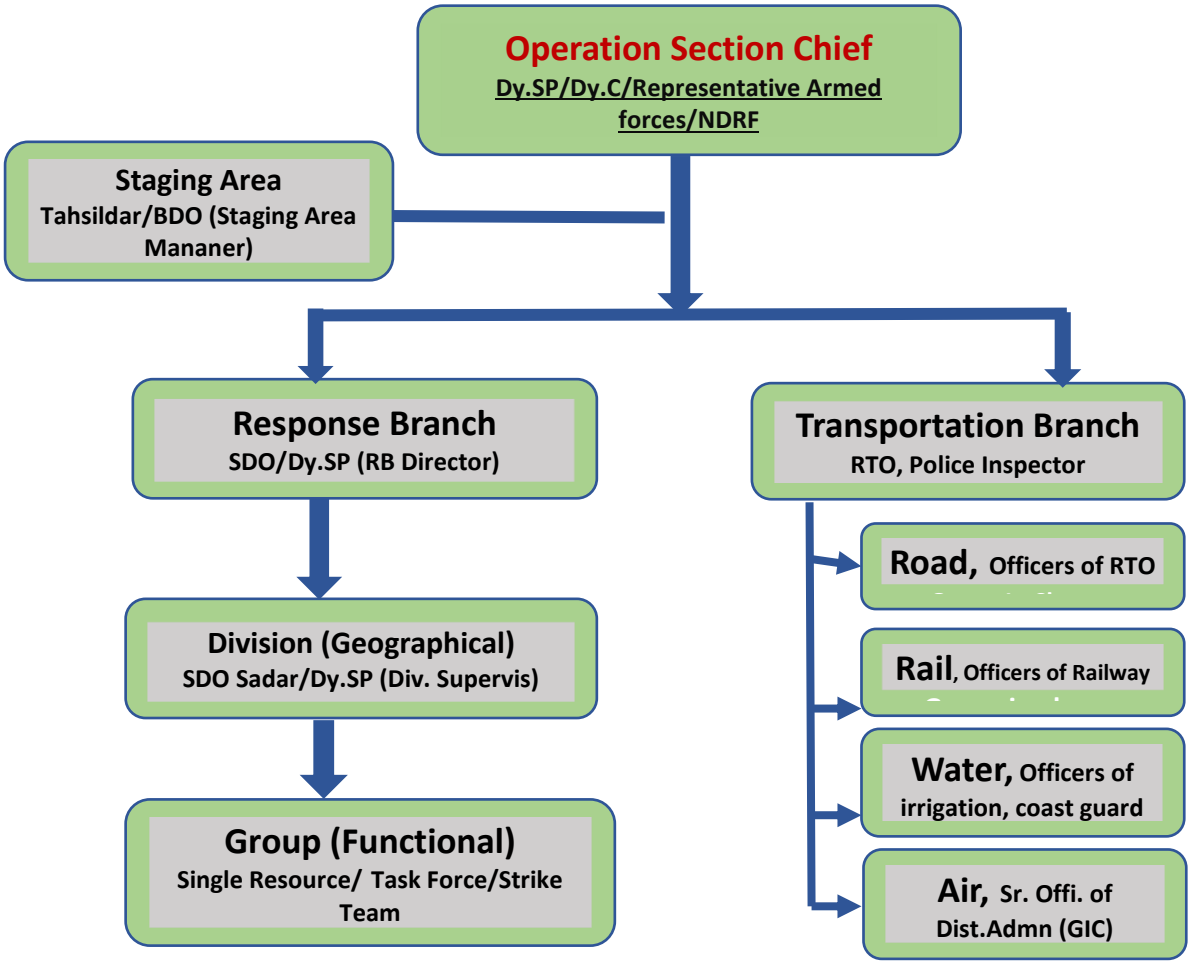


Fig-6, Composition of Operations Section

The OS comprises Response Branch (RB), Transportation Branch (TB) and Staging Area (SA) and is headed by the OSC. The activation of the RB and TB is situational. The RB consists of various Divisions and Groups depending upon the functional and geographical requirements of the incident response. The Groups are classified by their functional characteristics, such as Single Resource, Strike Teams and/or Task Force. The TB may consist of Road Operations Group, Rail Operations Group, Water Operations Group and Air Operations Group. These Groups are also activated according to the transportation modes that may be required in the incident response.

SA is the area where resources mobilised are collected and accounted for. It is from this location that the resources are deployed for specific assignments or tasks. The composition of OS is shown in Fig. 6.

RB is activated according to the nature of response required. For example in case of earthquake and flood where a lot of houses get damaged or destroyed and people need to be rescued and provided relief and temporary shelter. The rescue and relief group of the Response Branch will be activated to provide these services.

The TB will manage the transportation of the affected people and the movement of relief materials. Groups within the TB like Road group or Water group will be activated as required for managing and providing the Road or Water transport. Since Air Operations in disaster response involves coordination between the Central Government, Ministry of Civil Aviation, Air Force, State and the Districts concerned and also require technical inputs, procedures for activation is dealt in detail separately.

Selection of the OSC depends on the nature of operations required. Rescuing people and taking them to shelter in case of earthquake or floods can best be handled by the police/Armed Forces and thus in such cases it should ideally be headed by them. However in cases of such disaster like bird flu epidemic, the main requirement will be providing medical treatment to the victims, vaccinating and culling of birds. In such cases the OS shall have to be headed by Doctors for treatment of victims and supported by Animal husbandry department and Municipal institutions for vaccinating and culling of birds.

In disaster response a large number of duties and activities need to be performed. To meet the various duty requirements, the IRS provides for Single Resource, Task Force and Strike Teams. The details of the Single Resource, Task Force and Strike Teams and their illustrative roles have been discussed at para 6.6.3.4.

As the operational activity increase because of the largeness and magnitude of the disaster, the OSC who is responsible for directing all tactical actions to meet the incident objectives will have to deploy more and more functional teams. It has been generally accepted that an ideal span of control is 1:5 that is one leader or supervisor can effectively manage five groups. In order to maintain close supervision, the IRS provides for the formation of Branches, Divisions and Groups.

IRS Positions and suitable officers at District levels		
District Level IRT		
S#	***IRS Position***	***Suitable Officer***
1	***Operation Section Chief***	*ADM/Dy. Superintendent of Police / Dy. Collector/Representative of Armed Forces/NDRF or any other suitable position at District level as deemed by IC / RO*
2	*Staging Area Manager*	*Personnel of; Block Office of affected site (Preferably Block Education Officer or Grampanchayat Officer etc.) /Tehsildar Office of affected site/ Sub-Divisional Office ofaffected site / District Magistrate Office of affected siteor any other suitable position at District level as deemedby IC*
3	*Response Branch Director*	*SDO / SDM / Dy. SP or any other suitable position at District level as deemed by IC*
4	*Division Supervisor / Group-incharge*	*SDO Sadar /BDO HQ or any other suitable position at District level as deemed by IC*
5	*Task Force / Strike Team*	*Depending on the task to be performed, the personnel and their resources of District, Sub-Division, Tehsil/ Block belonging to various line departments shall combine to form the Task Force / Strike Team. These line departments could be from the departments of; Fire, Police, Civil Defence, NDRF, DFO, Irrigation and Flood Control, BDO and Village level teams headed by elected representatives or officers from any other appropriate Line Departments and Specialists of various corporate sectors (Safety officer, chemical specialist) etc.*
6	*Single Resources*	*Personnel and their equipment of; Sub-Divisional IRT /Health Department / PHD and PWD / Electricity Board /Fire Department / Police Department / Civil Defence / NDRF/ Forest Department / NGOs / CBOs / Block Headquarter IRT + Elected representatives / Irrigation and Flood Control Department / Village level resources and its trained operators / Specialists of various corporate sectors (Safety officer, chemical specialist, etc) / Other specialists of Governmentsectors including NDRF and Civil Defence or from any other appropriate Line Department*
7	*Transportation Branch*	*Road Transport Officer (RTO) / Police Inspector / Officers of Forest Department at District level as deemed by IC /OSC*
	Road Group	
8	*Group-in-charge*	*Officer of; Road Transport Office (RTO) / Police Inspector /Officers of Forest Department or any other suitable positionat District level as deemed by IC / OSC*
9	*Vehicle Coordinator*	*Officer of; Road Transport Office (RTO) / Police Inspector /Officers of Forest Department or any other suitable position at District level as deemed by IC / OSC*
10	*Loading-in-charge / Unloading-in-charge*	*As deemed fit by Vehicle Coordinator*
	Rail Group	
11	*Group-in-charge*	*Officer of Railway Division*
12	*Coordinator*	*As deemed fit by Officer of Railway Division*

13	*Loading-in-charge / Unloading-in-charge*	*As deemed fit by Officer of Railway Division*
	Water Group	
14	*Group-in-charge*	*Officer of Water and Irrigation Department*
15	*Coordinator*	*Officer of Irrigation Department or any other suitable position of District as deemed by IC / OSC*
16	*Loading-in-charge / Unloading-in-charge*	*As deemed by IC / OSC / FBD*
	Air operation Group	
17	*Group-in-charge Air operations*	*Sr. Officer of District administration or any other suitable position at District level as deemed by RO / IC / OSC*
18	*Helibase / Helipad-in-charge*	*Officer of Airport Authority of India (State specific) or any other suitable position at District level as deemed by RO / IC / OSC / TBD*
19	*Loading / Unloading-in-charge*	*As deemed fit by Officer of Airport Authority of India (State specific) or any other suitable position as deemed by RO / IC / OSC*

6.6.2 Operations Section Chief (OSC)

On activation of the OS, the OSC will assume command of all the field operations and will be fully responsible for directing all tactical actions to meet the incident objectives.The OSC will report to the IC. He will be responsible for activation, deployment and expansion of his Section as per IAP. As the operational activities increase and because of geographical reasons, the OSC will introduce or activate and expand the Branch into Divisions for proper span of control and effective supervision.

Roles and Responsibilities of OSC

The OSC will:

1. coordinate with the activated Section Chiefs;
2. manage all field operations for the accomplishment of the incident objectives;
3. ensure the overall safety of personnel involved in the OS and the affected communities;
4. deploy, activate, expand and supervise organisational elements (Branch, Division, Group, etc,) in his Section in consultation with IC and in accordance with the IAP;
5. assign appropriate personnel, keeping their capabilities for the task in mind and maintain On Duty Officers list (IRS Form-007) for the day as enclosed in Annexure-VII;
6. request IC for providing a Deputy OSC for assistance, if required;
7. brief the personnel in OS at the beginning of each operational period;
8. ensure resolution of all conflicts, information sharing, coordination and cooperation between the various Branches of his Section;
9. prepare Section Operational Plan in accordance with the IAP; if required;
10. suggest expedient changes in the IAP to the IC;
11. consult the IC from time-to-time and keep him fully briefed;
12. determine the need for additional resources and place demands accordingly and ensure their arrival;

13. ensure record of various activities performed (IRS Form-004 enclosed in Annexure-IV) by members of Branches, Divisions, Units/Groups are collected and maintained in the Unit Log IRS Form-003 (enclosed in Annexure-III); and
14. perform such other duties as assigned by RO / IC.

6.6.2.1 Roles and Responsibilities of the Staging Area Manager (SAM)

The SA is an area where resources are collected and kept ready for deployment for field operations. These may include things like food, vehicles and other materials and equipment. The SA will be established at a suitable area near the affected site for immediate, effective and quick deployment of resources.

More than one SA may be established if required. If resources are mobilised at other locations to be ultimately despatched to the affected areas, these locations are also known as SAs. The overall in-charge of the SA is known as Staging Area Manager (SAM) and he needs to work in close liaison with both the LS and PS through the OSC.

School and college playgrounds, community halls, cyclone shelters and Panchayat Offices, stadia etc. may be used as SA. In case of total destruction of buildings in an incident, tents or temporary shelters may be used for such purposes.

For Air Operations, open space of Airport Authority of India (AAI) may be used for loading and unloading of relief materials. If area of AAI is not available, other suitable places near Helipads, Helibases etc. will have to be selected for such purpose.

For parking of vehicles, playgrounds of the schools or any large plain areas may be used. Such parking area will preferably have separate entry and exit points. The SAM will arrange for separate entry and exit points to avoid and reduce traffic jam in an emergency.

The SAM will:

1. establish the SA with proper layout, maintain it in an orderly condition and ensure that there is no obstruction to the incoming and outgoing vehicles, resources etc;
2. organise storage and despatch of resources received and despatch it as per IAP;
3. report all receipts and despatches to OSC and maintain their records;
4. manage all activities of the SA;
5. utilise all perishable supplies expeditiously;
6. establish check-in function as appropriate;
7. request maintenance and repair of equipment at SA, as needed;
8. ensure that communications are established with the ICP and other required locations e.g. different SAs, Incident Base, Camp, Relief Camp etc;
9. maintain and provide resource status to PS and LS;
10. demobilise SA in accordance with the Demobilisation Plan IRS Form-010 as enclosed in Annexure-X;
11. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Sections concerned; and
12. perform any other duties as assigned by OSC.

6.6.3 Response Branch

6.6.3.1 Roles and Responsibilities of Response Branch Director (RBD)

Response Branch is the main responder in the field dealing with the situation and performing various function. Depending on the scale of disaster, the RBD may have to expand the number of Groups which in turn may require creation of Division. This structure is meant for close supervision by the OSC in the management of a large incident.

The ideal span for supervision is 1:5. i.e. one Branch Director can supervise up to five Divisions, one Division Supervisor can supervise up to five Groups and one Group-in-charge can supervise five teams as shown in Fig. 10. More Branches, Divisions, Groups may be formed as required.

The RBD will:

1. work under the supervision of the OSC and is responsible for the implementation of IAP as per the assigned role;
2. attend planning meetings as required by the OSC;
3. review Assignment Lists IRS Form-005 (enclosed in Annexure -V) for Divisions or Groups under his Branch;
4. assign specific tasks to Division and Groups-in-Charge;
5. supervise Branch functions;
6. resolve conflicts reported by subordinates;
7. report to OSC regarding modifications required if any in the IAP, need for additional resources, availability of surplus resources and when hazardous situations or significant events occur, etc.
8. provide Single Resource, Strike Team and Task Force support to various operational areas;
9. ensure that all team leaders maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) relating to their field Operations and send to OSC;
10. perform any other duties assigned by the OSC;

6.6.3.2 Roles and Responsibilities of Division Supervisor and Groups-in-charge

As the operational activities increase because of the largeness and magnitude of the disaster, the OSC who is responsible for directing all tactical actions to meet the incident objectives will have to deploy more and more functional teams. There may be such locations which are distant, isolated and difficult to reach. There may also be a situation when simultaneously different types of incidents occur requiring different specialised handling. For example while a lot of building may have collapsed in case of earthquake, gas leaks may also have occurred resulting in fire at a number of places.

The OSC may create a Division for close and proper supervision, when the span of control becomes larger or when some locations are very distant and difficult to reach. Except for the hierarchical difference, the roles and responsibilities of the Division Supervisors and the

Groups-in-charge are the same. Divisions are activated when there are supervisory requirements in an isolated and distant geographical area or for the purpose of a proper span of control when the number of functional Groups increase or for various specialised response. While Groups-in-charge are assigned to accomplish specific functions within the Branch, Divisions are created for effective supervision over a large number of Groups.

Division Supervisors and Group-in-charge will:

1. implement Division or Group assignment list;
2. assign resources within the Division or Group under them;
3. report on the progress of Operations, and the status of resources within the Division or Group;
4. circulate Organisational Assignment List (Divisional / Group) IRS Form-005 as enclosed in Annexure – V to the leaders of the Group, Strike Team and Task Force;
5. review assignments and incident activities with subordinates and assign tasks as per the situation;
6. coordinate activities with adjacent Divisions or Groups, if required;
7. submit situation and resource status to the RBD and the OSC;
8. report all hazardous situations, special occurrences or significant events (e.g., accidents, sickness, deteriorating weather conditions, etc.) to the RBD and the OSC;
9. resolve problems within the Division or Group;
10. participate in the development of IAP for next operational period, if required;
11. ensure that record of various activities performed (IRS Form-004 enclosed in Annexure-IV) are collected and sent to the RBD and OSC; and
12. perform any other duties as assigned by the RBD/OSC.

6.6.3.3 Single Resource

Single Resource includes both personnel and their required equipment to be deployed in a given incident, e.g. a fire tender with the required personnel, an ambulance with the required medical officer, paramedic and driver etc. For the purpose of a correct and proper requisition and deployment, it is important that the resources should be categorised into 'kind' and 'type'. The ROs of the States and Districts will ensure that the resources are categorized into 'kind' and 'type'. In IRS, resources are categorized under; a) 'kind' and b) 'type'. 'Kind' refers to equipment, vehicles or personnel for example; truck, medical team, bulldozer, etc. 'Type' refers to its capacity for that kind of resource e.g. truck having 1 ton capacity or 2 tons capacity, medical team having 1 doctor and 3 paramedics etc.

Roles and Responsibilities of Single Resource Leader

The Single Resource Leader will:

1. take charge of necessary equipment and supplies;
2. assess local weather and environmental conditions, law and order situation etc. in the assigned area and report to the in-charge;
3. perform the assigned duty;
4. keep contact with his supervisor; and
5. perform any other duties that may be assigned by his supervisor.

6.6.3.4 Strike Team or Task Force

A Strike Team is a combination of same 'kind' and type' of Single Resource with a common communication facility and one leader. A Task Force is a combination of different 'kinds' and 'types' of Single Resources. They are assembled for a particular tactical need, with a common communication facility and one leader. A Strike Team may be needed when specific type of work, requiring specific expertise and resources are grouped under one leader.

A Task Force may be grouped with different 'kinds' and 'types' of Single Resource and despatched under a leader, when a number of different tasks requiring different expertise need to be performed. For example, if a combination of Medical team, Rescue personnel, Fire personnel, Sanitation workers and workers for disposal of dead bodies and animal carcasses is required to be sent to a particular location, the team so constituted will be called a Task Force. The concept of proper span of control should be kept in mind while constituting the Task Force.

The Strike Team or Task Force Leader reports to the Division Supervisor or Group Supervisor and is responsible for performing the tactical assignments assigned to the Strike Team or Task Force. The leader of the Strike Team and Task Force reports on work progress and status of resources, maintains work records on assigned personnel and relays important information to their supervisor. In case the Branch, Division, or Group is not activated, the team leader will directly report to the OSC.

Roles and Responsibilities of Strike Team or Task Force Leader

The Strike Team or Task Force Leader will:

1. review assignments with members of his team;
2. report on work progress;
3. coordinate activities with adjacent Single Resource, Strike Teams and Task Forces if assigned;
4. establish and ensure communications;
5. perform any other duties assigned; and
6. maintain record of various activities.

Examples of Groups for Formation of Strike Team & Task Force and their Roles & Responsibilities

Response in disasters normally may require performance of rescue & evacuation, setting up of Relief Camps, providing medical assistance, supply of food, Restoration of essential services, and establishment of facilities both for the affected communities and the responders etc.When under one leader, a number of boats and personnel (preferably not more than five in the context of span of control) are assigned the job of rescuing marooned villagers, such a team would be called a Strike Team. In this case a number of single resource i.e. boat with rescue personnel are being deployed to perform only one task i.e. rescue and evacuation of marooned villagers.When under one leader a team of doctors / paramedics, personnel for dead body management, setting up and management of relief camp etc., such a combined team of different types and kinds of Single resource is called a Task force. These teams may be formed

for any type of requirement that may crop up. An illustrative list of different functional groups is being given for reference. The list is not exhaustive.Different functional Groups and their roles and responsibilities

A. Food Group-in-charge

1. Work under the direction of Team Leader / RBD and supervise functions of all group members and report;
2. Attend planning meeting of the section at the request of Team Leader / OSC / RBD;
3. Brief Group members about the objectives and strategy to achieve the goal;
4. Supply food to the affected site. The team leader shall ensure that the food is properly cooked, packed and religious sentiments are kept in mind;
5. Maintain record of all important activities e.g. numbers of kitchens activated, resources supplied, personnel deployed etc.;
6. Assess further requirement and inform RBD / OSC;
7. Organise the communities and take their help in running the kitchen etc.;
8. Perform any other duties assigned by the RBD/OSC.

B. Medical Group-in-charge

1. Work under the direction of Team Leader / RBD and supervise functions of all group members and report;
2. Attend planning meeting of the section at the request of Team Leader / OSC / RBD;
3. Brief Group members about the objectives and strategy to achieve the goal;
4. Support PS and LS for organizing and mobilizing; referral services, first aid, treatment of pregnant and lactating women, care for differently abled person and HIV / TB infected patients, etc. if required;
5. Ensure that affected population is getting appropriate care. If the managing capability is beyond the control of the team leader, he shall ask for more teams;
6. Collect a list of health referral service centers from the OSC / RBD or Division supervisor and obtain resources for transportation of patients;
7. Arrange photography and display the information for non-identified patients for identification;
8. Open a counter for public information;
9. Provide psycho-social care. The NDMA Guidelines for Psycho-Social Support and Mental
10. Health Services in disaster should be referred;
11. Develop strategy to control and manage rush of patients at the medical camp;
12. Maintain record of important activities performed relating to health care, e.g. record of number of victims admitted, treated, discharged and referred, types of casualty, status of various medicines used and available, etc.; and perform such other duties as directed by RBD.

A. Relief camp management Group-in-charge

1. Work under the direction of Team Leader / RBD and supervise functions of all group members and report;
2. Attend planning meeting of the section at the request of Team Leader / OSC / RBD;
3. Brief Group members about the objectives and strategy to achieve the goal;
4. Ensure preparation of food and its distribution in the camp. While distributing food Keep religious sentiments in mind;

5. Place order and ensure that food materials and other required resources are available;
6. Maintain cleanliness of the camp;
7. Arrange light, water & sanitation services;
8. Ensure gender sensitive needs and their safety are in place;
9. Ensure general security of the camp, and;
10. Perform such other duties as directed by RBD.

B. Dead body management Group-in-charge

1. Work under the direction of Team Leader / RBD and supervise functions of all group members and report;
2. Attend planning meeting of the section at the request of Team Leader / OSC / RBD;
3. Brief Group members about the objectives and strategy to achieve the goal;
4. Organise Inquest / postmortem and other legal requirement before cremation / burial of dead bodies;
5. Identify suitable places for cremation / burial or liaison with the in-charge of cremation / burial ground, if required;
6. Mobilise communities for cremation / burial and also for identification of dead bodies, if required;
7. Organise photography of unidentified dead bodies and activate an information cell and display photos for identification;
8. Maintain record of all important activities relating to identification of dead bodies including photographs, status of dead bodies, locations where they were found, place of cremation / burial, etc. and send to RBD; and
9. Perform any other duties assigned by the RBD.

Groups for Restoration of Essential Services

A. Restoring Medical Services: roles and responsibilities

1. Work under the team leader of restoration of essential services and supervise functions of all groups and report to RBD / OSC;
2. Attend planning meetings of the Section at the request of RBD / OSC;
3. Brief team members about the objectives and strategy to achieve the goal;
4. Check different instruments installed in the hospitals;
5. Check power supply and ensure backup in case of failure;
6. Ensure telephone and other means of communication are in working condition;
7. Ensure services of water and sanitation;
8. Maintain cleanliness;
9. Involve community;
10. Maintain record of activities relating to restoration activities;
11. Perform any other duties assigned by Team Leader / RBD / OSC.

B. Restoring Water and Sanitation Services: roles and responsibilities

1. Work under the team leader of restoration of essential services and supervise functions of all groups and report to RBD / OSC;
2. Attend planning meetings of the section at the request of RBD / OSC;
3. Brief team members about the objectives and strategy to achieve the goal;
4. Project requirement of Task Forces, Strike Teams and Single Resource for water and sanitation services, if required;
5. Repair water lines or supply water tanks of the affected sites;
6. Supply drinking water tank to inaccessible area;
7. Repair tube wells;
8. Check contamination of water and provide facilities for water purification;
9. Involve employees of NAC, Municipality or Corporation for sanitation services in consultation with OSC, LSC and ensure that work is in progress;
10. Involve community;
11. Maintain the record of important activities performed; and

12. Perform any other duties assigned by the Team Leader / RBD / OSC.

C. Restoring Telephone / Electric Service: roles and responsibilities

1. Work under the team leader of restoration of essential services and supervise functions of all groups and report to RBD / OSC;
2. Attend planning meetings of the section at the request of RBD / OSC;
3. Brief team members about the objectives and strategy to achieve the goal;
4. Perform assigned tactical tasks;
5. Maintain record of important activities performed etc; and
6. Perform any other duties assigned by the Team Leader / RBD / OSC.

6.6.4 Transportation Branch (TB)

The TB in the OS supports the response effort by transporting different resources, relief materials, personnel to the affected site and also transportation of victims if necessary. Though there is a Ground Support Unit (GSU) in the LS which is responsible for providing all transportation and other related resources, the TB in the OS manages the actual deployment and utilisation of the transport at ground zero according to the needs of the IRT and the IAP. The TB may comprise four operational Groups such as Road, Rail, Water and Air. These Groups may be activated as and when required.

Air Operations is an important transportation activity during disasters which requires coordination at the National, State and District level. For coordination of Air Operations, the RO of the State and District will identify and designate a NO.

6.6.4.1 Roles and Responsibilities of Transportation Branch Director (TBD)

All functional Groups (Road, Rail, Water and Air) of the TB are managed by the TBD. Since the air transportation is to be coordinated at the State and District levels, the TBD also needs to function in close coordination with RO, IC and NO for Air Operations. He will collect the details of all related flights from the concerned NO and organise the ground support requirement. The TBD will also be responsible for the activation and expansion of various functional Groups as per the IAP.

The TBD will:

1. activate and manage different Operations Groups like Road, Rail, Water and Air;
2. coordinate with the LS for required resources, and activate Groups of his Branch;
3. coordinate with railways, road transport, waterways and airport authorities for support as required;
4. ensure that Organisational Assignment List (Divisional / Group) IRS Form-005 as enclosed in Annexure – V is circulated among the Group-in-charge(s) and other responders of his Branch;
5. provide ground support to the air operations and ensure appropriate security arrangements;
6. provide Road transport support to the Rail and Water Operations Group as required;

7. ensure safety of all personnel of his Branch involved in the Incident Response activities;
8. ensure that all units moving in the area are familiarised with route with the help of road maps or local guides;
9. report to the OSC and IC about progress of the TB;
10. prepare transportation plan as per the IAP, if required;
11. determine the need for additional resources, their proper and full use and place demand accordingly in advance;
12. resolve problems and conflicts, if any;
13. ensure the maintenance of the status of hired resources, their full utilisation and timely release;
14. ensure that the record of various activities performed (IRS Form-004 enclosed in Annexure- IV) by different operational groups (Road, Rail, Water and Air) are collected and sent to the Section concerned; and
15. perform any other duties assigned by the IC or OSC;

6.6.4.1.1 Roles and Responsibilities of Group-in-charge (Road Operations)

The Group-in-charge (Road Operations) works under the TBD and is responsible for all road transportation activities. He has a Coordinator (Road Operations) under him for assistance. If the scale of operations increase, the TBD may activate the position of an Assistant Coordinator. The Loading and Unloading-in-charge will work under the Coordinator as shown in Fig.7.

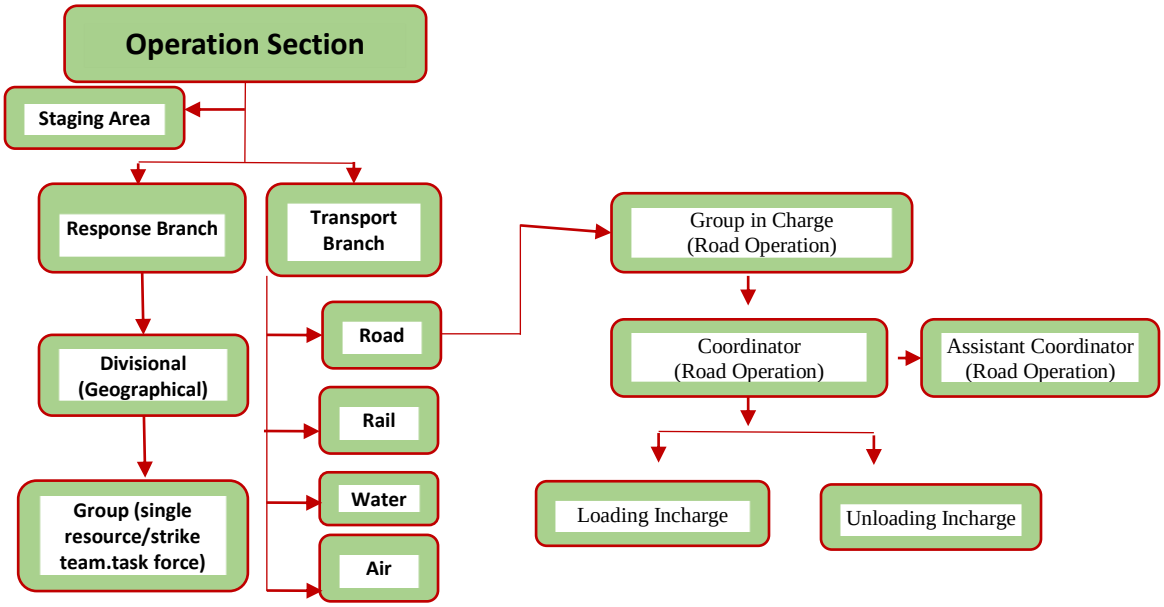


Fig 7, Composition of Road Operation Group

The Group-in-charge (Road Operations) will:

1. ensure transportation of resources by Road to the affected sites; requisition additional personnel support, if required;
2. attend planning meetings on the direction of OSC;
3. determine coordination procedures with various destinations as per IAP;
4. ensure proper parking locations;
5. resolve conflicts of the Group, if any;
6. update Road Operations plan as required and share them with higher authorities;
7. in case of accidents, inform the TBD, the local police and provide assistance in investigation, if required;
8. ensure that mechanics are available for repair of vehicles and also ensure adequate availability of Petrol, Oil and Lubricants (POL);
9. maintain the records of all important activities relating to the number of vehicles deployed, source of vehicles (i.e. Government or private), locations where vehicles are deployed along with resource details they are carrying, etc.;
10. support and coordinate the Road Operations part of the Rail, Water and Air Operations as required;
11. collect record of various activities performed (IRS Form-004 enclosed in Annexure-IV) from coordinator and other members and send to TBD or OSC; and
12. perform any other duties assigned by the TBD or OSC.

6.6.4.1.2 Roles and Responsibilities of Coordinator (Road Operations)

The Coordinator (Road Operations) is primarily responsible for coordinating the Road transport needs. There may be more than one coordinator depending upon the number of vehicles deployed.

The Coordinator (Road Operations) will:

1. survey the assigned incident area to analyse situation and identify other potential problems in the context of transportation;
2. requisition an Assistant Coordinator (Road Operations) depending on the magnitude of the incident and requirement;
3. coordinate with SAM for smooth transportation of resources;
4. receive assignments, brief drivers regarding the routes, assign missions, supervise vehicle movement and attend to the vehicle maintenance and repair needs;
5. monitor activities of all assigned vehicles and keep senior officers informed;
6. report incidents or accidents that occur in Road Operations to the TBD;
7. maintain the records of supplies to different locations;
8. keep track of vehicle movements. Provide GPS support, if available;
9. request security support for transportation of relief materials if required and alert the police administration in the affected areas along the transportation route;
10. maintain coordination at loading and unloading points;
11. ensure that communication facilities are established at loading stations, SAs and destination points;

12. attend to and resolve the needs of the personnel working under him;
13. maintain record of various activities performed (IRS Form-004 enclosed in Annexure-IV) and send to the Group-in-charge or TBD; and
14. perform any other duties assigned by the OSC or TBD.

6.6.4.1.3 Roles and Responsibilities of Loading / Unloading-in-Charge (Road, Rail and Water)

The Loading and Unloading-in-charge has a very significant role to play in any disaster response. The roles and responsibilities in Road, Rail and Water Operations are the same where as the roles and responsibilities for the Air Operations is slightly different. Therefore the roles and responsibilities of Loading / Unloading-in-charge are being dealt together for the Rail, Road and Water and separately for the Air Operations. The Loading / Unloading-incharge will work under the Road, Rail and Water Coordinator.

The Loading / Unloading-in-charge (Road, Rail and Water) will:

1. supervise the safe Operations of Loading / Unloading activities;
2. obtain Operations Summary from the Groups-in-charge (Road, Rail and Water transport);
3. organise the Loading areas;
4. supervise Loading and Unloading crews and collect equipment (ladder, gloves, helmet, etc.) as required;
5. from time to time inform the coordinator about the progress of Loading / Unloading
6. activities;
7. prepare a Loading / Unloading plan with details of their resources and destinations;
8. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to the TBD or Coordinator; and
9. perform any other duties assigned by Coordinator or in-charge (Road, Rail and Water).

6.6.4.2 Roles and Responsibilities of Group-in-charge (Rail Operations)

In most disaster response situations, Rail Transportation is utilised for transporting relief materials and resources from very distant places. It requires coordination with the railway authorities for making available trains and wagons at appropriate places.

Railway stations are located at specific locations, sometimes far away from the affected sites. Loading and Unloading may be required from Rail to Road and Road to Rail. Whenever transportation by Rail is envisaged, a Rail Operations Group needs to be activated and they should have close liaison with the Road Operations Group-in-charge.

The Group-in-charge (Rail) works under the TBD and is responsible for supervision of all Rail Transportation activities. In keeping with the scale of transportation requirements and management of proper span of control, the TBD may activate position of Assistant Coordinator if required. The Loading / Unloading-in-charge will work under the Coordinator as shown in Fig 8.

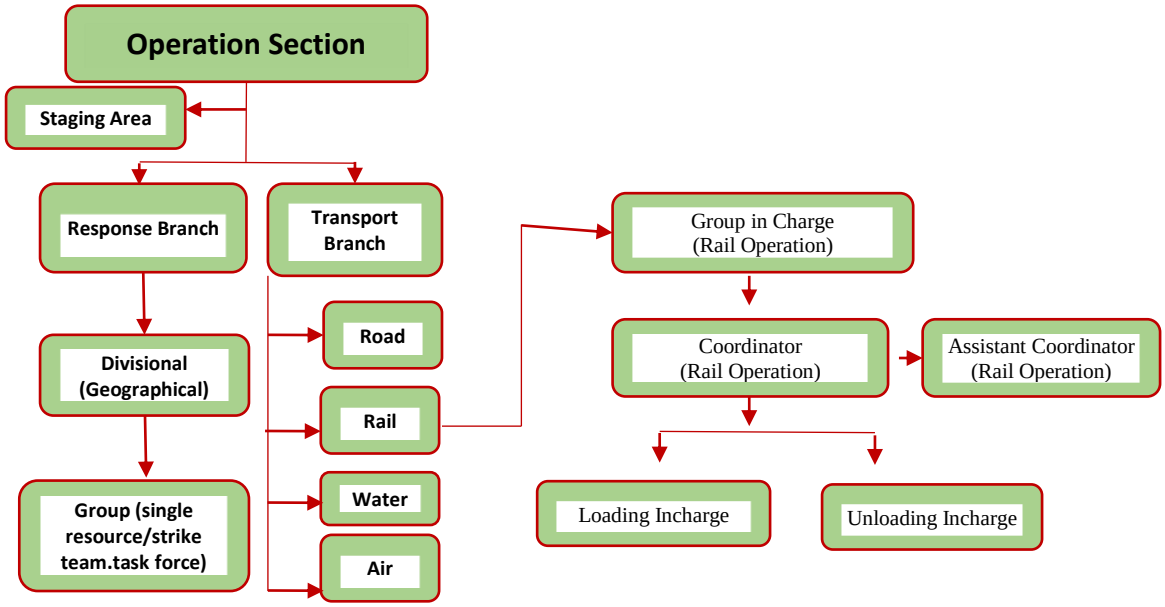


Fig 8, Composition of Rail Operation Group

The Group-in-charge (Rail Operations) will:

1. work under the TBD and coordinate all Rail Operations;
2. organise crew for Loading and Unloading;
3. ensure safe storage and warehousing of the materials;
4. evaluate storage locations, ensure safety and obtain guidance from the TBD, if required;
5. coordinate with Road Operations Group for movement of resources;
6. prepare and provide Rail Operations Summary including time of departure and arrival, destinations, resource details, etc as and when required by the senior officers;
7. request for additional personnel support, if required;
8. update the TBD from time to time and seek support, if required;
9. resolve conflicts within his Group, if any;
10. update Rail Operations Plan;
11. establish and maintain communications with various storage and warehousing areas, destination points and railway officers;
12. collect record of various activities performed IRS (Form-004 enclosed in Annexure-IV) from Coordinator and other in-charges and send to TBD or OSC; and
13. perform any other duties assigned by OSC or TBD.

6.6.4.2.1 Roles and Responsibilities of Coordinator (Rail Operations)

The Coordinator (Rail Operations) will:

1. work under the Group-in-charge and provide coordination services for transportation of relief materials by Rail;
2. survey assigned stations or points, to analyse the situation and other potential problems;
3. ask for additional personnel support, if required;
4. receive assignments, and supervise movement of resources;

5. maintain liaison with Railway authorities regarding train timings etc.;
6. report incidents or accidents that may occur in Rail Operations;
7. ask for and monitor security arrangements of the resources;
8. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to the Group-in-charge or TBD; and
9. perform any other duties assigned by Group-in-charge.

6.6.4.2.2 Roles and Responsibilities of Loading / Unloading-in-charge (Rail Operations)

The roles and responsibilities of Loading/Unloading-in-charge of Rail Operations are similar to those of the Loading/Unloading-in-charge of Road Operations.

6.6.4.3 Roles and Responsibilities of Group-in-charge (Water Operations)

In some disasters, especially floods and cyclones, the need for Water Operations may become essential. The deployment of boats / country boats and other water transport may be necessary both for rescue work and transportation of relief materials. Depending on the scale of the disaster, the TBD may activate a Water Operations Group, consisting of Group-incharge, Coordinator and Loading / Unloading-in-charge. If required, the Group-in-charge may request for an Assistant Coordinator as shown in Fig.9

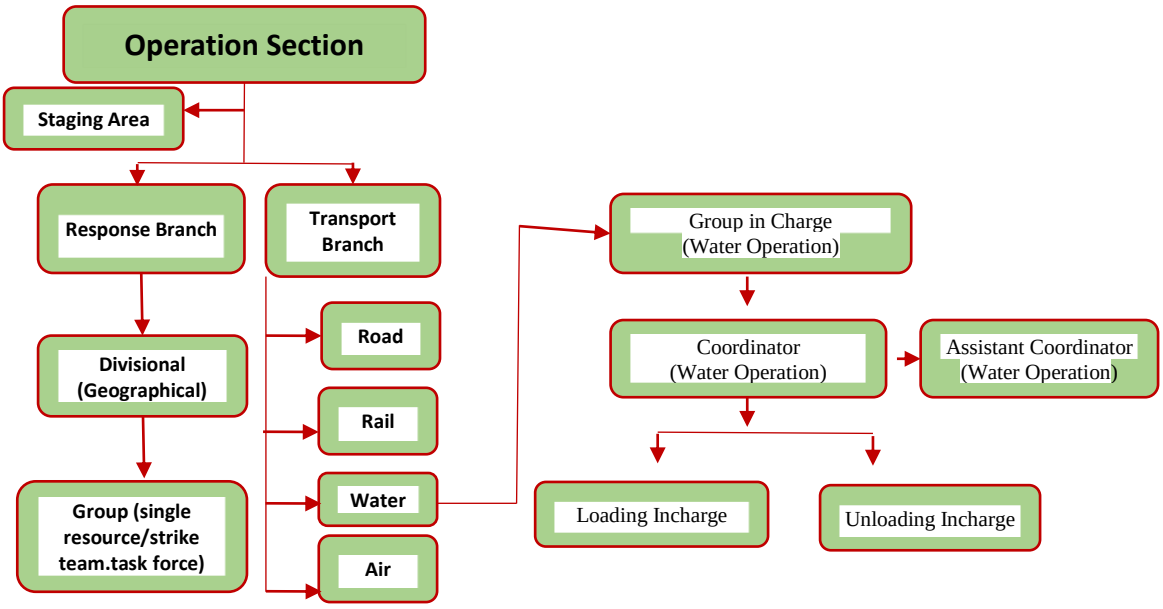


Fig 9, Composition of Water Operation Group

The Group-in-charge (Water Operations) will:

1. ensure transportation of rescue teams and relief materials by motor boats / country boats or by any other water transport to the affected sites with communication facilities and a local guide for guidance with each team;
2. requisition personnel support, if required;

3. determine coordination procedures with various destinations as per IAP;
4. supervise all Water Operations and related activities associated with the incident;
5. evaluate and ensure docking or harboring locations;
6. resolve conflicts, if any;
7. update Water Operations plan and share it with the higher authorities, including the LSC;
8. arrange for an accident investigation team as and when required and cooperate with the appropriate investigating authorities;
9. ensure availability of POL and other logistic support for boat operations;
10. attend to the needs of the personnel working with him.
11. collect record of various activities performed (IRS Form-004 enclosed in Annexure-IV) from Coordinator and other in-charges and send to TBD or OSC; and
12. perform such other duties as assigned by TBD or OSC.

6.6.4.3.1 Roles and Responsibilities of Coordinator (Water Operations)

The Coordinator (Water Operations) will:

1. coordinate all activities relating to transportation of resources by motor boats / country boats etc. Activation of this position is contingent upon the complexity of the incident. There may be more than one Coordinator (Water) assigned to an incident with Loading and Unloading-in-charge;
2. survey assigned incident areas to analyse the situation and other potential problems;
3. coordinate with SAM for smooth transportation of relief materials, if required;
4. receive assignments and supervise Water transport movement activities;
5. monitor all Water Operations for their safety;
6. ensure proper communications with Water transport personnel deployed in search and rescue as well as relief operations;
7. keep the records of supplies to different locations, Water transport movements etc;
8. report incidents or accidents that may occur in Water Operations to the TBD and other designated authorities;
9. assess requirements of POL etc. for Water Operations and ensure their availability;
10. maintain liaison with Coordinator (Road Operations) as most relief supplies will arrive by road;
11. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to the Group-in-charge or TBD; and
12. perform any other duties assigned by the OSC or TBD.

6.6.4.3.2 Roles and Responsibilities of the Loading and Unloading-in-charge (Water Operations)

The roles and responsibilities of Loading and Unloading-in-charge for Water Operations will be similar to those of their counterparts in the Road Operations Group. Para 6.6.4.1.3 will be referred.

6.6.4.4 Air Operations

For disaster response in India air operations may be needed for four tasks: (a) quick transportation of relief materials and resources to the affected area, (b) quick distribution of relief materials, food, medicine etc (Air dropping) in inaccessible and affected areas, (c) search and rescue of victims trapped in inaccessible areas, and (d) evacuation of casualties. Normally, the Indian Air Force will be tasked for Air support Operations. At times, Indian Airlines, Pawan Hans and other private Airlines may also be utilised for transportation purposes. Different types of Aircrafts may need to be utilised for different mission requirements e.g. transport Aircraft or helicopter etc. from any of the agencies discussed above.

Close coordination at the National Level is essential for the launch of any Air Operations. It needs a close liaison among the NDMA, NEC, Air Force, Ministry of Civil Aviation, State RO and the ROs of the Districts where the Air Operations is to be performed. It is therefore very essential that a NO should be identified and designated in advance at all these levels for coordination and activation of the Air Support. The stakeholders should be aware of the designated NO for Air Operations.

In the context of the IRS, a ground support element will have to be placed at all required landing and takeoff facilities in the affected areas. The ground support requirements including Aviation Turbine Fuel (ATF), security etc. for the Air Operations will be the responsibility of the TBD. On taking the decision to launch Air Operations, the TBD will activate the Air Operations Group under him. The Group will be headed by a supervisor and necessary organizational elements will have to be activated at all required landing and takeoff locations headed by an in-charge at airbases, helibases and helipads.

The composition of the Air Operations (Fig.10) will be: NOs who will be designated by the State and District level ROs at their respective level, Group-in-charge, who will work directly under the TBD for coordination of logistic support at Airbase, Helibase and Helipad.

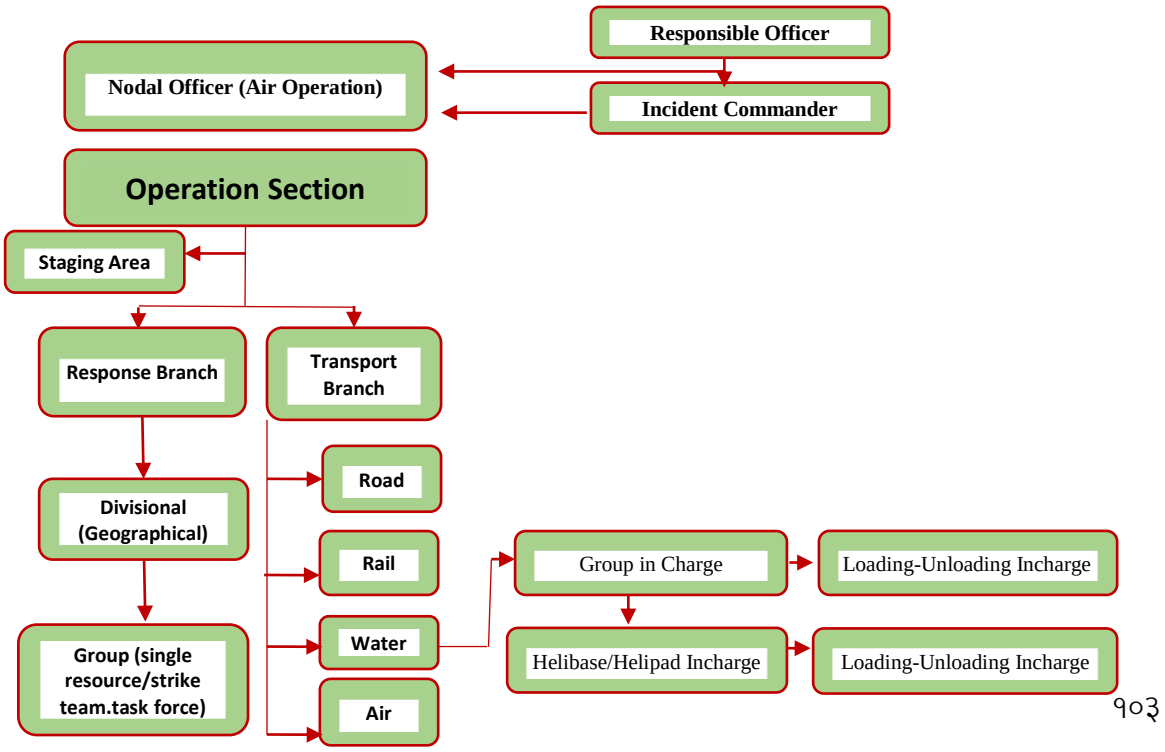


Fig 10, Composition of Air Operation Group

6.6.4.4.1 Roles and Responsibilities of Nodal Officer (NO)

The Nodal Officer (Air Operations) will:

1. coordinate with concerned authorities for air operations;
2. project the type of Air support required to the appropriate authorities based on the IAP and place the demand at least 24 hours in advance or as early as possible;
3. inform the IC and OSC about the Air movements and landing schedules in their respective areas;
4. ensure that relevant Maps of the incident locations are available with all agencies involved in the Air Operations to give the correct coordinates etc. of the locations where Air support is required;
5. determine the suitability of Helipads or Helibases in coordination with the Air Force authorities and the State authorities;
6. maintain communication with Air Traffic Control and the ground support staff regarding the Air movements and other related activities;
7. assist the IC and the LSC in the procurement of required ATF etc.;
8. report on Air Operations activities to the RO; and
9. perform any other duties assigned by the RO and IC.

6.6.4.4.2 Roles and Responsibilities of Group-in-charge (Air Operations)

The Group-in-charge (Air Operations) will:

1. provide ground support to Air Operations as per the IAP;
2. report to TBD the progress of Air Operations and work in close coordination with the NO, IC, OSC and TBD;
3. ensure resources and supplies required for the Air Operations are available at the concerned locations;
4. keep appropriate Maps in order to provide correct coordinates to the pilots and others involved in the Air Operations;
5. requisition additional personnel support, if required;
6. ensure refueling facilities are available at the landing and takeoff locations;
7. ensure that Helibase and Helipad locations are identified and approved by the
8. appropriate authorities;
9. determine the need for assignment of personnel and equipment at each Helibase and Helipad;
10. ensure identification and marking of Helibases and Helipads;
11. ensure that the communication systems are in place;
12. update landing and takeoff schedule of Aircrafts and Helicopters as informed by NO;
13. ensure preparation of the load manifest for proper loading or unloading of relief supplies;
14. arrange for unloading and despatch or storage of relief materials that arrive at the airports, helipads and helibase. In order to keep airports operational, special attention needs to be paid to unsolicited relief supplies that may arrive. They should be immediately cleared from the operational area;

15. ensure that proper packaging and weighing facilities are in place and used for loading of relief materials;
16. liaise with the road operations group for the road transportation needs;
17. ensure the functionality of Aircraft rescue and firefighting service at Helibases and Helipads, security, proper lights, smoke candles/devices, weighing facilities, wind direction socks, etc. are in place;
18. collect record of various activities performed (IRS Form-004 enclosed in Annexure-IV) from Helibase and Helipad-in-charge and send to TBD or OSC or IC; and
19. perform any other duties assigned by the TBD.

6.6.4.4.3 Roles and Responsibilities of Helibase / Helipad-in-Charge

A Helibase is the main location for parking, fueling and carrying out the maintenance of the Helicopters. It may also be used for loading and unloading of relief materials. Helipads are temporary locations in the incident area where Helicopters can safely land and take off. The Helibase is often located at the Airport or at another location decided by the District administration in consultation and approval by the agency operating the Helicopter. When more than one Helibase is established it will be designated by name of the incident with number. Helipads are established and used for operational purpose only like loading unloading of personnel and equipment and other relief materials etc. The Helibase / Helipad-in-charge will report to the TBD.

The Helibase, Helipad-in-charge will:

1. provide all ground support requirement of Helicopters at the location;
2. keep appropriate Maps in order to provide correct coordinates to the pilots;
3. survey the Helibase / Helipad area to analyse situation, potential Aircraft hazards and other likely problems;
4. ensure that the Helipad and Helibase is properly marked so that it is visible from the air for smooth landing of Aircrafts;
5. coordinate with the ground supervisor for Helicopter Operations;
6. determine and implement ground and air safety requirements and procedures;
7. maintain continuous monitoring of the assigned Helibases and Helipads and remain vigilant for unusual happening or hazards that may affect the Air Operations and take precautionary measures;
8. ensure that all personnel deployed at the Helibases and Helipads are aware of the safety requirements;
9. establish ground communication facilities;
10. notify supervisor immediately of any delays in Helicopter schedules;
11. ensure Aircraft rescue measures, firefighting services, lights, smoke candles,
12. weighing facilities, wind direction socks, dust abatement measures and security etc. are in place and working properly at Helibases and Helipads;
13. ensure proper facilities for rest, refreshment, water and sanitation for the Air crew;
14. inform the supervisor about the mission completion;
15. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Group-in-charge; and

16. perform any other duties assigned by the Group-in-charge.

6.6.4.4.4 Roles and Responsibilities of Loading / Unloading-in-Charge

The Loading / Unloading-in-charge will:

1. be responsible for the safe Operations of Loading and Unloading of cargo and personnel at Helibases;
2. report to the Airbases, Helibases and Helipad-in-charge;
3. ensure load manifest of personnel and cargo;
4. ensure no inflammable material is loaded on the Aircrafts;
5. supervise loading and unloading crew;
6. ensure proper packaging of the loads, keeping in view the weight restriction that may be imposed by the pilots due to weather conditions and make sure that weighing facilities are available for such purpose;
7. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Group-in-charge; and
8. perform any other duties as assigned by the Group-in-charge, Helibase-in-charge and Helipad-in-charge.

6.6.2 Planning Section (PS)

The PS is responsible for collection, evaluation and display of incident information, maintaining and tracking resources, preparing the Incident Action Plan (IAP) and other necessary incident relateddocumentation. They will assess the requirement of additional resources, propose from where it can be mobilised and keep IC informed. This Section also prepares the demobilisation plan.

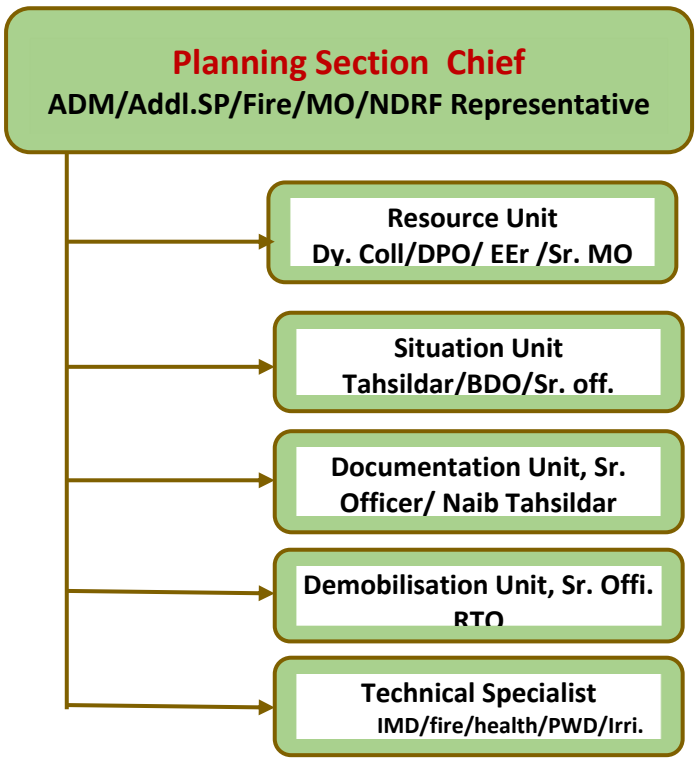


Fig -11, Composition of Planning Section

PS comprises Resource Unit, Situation Unit, Documentation Unit and Demobilisation Unit. The Section is headed by a chief known as Planning Section Chief.

IRS Positions and suitable officers at District levels		
District Level IRT		
S#	***IRS Position***	***Suitable Officer***
1	*Planning Section Chief*	*ADM (Sadar) / Add. SP / Dy. SP / Sr. Deputy Collector / Joint Collector / District Planning Officer / Fire Officer / Medical Officer / NDRF representative (If available) or any other suitable position at District level as deemed by IC / RO*
2	*Resource Unit*	*Deputy Collector or officers of equivalent rank / District Planning Officer + Team / Tehsildar or any other suitable position at District level as deemed by IC / PSC*
3	*Check-in-status Recorder*	*Sr. Officers of the District / Dy. Collector or any othersuitable position at District level as deemed by IC / PSC*
4	*Situation Unit*	*Deputy Collector / Equivalent rank officer / Statistical Officer / Executive Engineer Irrigation or any other suitable position at District level as deemed by IC / PSC*
5	*Display Processor*	*Officers of District Administration as deemed by the IC /PSC.*
6	*Field Observer*	*officers of district administration/officials of NGOS,involved in the similar kind of activities in the state/PRIs/ULBS or any other suitable position at district level as deemed by IC/PSC*
7	*Weather observer*	*Suitable officer selected by PSC in consultation with OSC*
8	*Documentation Unit*	*Any suitable Officer of the District Administration in the rank of Deputy Collector*
9	*Demibilisation Unit*	*Senior Official of department of transport / DSP AR or any suitable Official of District Administration in the rank of Dy. Collector as deemed by IC / PSC*
10	*Technical Unit*	*Suitable officer of Departments of; Meteorology / Fire / Forest / Finance / Health / PWD / PHD and Irrigation etc.*

6.6.3 Planning Section Chief (PSC)

The PSC is responsible for collection, evaluation, dissemination and use of information. It keeps track of the developing scenario and status of the resources. In case of need, the PS may also have Technical Specialist for addressing the technical planning matters in the management of an incident.

A list of such specialists will be kept available in the PS. The PSC reports to the IC and will be responsible for the activation of Units and deployment of personnel in his Section as per requirement.

Roles and Responsibilities of PSC

The PSC will:

1. coordinate with the activated Section Chiefs for planning and preparation of IAP in consultation with IC;
2. ensure that decisions taken and directions issued in case of sudden disasters when the PS had not been activated are obtained from the IMO (Command Staff) and incorporated in the IAP;
3. ensure collection, evaluation, and dissemination of information about the incidents including weather, environment toxicity, availability of resources etc. from concerneddepartments and other sources. The PS must have a databank of available resources with their locations from where it can be mobilised;
4. coordinate by assessing the current situation, predicting probable course of the incident and preparing alternative strategies for the Operations by preparing the IAP. The IAP contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period (24 hours is considered as one operational period). The plan may be oral or written. Written plan may have a number of attachments, including incident objectives, organisation assignment list IRS Form-005 (enclosed in Annexure-V), incident communication plan IRS Form-009 enclosed in Annexure-IX), demobilisation plan IRS Form-010 (enclosed in Annexure-X), traffic plan, safety plan, and incident map etc. The major steps for preparing IAP are as follows;

    a. Initial information and assessment of the damage and threat;
    b. Assessment of resources required;
    c. Formation of incident objectives and conducting strategy meetings;
    d. Operations briefing;
    e. Implementation of IAP;
    f. Review of the IAP; and
    g. Formulation of incident objectives for the next operational period, if required;

5. ensure that Incident Status Summary (IRS Form-002) enclosed in Annexure-II is filled and incorporated in the IAP;
6. ensure that Organisational Assignment List (Divisional / Group) IRS Form-005 as nclosed in Annexure – V is circulated among the Unit leaders and other responders of his Section;
7. plan to activate and deactivate IRS organisational positions as appropriate, in consultation with the IC and OSC;
8. determine the need for any specialised resources for the incident management;
9. utilise IT solutions for pro-active planning, GIS for decision support and modeling capabilities for assessing and estimating casualties and for comprehensive response management plan;
10. provide periodic projections on incident potential;
11. report to the IC of any significant changes that take place in the incident status;
12. compile and display incident status summary at the ICP;
13. oversee preparation and implementation of Incident Demobilisation Plan (IRS Form-010) enclosed in Annexure-X;
14. assign appropriate personnel, keeping their capabilities for the tasks in mind and maintain On Duty Officers List (IRS Form-007) for the day as enclosed in Annexure-VII;

15. ensure that record of various activities performed (IRS Form-004 enclosed in Annexure-IV) by members of Units are collected and maintained in the Unit Log (IRS Form-003) enclosed at Annexure-III; and
16. Perform any other duties assigned by IC.

6.6.3.1 Roles and Responsibilities of Resource Unit Leader (RUL)

The Resource Unit Leader will:

1. maintain and display the status of all assigned resources (Primary and Support) at the incident site by overseeing the check-in of all resources, and maintaining a resource status-keeping system. Primary resources are meant for responders and support resources are meant for affected communities;
2. compile a complete inventory of all resources available. He will also access information about availability of all required resources at other locations and prepare a plan for their mobilisation, if required. IDRN, CDRN and IDKN facilities will also be used for this purpose;
3. ensure and establish Check-in function at various incident locations;
4. update the PSC and IC about the status of resources received and despatched from time to time;
5. coordinate with the various activated Branches, Divisions and Groups of OS for checking status and utilisation of allotted resources;
6. ensure quick and proper utilisation of perishable resources;
7. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Section concerned; and
8. perform any other duties assigned by PSC.

6.6.3.1.1 Roles and Responsibilities of Check-in/Status Recorder

The Check-in and Deployment Status Recorder will:

1. report to the RUL;
2. ensure that all resources assigned to an incident are accounted for at each check-in point;
3. obtain required work materials, including Check-in Lists, Resource Status display boards showing different locations for deployment of resources, collection of resources with time of arrival and type of resources etc. The status of resources would be displayed through T card board or through a computerised programme on the computers;
4. establish communications with the EOC and Ground Support Unit (GSU) of LS;
5. ensure displays of check-in locations on signboard so that arriving resources can easily locate the Check-in location(s);
6. enter or record information on Incident Check-in and deployment list as per the IRS Form-006 enclosed at Annexure - VI;
7. transmit Incident Check-in and deployment information to Resource Unit on a regular and prearranged schedule or as needed;
8. forward completed Check-in Lists to the Resource Unit;

9. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Sections concerned; and
10. perform any other duties as assigned by PSC.

6.6.3.2 Roles and Responsibilities of Situation Unit Leader (SUL)

The SUL will:

1. collect, process and organise all incident information as soon as possible for analysis. For such purposes, he can take the help of members of the Single Resource, Task Forces, Strike Teams, field level Government officers and members of PRIs, CBOs, NGOs etc;
2. prepare periodic future projections of the development of the incident (along with maps if required) and keep the PSC and IC informed;
3. prepare situation and resource status reports and disseminate as required;
4. provide authorised maps, photographic services to responders, if required;
5. attend IAP Meeting with required information, data, documents and Survey of India maps etc;
6. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Section concerned; and
7. perform such other duties assigned by SUL or PSC.

6.6.3.2.1 Roles and Responsibilities of Display Processor (DP)

The DP is responsible for the display of incident status information obtained from Field Observers (FOs), Single Resource, Strike Teams, Task Forces, and through other sources.

The DP will:

1. display incident status obtained from Field Observers (FOs), Single Resource, Strike Teams, Task Forces, aerial photographs and other data received from technical sources;
2. report to the SUL;
3. ensure timely completion of display chart;
4. obtain necessary equipment and stationery;
5. assist in analysing and evaluating field reports;
6. maintain record of various activities performed as per IRS Form-004 (enclosed in
7. Annexure-IV) and send to the SUL; and
8. perform such other duties as assigned by SUL or PSC.

6.6.3.2.2 Roles and Responsibilities of Field Observer (FO)

The FO is responsible for collecting situation information from personal observations of the incident and provide this information to the SUL. He may be a local private individual or a member of any of the operational Units / Groups. The PSC will specially designate the individuals for such purpose.

The FO will:

1. report to SUL immediately on any situation observed which may cause danger and safety hazard to responders and affected communities. This should also include local weather conditions;
2. gather intelligence that may facilitate better planning and effective response;
3. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to the SUL; and
4. perform such other duties as assigned by SUL or PSC.

6.6.3.3 Roles and Responsibilities of Documentation Unit Leader (DUL)

The DUL will:

1. ensure that all the required forms and stationery are procured and issued to all the activated Sections, Branches, Divisions, Groups and Units;
2. compile all information and reports related to the incident;
3. review and scrutinise the records and various IRS forms for accuracy and completeness;
4. inform appropriate Units of errors or omissions in their documentation, if any, and ensure that errors and omissions are rectified;
5. store files properly for post-incident analysis;
6. maintain record of various activities performed as per IRS Form-004 (enclosed in
7. Annexure-IV) and send to Sections concerned; and
8. perform any other duties as assigned by the PSC.

6.6.3.4 Roles and Responsibilites of Demobilisation Unit Leader (Demob. UL)

In the management of a large incident, demobilisation can be quite a complex activity and requires proper and separate planning. When the disaster response is nearing completion, the resources mobilised for response need to be returned. This should be done in a planned and phased manner. Demobilisation requires organising transportation of both equipment and personnel to a large number of different places both near and far away. The Demob. Unit will prepare the demobilisation plan in consultation with RO, IC and PSC. The plan should include the details of the responders to be demobilised, the date, mode of transport, location from where they will be demobilsed, the destination where they have to finally reach etc. There will be a similar plan for out of service equipment and sick personnel also.

The Demob. UL will:

1. prepare Incident Demobilisation Plan (IDP) as per IRS Form-010 given in Annexure-X;
2. identify surplus resources and prepare a tentative IDP in consultation with the PSC and give priority to demobilisation of surplus resources;
3. develop incident check-out functions for Sections, Branches, Divisions and units in consultation with all Sections and send to the PS;
4. plan for logistics and transportation support for Incident Demobilisation in consultation with LS;
5. disseminate IDP at an appropriate time to various stakeholders involved;
6. ensure that all Sections, Units, Teams and Resources understand their specific Incident Demobilisation responsibilities and avail Demobilisation facilities;

7. arrange for proper supervision and execution of the IDP;
8. brief the PSC on the progress of Demobilisation;
9. request the PSC for additional human resources, if required;
10. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Sections concerned; and
11. perform any other duties assigned by the PSC.

6.6.3.5Technical Specialists (TS)

In consultation with the RO and IC, the PSC may mobilise Technical Resources and Specialists for specialised response, if required. They may be deployed for technical planning or specialized technical response and will function under the concerned section chief.The TSs will provide technical support to the response management. A data base of TS will be prepared in advance at the District, State, Metropolitan City and Union Territory levels and incorporated in their DM Plan.

6.6.3 Logistics Section (LS)

The LS is responsible for providing facilities, services, materials, equipment and other resources in support of the incident response. The Section Chief participates in development and implementation of the IAP, activates and supervises Branches and Units of his section. In order to ensure prompt and smooth procurement and supply of resources as per financial rules, the Finance Branch has been included in the LS.

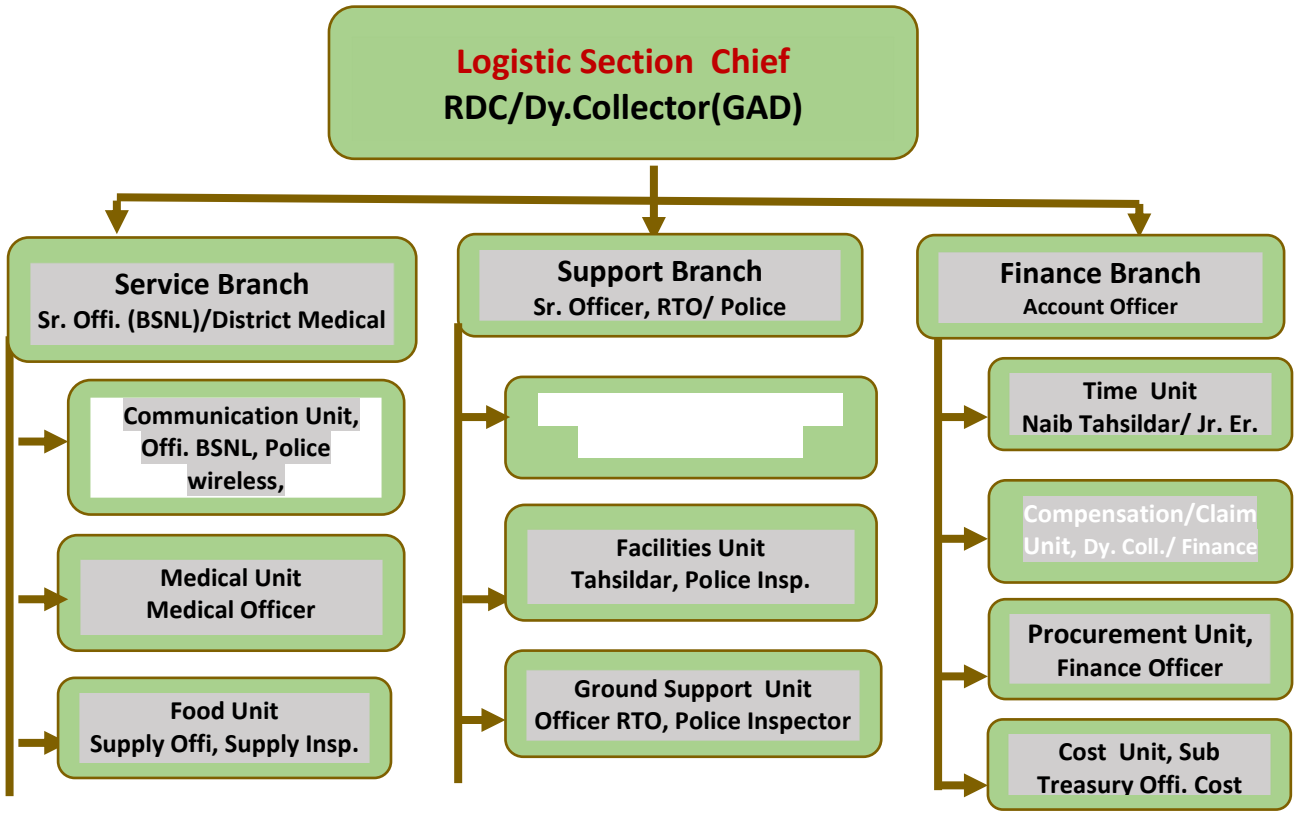


Fig- 12, Composition of Logistic Section

LS provides all logistic support for effective response management. The Units under different Branches of the LS are responsible not only for the supply of various 'kinds' and 'types' of resources, but also for the setting up of different facilities like the Incident Base, Camp, ICP and Relief Camp etc. This would entail the involvement of several line departments of Government and other agencies. It would require a proper and smooth coordination at the highest level of the administration. The LS will work closely with the RO, EOC and the IC. The State and District DM plans will have comprehensive details like where the required resources can be procured from and manpower mobilised, etc. IDKN, IDRN and CDRN may also be useful for the mobilisation of equipment and manpower.

IRS Positions and suitable officers at District levels		
District Level IRT		
S#	***IRS Position***	***Suitable Officer***
1	***Logistic Section Chief***	Senior Dy. Collector or any other suitable position at District level deemed by IC / RO
2	Service Branch Director	Dy. Collector / DSP I/c Reserve Officer or any other suitable position at District level as deemed by IC / LSC
3	Communication unit	Supporting personnel of; I/c Police Wireless / Deputy JTO, BSNL / HAM operators or any other suitable position at District level as deemed by IC / LSC
4	Medical Unit	Asst. Chief Medical Officer or any other suitable position at District level as deemed by IC / LSC
5	Food Unit	Asst Civil Supply Officer / Supply Inspector / Food Inspector (Quality Inspector) or any other suitable officer of the District as deemed by IC / LSC.
6	Support Branch Director	Dy. Collector / DSP I/c Reserve Officer or any other suitable officer as deemed by IC
7	Resource Provisioning Unit	Additional Supply Officer / Asst. Engineer / Dy. Ex. Engineer or any other suitable position as deemed by IC / LSC
8	Facilities Unit	Tehsildar / Dy. Tehsildar / Police Reserve Inspectors or any other suitable position as deemed by IC / LSC
9	Ground Support Unit	Officer of; Road Transport / Inspector/(RTO) / Police Inspector / PWD / PHD / State Transport or any other suitable position as deemed by IC / LSC
10	Finance Branch Director	Nazarat / Treasury Officer / Dy. Collector or any other suitable position at district level deemed by the IC
11	Time Unit	Sub-Treasurer / Supply Inspector or any other suitable position at District level deemed by IC / LSC
12	Compensation / Claim Unit	Dy. Collector or any other suitable position at District level deemed by the IC / LSC
13	Procurement Unit	SDM / Additional City Magistrate / Dy. Collector + AO or any other suitable position at District level deemed by IC / LSC
14	Cost Unit	Sub Treasury Officer / Finance Officer / Cost Accountant in any Office or any other suitable position at District level as deemed by IC / LSC

6.6.4 Logistics Section Chief (LSC)

The LS comprises Service, Support and Finance Branches. Structure and details of each Branch are shown in Fig. 12. The Section is headed by a chief known as the LSC. The activation of various Branches of the LS is context specific and would depend on the enormity and requirements of the incident. The Finance Branch (FB) constitutes an important component of the LS to specially facilitate speedy procurement, and proper accounting following financial procedures and rules.

Roles and Responsibilities of LSC

The LSC will:

1. coordinate with the activated Section Chiefs;
2. provide logistic support to all incident response effort including the establishment of SA, Incident Base, Camp, Relief Camp, Helipad etc.;
3. participate in the development and implementation of the IAP;
4. keep RO and IC informed on related financial issues;
5. ensure that Organisational Assignment List (Divisional / Group) IRS Form-005 as enclosed in Annexure – V is circulated among the Branch Directors and other responders of his Section;
6. request for sanction of Imprest Fund, if required;
7. supervise the activated Units of his Section;
8. ensure the safety of the personnel of his Section;
9. assign work locations and preliminary work tasks to Section personnel;
10. ensure that a plan is developed to meet the logistic requirements of the IAP with the help of Comprehensive Resource Management System;
11. brief Branch Directors and Unit Leaders;
12. anticipate over all logistic requirements for relief Operations and prepare accordingly;
13. constantly review the Communication Plan, Medical Plan and Traffic Plan to meet the changing requirements of the situation;
14. assess the requirement of additional resources and take steps for their procurement in consultation with the RO and IC;
15. provide logistic support for the IDP as approved by the RO and IC;
16. ensure release of resources in conformity with the IDP;
17. ensure that the hiring of the requisitioned resources is properly documented and paid by the FB;
18. assign appropriate personnel, keeping their capabilities for the tasks to be carried out and maintain On Duty Officers List (IRS Form-007) for the day as enclosed in Annexure-VII;
19. ensure that cost analysis of the total response activities is prepared;
20. ensure that record of various activities performed (IRS Form-004 enclosed in Annexure- IV) by members of Branches and Units are collected and maintained in the Unit Log IRS Form 003 as enclosed at Annexure-III; and
21. Perform any other duties as assigned by RO or IC.

6.6.4.1 Roles and Responsibilities of Service Branch Director (SBD)

The SBD will:

1. work under the supervision of LSC, and manage all required service support for the incident management;
2. manage and supervise various Units of the Branch like Communication Unit, Medical Unit, Food Unit and any other activated Unit;
3. discuss with activated Unit leaders for the materials and resources required and procure the same through LS;
4. ensure proper despatch of personnel, teams, resources etc as per the IAP;
5. prepare an assignment list, if required;
6. keep the LSC informed about the progress of Service Branch, from time-to-time;
7. resolve Service Branch problems, if any;
8. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to sections concerned; and
9. perform any other duties assigned by the IC and LSC.

6.6.4.1.1 Roles and Responsibilities of Communication Unit Leader (Com. UL)

The Com. UL will:

1. work under the direction of the SBD;
2. provide communications facility as and when required;
3. ensure that all communications equipment available are in working condition and that the network is functional;
4. supervise Communication Unit activities;
5. maintain the records of all communications equipment deployed in the field;
6. recover equipment provided by Communication Unit after the incident is over. Ensure that it is properly linked with the IDP;
7. ensure setting up of a message centre to receive and transmit radio, telephone and other messages from various activated Sections, Branches, Units and higher authorities and maintain their records;
8. prepare an alternative communication plan for execution in case of possible failure of the normal communications network. The alternative communications network may have wireless, satellite phones, cell phones, HAM radios etc;
9. prepare a plan for integration of the communications set up of the central teams (NDRF, Armed Forces) with the local communications set up for the management of large scale disasters when they come to assist in the response effort;
10. ask for and ensure adequate staffing support;
11. ensure that the communications plan is supporting the IAP;
12. demobilise Communications Centre in accordance with the IDP;
13. maintain record of various activities performed as per IRS Form-004 (enclosed in
14. Annexure-IV) and send to SBD; and
15. Perform any other duties assigned by the SBD or LSC.

6.6.4.1.2 Roles and Responsibilities of Medical Unit Leader (MUL)

The MUL will:

1. work under the direction of the SBD;
2. prepare the Medical Plan and procurement of required resources as per IAP, provide medical aid and ambulance for transportation of victims and maintain the records of the same, as given in IRS Form 008 (Annexure-VIII), obtain a road map of the area from the PS for the ambulance services, transportation of medical personnel and victims;
3. respond to requests of the OS for medical aid, transportation and medical supplies etc. under intimation to the SBD and LSC;
4. maintain the list of medical personnel who could be mobilised in times of need;
5. requisition more human resources as and when required to meet the incident objectives;
6. prepare and circulate list of referral service centres to all the medical team leaders;
7. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to SBD; and
8. perform any other duties assigned by the SBD and LSC.

6.6.4.1.3 Roles and Responsibilities of Food Unit Leader (FUL)

The FUL will:

1. work under the direction of the SBD;
2. supply resources to various activated Sections, Branches, Units and Groups of IRT as per direction of the SBD;
3. supply food to: a) Personnel of IRT(s) at ICP, Camps, Incident Base, SA, etc., and b) Victims at the temporary shelters, relief camps etc.;
4. request for assistants if the task becomes very large. The FUL may request the LSC to split the unit into two groups—one to supply food for personnel and another for victims. Requisition transport for supply of food to incident base, relief camp and other facilities;
5. determine food and drinking water requirements and their transportation, and brief the SBD and LSC;
6. maintain an inventory of receipt and despatch of resources;
7. supervise the Unit activities;
8. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to SBD; and
9. perform any other duties assigned by the SBD and LSC.

6.6.4.2 Roles and Responsibilities of Support Branch Director (Sup. BD)

The Sup. BD will:

1. work under the supervision of LSC, and supervise the function of Resource Provisioning Unit, Facility Unit and Ground Support Unit;
2. procure and despatch required tactical materials and resources for Operations with the concurrence of the Section Chief;
3. participate in the planning meeting of the LS;
4. ensure that organisation assignment list concerning the Branch is circulated to all Units under him;
5. coordinate various activities of the Support Branch;
6. keep the LSC informed about the progress of work;

7. resolve problems within his unit, if any;
8. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Section concerned; and
9. perform any other duties assigned by the LSC.

6.6.4.2.1 Roles and Responsibilities of Resource Provisioning Unit Leader (RPUL)

The RPUL will:

1. work under the supervision of Sup.BD;
2. organise movement of personnel, equipment and supplies,
3. receive and store safely all supplies required for the incident response,
4. maintain the inventory of supplies and equipment;
5. maintain the records of receipt and despatch of supplies including equipment and personnel;
6. organise repair and servicing of non-expendable supplies and equipment;
7. participate in the planning meeting of LS;
8. monitor the 'Kind', 'Type' and quantity of supplies available and despatched;
9. receive and respond to requests for personnel, supplies and equipment from the activated Sections, Branches, Divisions, Units and Groups of the IRS organisation under intimation to Sup. B.D.;
10. requisition additional human resource assistance, if needed. These assistants may be deployed for different functional activities such as Resource Ordering, Resource Receiving and Tool & Equipment maintenance;
11. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Sup.BD; and
12. Perform any other duty as assigned by LSC or Sup.BD.

a. Roles and Responsibilities of Resource Ordering-in-charge

The Resource Ordering-in-charge will:

1. report to the RPUL;
2. prepare a list of resources to be procured and obtain its approval;
3. place resource orders in a timely manner as per procedure laid down;
4. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to RPUL; and
5. perform any other duties assigned by the RPUL.

b. Roles and Responsibilities of Resource Receiving and Distribution-in-Charge

The Resource Receiving and Distribution-in-Charge will:

1. report to the RPUL;
2. receive and distribute all resources and services which have been ordered;
3. identify and ensure time and locations for delivery of supplies and equipment;

4. prepare separate lists for the resources received from line departments of Government and from other sources;
5. organise physical layout of supply area;
6. set up a filing system for receiving and distributing supplies and equipment and keep RPUL informed;
7. ensure security requirements;
8. keep the Resource Ordering-in-Charge informed about the positions of supplies and equipment received;
9. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to RPUL; and
10. perform any other duties assigned by the RPUL.

c. Roles and Responsibilities of the Tool and Equipment Specialist

The Tool and Equipment Specialist will:

1. report to RPUL;
2. supervise the service and repair all tools and equipment and keep the RPUL informed of their status;
3. maintain record of activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to RPUL; and
4. perform any other duties assigned by the RPUL.

6.6.4.2.2 Roles and Responsibilities of Facilities Unit Leader (Fac. UL)

The Fac. UL will:

1. prepare the layout and activation of incident facilities, e.g., Incident Base, Camp(s), Relief Camp(s), ICP, etc., and provide basic amenities to the responders;
2. report to the Sup.BD;
3. locate the different facilities as per the IAP;
4. participate in the planning meeting of the Section, prepare list for each facilities and its requirements in coordination with the LSC;
5. ask for additional personnel support if required to monitor and manage facilities at Incident Base and Camp etc;
6. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Sup. BD; and
7. perform such other duties as assigned by the Sup. BD.

a. Other in-charges under the Fac. UL

Depending on the enormity and magnitude of the arrangements required, the Fac.UL may need to deploy other incharge under him for maintenance of various facilities and their security.The various other in-charges and their roles and responsibilities are as follows:

Roles and Responsibilities of Facility Maintenance-in-charge

The Facility Maintenance-in-charge will:

1. ensure that proper sleeping and resting facilities are organised;

2. organise and provide toilet, bath and sanitation;
3. maintain lighting arrangements;
4. maintain general cleanliness in Incident Base, Camp(s), Relief Camp(s), ICP etc.;
5. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Fac. UL; and
6. perform any other duties directed by the Fac. UL.

Roles and Responsibilities of Security-in-charge

The Security-in-charge will:

1. provide security to the deployed resources including responders, relief materials at the required places and relief camps;
2. establish contact with local law enforcement agencies, as required;
3. request personnel support to accomplish work assignments, if required;
4. coordinate security plan for incident facilities;
5. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Fac. UL; and
6. perform any other duties assigned by the Fac. UL.

6.6.4.2.3 Roles and Responsibilities of Ground Support Unit Leader (GSUL)

The GSUL will:

1. work under the supervision of the Sup. BD;
2. provide transportation services for field operations to TBD;
3. in case Air Operations are activated, organise and provide required ground support through TBD;
4. provide maintenance and repair services for all the vehicles and related equipment used for incident management as per proper procedures and keep the concerned line departments informed through the Sup. BD and LSC;
5. develop and implement the Incident Traffic Plan;
6. inform Resource Unit about the availability and serviceability of all vehicles and equipment;
7. arrange for and activate fueling requirements for all transport including Aircrafts in consultation with the Sup. BD;
8. maintain inventory of assigned, available and off road or out of service resources;
9. ensure safety measures within his jurisdiction;
10. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to the Sup. BD; and
11. perform any other duties as assigned by the Sup. BD.

6.6.4.3 Roles and Responsibilities of Finance Branch Director (FBD)

The FB is responsible for managing all financial aspects of response management. The FB has been kept under the LS for quick and effective procurement. Due diligence is very important in all financial transactions and proper procedure needs to be followed. Special

precautions will be taken in selecting knowledgeable and experienced personnel conversant with the financial rules for functioning in this Branch.

The FBD will:

1. work under the LSC;
2. attend planning meetings;
3. prepare a list of resources to be mobilised, procured or hired in accordance with the IAP. Obtain orders of the competent authority as per financial rules and take steps for their procurement without delay;
4. ensure that time records of hired equipment, personnel and their services are accurately maintained as per Government norms for payment;
5. examine and scrutinise cost involved in the entire response activity including the demobilisation, analysis the cost effectiveness and keep the LSC informed;
6. ensure that all obligation documents initiated at the incident are properly prepared, completed, verified and signed by the appropriate Section Chief and BD;
7. brief the LSC or IC on all incident related financial issues needing attention or follow-up;
8. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to Sections concerned; and
9. perform any other duties as assigned by the LSC or IC.

6.6.4.3.1 Roles and Responsibilities of Time Unit Leader (TUL)

The TUL will:

1. maintain time recording of hired equipment and personnel and ensure that it is maintained on a daily basis and according to government norms;
2. examine logs of all hired equipment and personnel with regard to their optimal utilisation;
3. ensure that all records are correct and complete prior to demobilisation of hired resources;
4. brief the FBD on current problems with recommendations on outstanding issues, and any ollow-up required;
5. ask for additional support of human resources for assistance, if required;
6. maintain record of the activities performed as per IRS Form-004 (enclosed in Annexure-IV) and end to FBD; and
7. perform any other duties as assigned by the FBD.

6.6.4.3.2 Roles and Responsibilities of Procurement Unit Leader (PUL)

The PUL will:

1. attend to all financial matters pertaining to vendors and contracts;
2. review procurement needs in consultation with the FBD;
3. prepare a list of vendors from whom procurement can be done and follow proper procedures;
4. ensure all procurements ordered are delivered on time;
5. coordinate with the FBD for use of imprest funds, as required;

6. complete final processing of all bills arising out of the response management and send documents for payment with the approval of the FBD, LSC and IC;
7. brief FBD on current problems with recommendations on outstanding issues and follow-up requirements;
8. maintain record of activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to FBD; and
9. perform any other duties as assigned by the FBD.

6.6.4.3.3 Roles and Responsibilities of Compensation / Claims Unit Leader (Com./CUL)

DM Act 2005, Section 65 and 66 provides for payment of compensation. Payments are also to be made for requisitioned premises, hired services, resources and vehicles for the purpose of disaster response and rescue operations etc. The Government may also decide to make ex-gratia payments depending upon the magnitude and the quantum of damage. There are some benchmarks for quantifying the level of loss in different scenarios like flood, drought, etc.While some states may have their own norms for such purposes the GoI has also laid down the CRF Norms which should be followed.

If the incident is such that there may be a requirement of making payments concerning compensations and claims, the IC in consultation with the RO will activate a Compensation / Claims Unit and appoint a leader to collect and compile figures of loss of life and property etc. as provided by the relevant Government norms and directions. The leader in such cases should be advised to get photographs taken of the damages that may have occurred and even get the photographs of the dead victims and animals. He will also compile details of premises requisitioned, services and resources hired for which payments have to be made. These details should be sent to RO through IC for further necessary orders and payments.

The Com./CUL will:

1. collect all cost data and provide cost estimates;
2. prepare and maintain a list of requisitioned premises, services, resources and vehicles, etc. with correct date and time of such requisition;
3. follow appropriate procedures for preparation of claims and compensation;
4. requisition additional human resources, if required;
5. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to FBD; and
6. perform any other duties as assigned by the FBD.

6.6.4.3.4 Roles and responsibilities of Cost Unit Leader (CUL)

The CUL is responsible for collecting all cost data, and providing cost estimates. At the end of the response the CUL provides cost effectiveness analysis.

The CUL will:

1. develop incident cost summaries in consultation with the FBD on the basis of Cost Analysis Report;

2. make cost-saving recommendations to the FBD;
3. complete all records relating to financial matters prior to demobilisation;
4. maintain record of various activities performed as per IRS Form-004 (enclosed in Annexure-IV) and send to FBD; and
5. perform any other duties as assigned by the FBD.

6.7 Emergency Support Functions and Lead Agencies

The major Emergency Service Functions (ESFs) have to be managed by leading agencies with the supports of line agencies during emergency situation. Every ESF has a nodal organization in the State to lead the function assigned to it in coordination with other line departments without administrative delay.

ESF	Lead Agency	Supporting Agencies
Communication	MTNL/BSNL	NIC, Police/Revenue Wireless, HAM Reps, private telecom/ mobile operators/PRIs/ULBs/ Service Provider.
Evacuation	Police Dept.	Fire Service, Civil Defence, NCC, Army, NGO, SDRF/NDRF
Search and Rescue	Fire Dept.	Police, Civil Defence, NCC, Army, SDRF/NDRF, Paramilitary forces.
Law and Order	Police Dept.	Home guards, Civil Defence, Army, Paramilitary
Medical Response and Truama	Health Department/Directorate of health services	Major Hospitals, PHCs, Indian Red Cross, St. John Ambulance Brigade Civil Defence, NSS
Water Supply	Jal Board/Department of Water Supply	Municipal department/Urban Bodies, Irrigation and Flood Control, PHED
Relief (food & shelter)	Department of Revenue/Relief/ Disaster Management	Department of Food and Civil Supplies, Indian Red Cross, NGOs, Education department
Equipment Support debris road clearance	Municipal bodies	PWD, Paramilitary forces NGOs, Army
Help Line/ warning dissemination	Department of Revenue (EOC Control room)	NIC/NGO Reps
Electricity	Department of Energy	Department of power, Power companies
Transport	Transport Department	State Transport Corporation, Education Department PWD, Municipal bodies
Coordination	Department of Revenue,	Police, Fire, Civil defence

	Relief/Disaster Management	
Recovery, Relief and Rehabilitation	Department of Revenue, Relief/Disaster Management	PWD, Local Bodies.
Media Management	Department of Revenue, Relief/Disaster Management	Dept. of Telecommunication Dept. of information and Public Relation

6.8 Coordination with Armed Forces, Para Military Forces, Railway and Air Port Authorities

Immediately after a disaster the district administration will start its response works with its own available resources. If situation goes beyond its control then district administration seeks supports from State and National level. In this emergency situation State Government coordinates with Armed forces, Paramilitary forces, Air Port Authorities of India, Indian Railways and other organizations for search and rescue operation, relief management and temporary shelter arrangement for affected people.

The National Disaster Response Force (NDRF) located at Talegaon, Pune covers the Maharashtra State and it plays an energetic role in response and relief operations. This battalion is well equipped with skilled manpower and equipment and ready to response any disaster in the State. The Maharashtra government will take its supports as and when necessary. In normal time the NDRF helps the disaster prone districts in organizing capacity building trainings for various stake holders and in emergency situation it reaches at the spot to response on demand of the district/state. The district administration may directly contact the NDRF or go through the Chief Secretary and Secretary of Disaster Management Unit.

In extreme situation if supports of Armed forces require at that time the Chief Secretary will have to ask the national authorities for help.

As it is said in Response Mechanism chapter that the SDMA will adapt the IRS in its emergency response operation. If necessary, the State will take help of NDRF, Para Military Forces and Armed Forces in the time of emergency for search and rescue operations, relief and rehabilitation purposes. In order to make the operation works easier and effective the representative of NDRF, Armed Forces and Paramilitary Forces may be appointed as the Operation Section Chief (OSC). Under his leadership the Search and Rescue operations will be carried out. The role and responsibilities of OSC, Strike Team or Task Force Leader are given details in Response Mechanism chapter.

6.9 Involvement of NGOs, NSS/NCC, and Local Communities

In emergency response activities the voluntary organizations play an important role. They get involved in search and rescue operation, first aid service, food and shelter management, and relief works. Thus, the local communities, college NSS/NCC students, community-

based organizations, NGOs and INGOs will be involved in emergency activities to help the disaster affected people and the response personnel.

6.10 Temporary Shelter, Health and Sanitation

Immediately after disaster the search and rescue works get started on war footing basis, the rescued persons and affected families need to have temporary shelters with basis amenities. The shelter management teams have to take all necessary steps to arrange the temporary shelters in affected locations with the facilities of toilets, drinking water, light, food and security. The problems of women, children, elderly people and disable persons must be taken care of. The victim families would be provided candles, matches, water pouches, milk pockets, biscuits, potable gas stoves, first aid kits, and clothes.

6.11 Maintenance of Essential Services

Disaster causes a great damage to the infrastructures and disturbs the normal movement of the society. The basis essential services like electricity, water supply, communication, road links, and gas connection etc. need immediate attention of the administration to get restored. The concerned departments with the help of other supporting agencies must come forward and start working on priority basis.

6.12 Law and Order

In emergency situation the affected people and administration get busy in search and rescue operation and try to save the lives of maximum people. In such situation security needs to be stringent and police must have close look into the behaviors of criminals. People during disaster become hopeless and do not have time and patience to take care of their properties. Thus, police have to maintain law and order in disaster affected areas with great care and ensure that the belongings of people are safe.

6.13 Communication

Every stakeholder in emergency situation needs to be informed about the progress and constraints of response works. The govt. bodies, affected communities, media persons and voluntary organizations work together during emergency situation so district administration will have to set a communication desk to circulate the updated information to all and based on field information the State will also do same. Media management is important to control the panic in community and make the response activities more effective, systematic and fair. Through communication unit the authentic information go to media and let people to know what are the measures govt. is taking up, where and how the work is going on, what is the span of search and rescue operation and how community will get involved in this phase. Only effective communication help the affected people to stay with govt. connected and know govt. welfare schemes, relief measures, and financial supports.

6.14 Preliminery Damage Assessment

In the aftermath of a disaster the affected families and areas need assistance from government on priority basis. But it is difficult to meet the demands without proper damage assessment. In this regard the government departments and local authorities shall carry out

a preliminary need and loss assessment study under the guidance of district administration and allocate the available resources accordingly in affected areas. The loss and damage assessment report helps to deploy the limited resources properly without chaos. The district administration for this purpose shall develop some parameters as a result the affected people and the infrastructures will be restored in time.

6.15 Funds Generation

In Maharashtra, every district has its District Disaster Management Authority headed by Ditstrict Collector. Besides, government has made fund provision for all its 35 districts to undertake various disaster related activities in normal situation like organizing capacity building trainings, awareness generation programmes, strengthening EOC and purchasing of SAR equipments. In addition to it, Maharashtra government has also made budget provision for 10 Regional Disaster Management Centres in the State to take disaster management activities at city level.. For relief purpose the State government has provision at district level to provide all possible supports to the affected families immediately during emergency situation. In case of large disaster the government shall seek additional sources of funding through aid, grants, loans etc. If possible government may create special budget provision for mitigation, relief and rehabilitation purpose.

6.16 Finalizing Relief Pay Outs

The government of Maharashtra will take all possible efforts to help the victims of disaster without any discrimination of caste, creed, religion or sex. The relief package may include cash, materials, and other facilities specific to affected families. The district administration and local authorities will finalize the list of victims and share the same with the State and distribute the relief packages in free and fair manner without delay and disarray.

6.17 Post Relief Assessments

Upon completion of the response, relief and rehabilitation works of a disaster the post disaster assessment will be undertaken by the SDMA with the assistance from government departments, district administration and local authorities to document the best learnings and mistakes from the overall disaster management. In future, this assessment report will tremendously help the concerned authorities that how to handle the disaster management works in different phases effectively and how to minimise the risk.

Chapter -7

Partnership with Other Stakeholders

7.1 National Disaster Management Authority (NDMA)

Government of India has set up the NDMA at national level to deal with all policy and planning issues of disasters. Being an apex body it has prime responsibility of developing policies, plans and guidelines for disaster management and ensure their timely enforcement and implementation.The NDMA lays out the guidelines to develop the DM plans at different levels. It approves the National Disaster Management Plan prepared by National Executive Committee (NEC) and plans of the central ministries and departments. At national level any policy related to disaster management comes under the NDMA.Its involvement in every phases of disaster management is important. It takes such other measures as it may consider necessary, for the prevention of disasters, or mitigation, or preparedness and capacity building, for dealing with a threatening disaster situation or disaster.

It also oversees the provision and application of funds for mitigation and preparedness measures. It has the power to authorize the departments or authorities concerned, to make emergency procurement of provisions or materials for rescue and relief in a threatening disaster situation or disaster. It also provides such support to other countries in times of disasters as may be determined by the central government. The State keeps in touch with the NDMA for implementing various projects / schemes which are being funded through the Central Government. The State also appraises the NDMA about the action taken by the State Government regarding preparation of DM plans and implementation of guidelines issued by NDMA for various hazards from time to time.

7.2 National Institute of Disaster Management (NIDM)

The NIDM, in partnership with other research institutions has capacity development as one of its major responsibilities, along with training, research, documentation and development of a National level information base. It networks with other knowledge-based institutions and function within the broad policies and guidelines laid down by the NDMA. It organizes training of trainers, DM officials and other stakeholders as per the training calendar finalized in consultation with the respective State Governments.

7.3 National Disaster Response Force (NDRF)

For the purpose of specialized response to a threatening disaster situation or disasters/ emergencies both natural and man-made such as those of Chemical, Biological, Radiological and Nuclear (CBRN) origin, the National Disaster Management Act has mandated the constitution of a NDRF.

The general superintendence, direction and control of this force is vested in and exercised by the NDMA and the command and supervision of the Force is vested in an officer appointed by the Central Government as the Director General of Civil Defence and National Disaster Response Force. Presently, the NDRF comprises eight battalions and further expansion may be considered in due course. These battalions are positioned at different locations across the State.

NDRF units maintains close liaison with the designated State Governments and are available to them in the event of any serious threatening disaster situation. While the handling of natural disasters rests with all the NDRF battalions, four battalions are equipped and trained to respond to situations arising out of CBRN emergencies.

Training centres are also set up by respective paramilitary forces to train personnel from NDRF battalions of respective forces and also meets the training requirements of State/UT Disaster Response Forces. The NDRF units also impart basic training to all the stakeholders identified by the State Governments in their respective locations. In addition, the State Government also utilizes the services of the NDRF whenever required during emergency search, rescue and response.

7.4 Armed Forces (AF)

Conceptually, the Armed Forces are called upon to assist the civil administration only when the situation is beyond the coping capability of the State Government. In practice, however, the Armed Forces form an important part of the Government's response capacity and are immediate responders in all serious disaster situations. Army, Navy and Airforce have played very vital role in disastrous situaions of Odisha Super Cyclone, Uttarakhand Storm, and Jammu Kashmir Flood. Army and Airfoce of India closely also experienced the search and rescue operation, relief and reconstruction works of severe disasters in the country.

On account of their vast potential to meet any adverse challenge, speed of operational response and the resources and capabilities at their disposal, the Armed Forces have historically played a major role in emergency support functions. These include communication, search and rescue operations, health and medical facilities, and transportation, especially in the immediate aftermath of a disaster. Airlift, heli-lift and movement of assistance to neighboring countries primarily fall within the expertise and domain of the Armed Forces.

The Armed Forces also participates in imparting training to trainers and DM managers, especially in CBRN aspects, high-altitude rescue, watermanship and training of paramedics. At the State and District levels, the local representatives of the Armed Forces have been included in their executive committees to ensure closer coordination and cohesion in all aspects related to Disaster Management.

7.5 Airport Authority of India (AAI)

When disaster strikes, the airports are quickly overwhelmed with the tons of relief materials (like food, bottled water, medical supplies, cloths, tents, etc.) arriving from all over the world. This material is urgently needed to be in the field. In such cases, AAI should appoint senior officer at the airport for proper handling and distribution (which includes precise unloading, inventory, temporary storage, security and distribution of relief material) of relief material during disaster situation.

The AAI shall prepare and provide a list of equipments required for handling the material to either MSDMA or Secretary of Relief and Rehabilitation. The equipments will be procured and maintained through SDMA.

7.6 Indian Railways (IR)

Indian Railways is spread over a vast geographical area over 63000 route kilometers. Unlike in other countries where the role of Railways, in the event of a disaster, is restricted to clearing and restoring the traffic, in our country Indian Railways handles the rescue and relief operations. Railways are preferred mode of transport both for the movement of people and relief material in bulk, if accessible.

Railways should have a provision for transportation of mass community and proper handling and distribution of relief material (through special trains, if required) in their disaster management plan.

7.7 India Meteorological Department (IMD)

The role of IMD has already been discussed in previous chapters
The meteorological department undertakes observations, communications, forecasting and weather services. IMD was also the first organization in India to have a message switching computer for supporting its global data exchange.

In collaboration with the Indian Space Research Organization, the IMD also uses the Indian National Satellite System (INSAT) for weather monitoring of the Indian subcontinent, being the first weather bureau of a developing country to develop and maintain its own geostationary satellite system.

During the cyclone and flood seasons, the State Government keeps close contact with the IMD – Mumbai office for weather related forecasts. Earthquakes occurring in the State which are of magnitude 3.0 and above on Richter Scale are also reported by the IMD to the State Government immediately.

7.8 Indian National Centre for Ocean Information Services (INCOIS)

INCOIS is a national agency of the Government of India, under Ministry of Earth Sciences. It provides the coastal and ocean information services, supporting developmental and operational sectors like ports, fisheries, shipping, meteorology, environment, off shore and coastal zone management in addition to promoting advanced oceanographic research in the country.

INCOIS generates and disseminates near real time information on Sea Surface Temperature (SST), chlorophyll, Potential Fishing Zones (PFZ) advisories, tracking of oil spills, forecast economical shipping routes, and upwelling zones along the Indian coast, utilizing both remotely sensed and conventionally observed data.

The parameters envisaged for dissemination include wind, wave, current, mixed layer depth, heat budget and maps on coral reef, mangroves, shore line change and land use pattern. INCOIS thus, plays an important role in supporting the nation for sustainable development of the coastal and ocean sectors through ocean information services.

INCOIS has already put in place an early warning system for Tsunami through which it alerts the coastal States whenever an undersea earthquake of higher magnitude capable of triggering a Tsunami is reported.

7.9 State Fire and Emergency Services (SFES)

The State Fire & emergency Services are crucial immediate responders during any disaster. They are the first responders (during the Golden Hour after a disaster) and hence play a vital role in saving lives and property immediately after a disaster.

Threre are 10 Regional Disaster Management Centres (RDMCs) in the state working for city administrations. For purchasing of search and rescue materials there is budget provision with every RDMC. Along with SAR materials various capacity building trainings are also providing to different target groups. Trainings on fire safety and disaster management are imparting to all fire stations staff by RDMCs.

7.10 Institute of Seismological Research (ISR)

ISR is the only institute in India fully dedicated to seismological research and is on course on being transformed into a premier international institute in a few years time. ISR also does seismic microzonation of areas prone to earthquakes. They help the State Government in keeping a track on the seismic activities going on in highly seismic areas of the State through their state of the art monitoring network.They also provide consultancy services to various private companies in feasibility studies related to seismicity of the area prior to establishing a major project.

7.11 Media

The role of media, both print and electronic, is important in disaster management. During preparedness it may tremendeously help the people in awareness education, warning dissemination and evacuation, alerts government officials, and develops coordination among various stakeholders. During disaster media helps people to know updated information on rescue, relief operation and other arrangements. Certaily it also controls the panic and helps people to understand the graound reality and cooperate the government. Thus, media role is very sensitive and significant in preparedness, mitigation, response and recovery works.

Chapter -8

Reconstruction and Rehabilitation

In recovery phase both reconstruction and rehabilitation activities are carried out on priority basis. The post-disaster phase is more important to reconstruct the basic facilities and rehabilitate the victims properly. Primarily the local government bodies, private agencies, and target communities take maximum efforts to speed up the recovery works and help the victims to get the normal situation back.

Post disaster reconstruction and rehabilitation should pay attention to thefollowing activities for speedy recovery in disaster hit areas. The contribution of both government as well as affected people is significant to deal with all the issues properly.

- Damage assessment
- Disposal of debris and deadbodies
- Disbursement of assistance for houses
- Formulation of assistance packages
- Cases of non-starters, rejected cases, non-occupancy of houses
- Relocation
- Town planning and development plans
- Reconstruction as Housing Replacement Policy
- Awareness and capacity building
- Housing insurance
- Grievance redressal

8.1 Detailed Damage Assessment

In emergency situation a preliminary damage assessment is made to help the disaster affected families on priority baiss. In deed, such a study based on field reality helps a lot to allocate the available resources properly. But, relief and rescue operaion in response phase only lasts few days or weeks whereas recovery activities take a long time. The core activities under recovery phase are reconstruction and rehabilitation of disaster hit families. Thus, a detailed damage assessment study is highly important to take up any comprehencive recovery works in the field. On the basis of this study the felt needs of people in terms of

housing, amenities, and other infrastructures will be identified. In consultation with local authorities, affected families, local NGOs, government line agencies, and financial institutions the district administarion should a detailed damage assessment study. This study report will help the government to implement the recovery works properly without prejudice.

8.2 Corpse Disposal

Disposal of dead bodies is to be carried out as a part of the operation to prevent outbreak of epidemics. Minimum official requirements should be maintained as it is a very sensitive issue. The following points may be considered by the concerned authorities at the time of corpse disposal:-

- Mass photographs of corpses,
- Consent of the relatives or hand over to them
- Make a panchnama of concerned localities.

8.3 Housing Assistance

The basic problem immediately after disaster in disaster hit areas is housing. People who lost their houses will have tremendeous problem to stay and safe their properties from criminal elements. Government in this regard should be serious to restore the houses of the people without delay and discrimination. In order to speed up the restoration process all damaged houses a compensation package should be declared. Besides, the process of distribution of compensation should be free, fair and faster.

The following points may be considered in housing construction.

- Owner driven reconstruction
- Public Private Partnership (PPP)
- Joint possession of houses: names of the husband and wife.
- Houses should have insurance cover
- Financial, technical and material assistance provided by the government.
- Design hazard resistant houses considering seismic, flood & cyclone zone guidelines.
- Provide materials at subsidized rates.

8.4 Relocation of Disaster Affected Families

Relocation is a tedious issue for administarion. If disasater totally interrupted the base of the community at this situation a new location may be searched for rehabilitation of affected people. In fact, the affected communities do not feel comfortable to start their normal life in a new locations since they want to stay closed to their farmland, market place, water sources, education institutions, electricity and other basic facilities. As they are very dearer and nearer to their native villages it becomes ackward for their movement to new areas.

In this regard government should prepare the rehabilitation guideline in consultation with affected families and local authorities considering the nature of calamity and the extent of

damage. However, there should not be any extraneous factors in relocation process of affected people.The guideline may include people's consent, acceptable relocation package, getting due authorization for relocation, considering land use planning, completing land acquisition process and legal clearances, arranging livelihood measures for affected families and making provision of all basic infrastructures.

8.5 Approving Reconstruction and Rehabilitation Plan

Based on the detailed damage report the felt needs of disaster affected families will be identified and, on priority basis the government line agencies will develop their recovery plan including both reconstruction and rehabilitation works. The recovery plan must be time bound and systematic as a result the target communities will be settled properly without administrative delay and prejudice. The reconstruction and rehabilitation process needs intensive monitoring and supervison to get completed in time. So, every competent government authority should take close look on reconstruction and rehabilitation works. Every project or scheme designed for disaster affected groups must be technically approved from concerned authrority. However, throughout implementation of reconstruction and rehabilitation works the concerned department will take all technical supervision time to time.

8.6 Funds Arrangement, Dispersement and Audit

In recovery phase a series of projects will be taken up for reconstruction and rehabilitation works.Thus, funds will be required in huge amount. Besides, projects also need to be completed in time. The resource intensive projects are not ease to implement by State government alone in such disastrous situation. So, State government needs financial supports from Central government and other external agencies. For this purpose the government agencies will have to develop their recontrsuction and rehabiliataion plans properly as per the damage assessment report and submit to concerned authrorities accordingly.

The project funds received from Central government and other external funding agencies must be utilized as per their final instructions. Due attention must be given not to breach any instructions but to make the purpose success without any deviation. Proper mechanism should be in place to spend the budget. Every fund also to be audited as and when necessary.

8.7 Project Management

The State government with the help of local NGOs, voluntary organisations, private agencies and community people needs to develop a plan to implement the projects in disaster affected areas. Proper coordination at each and every stage of implementation is important to make resources and funds useful. For disaster devastated communities the nature of reconstruction and rehabililatation works are different in nature. The overall recovery phase covers a variety of issues like health, education, infrastructure, livelihood, agriculture, business, security etc. Every project should have a management plan including designing, planning, implementation, monitoring and supervision. For technical supervision the competent authority is to be involved.

The point that is to be given more importance in project management is to mainstream the disaster management in all development projects and make the community disaster resilient. In reconstruction works the safe construction practices are imporatant to incorporate. in this regard the following construction activities are vital.

- Retrofitting structures like houses, school buildings, hospitals, theatres and govt buildings
- Creation of disaster proofing dams, bridges, roads, canals, water towers etc.
- Restoration of infrastructure facilities – ports, airports, power stations, industrial and livelihood units etc.

8.8 Information, Education and Awareness

Coordination plays a vital role to make a number of stakeholders united and functional in implementation of a series of reconstruction and rehabilitation projects. Only effective communication helps people work together with better understanding. Thus, information, education and awareness activities should be undertaken by government departments, district administration and local authorities to disseminate all relevant measures related to reconstruction and rehabilitation of affected people, to help affected communities understanding and acquainted to their recovery plan, to collects necessary feedbacks, comments on on-going reconstruction and rehabilitation works.

Governemnt assistance during disaster and after disaster become more helpful to people. So, media management and public relation is neceaassry to convey the accurate information to public. All possible efforts should be taken to organsie considerable public awreness activities.

8.9 Public Grievance Redressal

In disaster hit areas people will come up with a number of grievances related to missing of people, death of people, lose and damage of property, restoration of basic infrastructures, misuse of relief materaisl, lack of medical assistances, livehood activities, and other facilities. It is in fact that the government to address all these issues properly. So, at different level government will set up public grievance desk to deal these issues. In this regard government would appoint officers to resolve such disputes with government rules. Appropriate dispute resolution mechanism with penalties for dealing with false claims will also be evolved to prevent misuse of assistance.

8.10 Social Rehabilitation

Disasters cause a lot of social problems. The number of disabled persons may be more after disaster. Government should provide health assistance to all disabled persons without dealy and discrimination. The following activities should be taken up seriously to assist the elderly people, women, children and other disables.

- Ensure artificial limbs fitted to affected persons.
- Provide modern wheelchairs and supportive devices to needy persons
- Ensure that the orphaned children are fostered.
- Set up Day centers to take care of children
- Establish orphanages
- Take care to set up child care helpline
- Ensure pensions given to aged persons
- Establish Old Age Homes
- Arrange physiotheraphy under continuous supervision of doctors
- Start women's Livelihood Restoration Project
- Link women with government self-employmnet scheme

Chapter -9

Mainsteaming Disaster Management in Development Plan

9.1 Mainstreaming DRR in Development Programmes/Projects/Schemes

Mainstreaming DRR means that risk reduction becomes a practice of all partners involved in development work by institutionalizing the process in planning and implementation and in policies.

The relationship between DRR and Development

Development and disasters have both positive and negative connections

- Development can increase vulnerability of people and assets if DRR measures are ignored. Poor land-use planning, environment mismanagement, lack of regulatory mechanisms and lack of enforcement of rules/regulations (Building by-laws/building codes/coastal zone regulations etc.) lead to unsafe development.
- Development process can also reduce the physical exposure to hazard e.g. earthquake resistant building code, flood protection measures etc. Development can reduce vulnerability if these factors are kept in mind.
- Disasters have the potential of wiping out and setting back years of efforts on development
- paradoxically, disasters also provide development opportunities in form of sustainable recovery

Good Practices

- Design of eco-friendly housing models under Indira Awas Yojana
- Strong emphasis on community, NGO participation in SSA and RMSA

- emphasis of decentralized decision making in Mahatma Gandhi National Rural Employment Guarantee Scheme
- Focus on mitigation efforts using MGNRGA funds
- Focus on PPP in JNNURM and UIDSSMT projects, especially in solid waste management
- Provision for entry-level activities to address local needs in NAP
- Availability of toilet designs suited to different geographical terrains under NBA
- Provision for increasing the eligible working days from 100 to 150 for disaster affected communities under MGNREGA
- Five percent of IAY funds are reserved to reconstruct houses of BPL families that are damaged in a disaster
- JNNURM propmotes mass rapid transportation projects (such as the Metro projects and CNG buses) using clean energies as a step toward decreasing the use of fossil fuels as well as the carbon footprint
- Local sanitation projects under UIDSSMT address issues of water logging
- Focus on mutual learning and lesson sharing in JNNURM and UDISSMT
- Adoption of the Enviroment Management Framework by RMSA
- Individuals over 60 are accorded top priority for allocation of IAYhouses in Maharashtra (16.3 per cent)

Entry Point Activities for Specific Projects

Indira Awaas Yojana

- Design and popularize low cost multi-hazard resistant housing designings
- Construct low cost multi-hazard resistant houses in all district and block headquarters to promote awareness
- Use the flexi fund to incorporate risk reduction features
- Coordinate the IAY construction with NBA and rural drinking water programme to ensure necessary amenities
- Train masons on hazard resistant construction practices

Mahatma Gandhi National Rural Guarantee Act

- Expand and strengthen drought proofing activities – plantation, water shed, water harvesting, check dam etc
- Implement effective flood proofing action including – homesteads, connecting roads and water drainages
- Establish a trigger mechanism to enhance the number of working days in case of disasters – construction of check dams, strengthening embankments

Pradhan Mantri Gramya Sadak Yojan

- Identify habitations that tend to get cut off during heavy rains as a part of village HRVA to priorities build connecting roads to such habitations

- National Rural Drinking Water Programme
- Design borewells that do not submerge during flood events and make it mandatory for flood prone areas

National Health Mission

- Community level health workers should be trained in DRR & Climate Change Adoptation
- Hazard resistant structures should be adopted in construction of new hospital buildings

Rastriya Krishi Vikash Yojana

- A number of action research projects exploring varieties of flood and salinity-resistant seeds should be under taken
- Farmers should be trained to track changes in weather pattern to anticipate their impacts on agriculture so that the necessary adaptive practices may be adopted

Sarva Shiksha Abhiyan and Rashtriya Madhyamik Shikshan Abhiyan

- Train habitation planning committee on DRR and CCA
- Using 10 per cent flexi fund prepare a list of activities that can be undertaken to strengthen DRR and CCA

9.2 Mainstreaming Issues with Govt. Departments

The issues of disaster mainstreaming which to be taken into consideration by concerned departments are given below.

Activities	**Responsibility**
To ascertain whether project involve any creation/ modification of structural/ engineering assets	➢ Line Depts. Irrigation - Power - Water supply - Health - Roads & Buildings - Education - Health - Others ➢ Dept. approving the project • Administratively • Financially • Technically ➢ Urban Development Authorities • PWD Dept • Irrigation Dept. • SDMA • Local Bodies
To ascertain the possible risks, likelihood and impact from disasters due to the location of project sites	
To ascertain whether probable risks have been prioritized and the mitigation measures being contemplated, both structural and non-structural measures	
To ascertain whether the design and engineering of the structure has taken into consideration the National Building Code 2005, the appropriate Bureau of Indian Standard (BIS) Codes, other applicable sources as per the type of the project and the NDMA guidelines	
To ascertain whether the process of risk assessment has been done based on available information and secondary evidence	
Impact Assessment of project (damage that can be caused to the project by natural disasters, design of the project that could accentuate the vulnerability of the area to disasters	➢ Line Depts.

and / or lead to rise in damage / loss of lives, property, livelihood and surrounding environment),	Irrigation - Power - Water supply - Health - Roads & Buildings - Education - Health - Others ➢ Dept. approving the project • Administratively • Financially • Technically ➢ Urban Development Authorities • PWD Dept • Irrigation Dept. • SDMA • Local Bodies
• Risk assessment of project • Vulnerability assessment of project (Evaluation of site with regards to parameters such as probable maximum seismicity, probable maximum storm surge, probable maximum wind speed, probable maximum precipitation, probable maximum flood discharge and level, soil liquefaction proneness under probable earthquake intensities) • Review of land use management, Building Code /Building use regulation, Directives and Legislation	
Details about the location of the project, proneness of the project area to various hazards and analysis of impact on safety of the project.	
Impact of the project on the environment and the surrounding population with respect to the type of the project and adoption of mitigation measures to reduce the impact of the same	

Chapter -10

Disaster-Wise Action Plan

10.1 Flood

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.Maharashtra is majorly vulnerable to floods. Also, floods are not just restricted to one particular region, but are spread all over the state. Maharashtra, therefore, exhibits a high proneness to floods. Most floods occur during monsoon and hence, the accompanying damage such as deaths due to lightning, landslides, house crashes and drowning have been commonly reported from most districts. Analyzing the floods in Maharashtra, one observes that most floods in Maharashtra are flash floods due to nallah-overflows and poor drainage systems. Very few floods, like the one in Konkan in 1983, are due to heavy rains in the region.The floods of 2005 and 2006 have shown that almost all the districts in the State are vulnerable to floods. All districts in the State except Ahmednagar, Beed, Solapur, Latur, Osmanabad, Jalna, Aurangabad, and Buldhana are flood prone. This puts a majority of the population in the State vulnerable to floods.

10.1.1 Onset Type

Floods may happen gradually and takes hours, or can even happen suddenly due to breach of the structures, spillover etc. heavy downpour can cause flash floods in the region.

10.1.2 Disaster Declaration

IMD, Mumbai and Nagpur predict heavy rainfall warning for Maharashtra state. Based on the information, and assessing the rainfall of catchment area, water level of rivers and dams the water resource department declars flood disaster for affected areas in the state.

10.1.3 Early Warning

Community based flood forecasting and 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. The way in which messages are disseminated in communities will depend on local conditions, but may include some or all of the following:

- Media warnings (print and electronic)
- General warning indicators, for example sirens
- Warnings delivered to areas by community leaders or emergency services
- Dedicated automatic telephone warnings to at-risk properties
- 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
- 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
- A community-based warning system to pass any information about an approaching flood to every family.

Involvement of communities in data collection and local flood warning systems

If communities become involved in data collection for flood forecasting, and the importance of their role is understood, a sense of ownership is developed. Individuals can be appointed for the following tasks:

- Taking care of installations/ equipments
- Trained as gauge readers for manual instruments (rain gauges, water level recorders)
- Radio operators to report real-time observations

Trained individuals within the community should be able to gather and update information to:

- Know the depth of past severe floods in the local area
- Know the causes of flooding in the local area
- Know how quickly the waters might rise
- Know how long the floodwaters might remain in the locality
- Know the direction of movement of the floodwaters
- The involvement of members of the community also helps to prevent vandalism and damage to installations going unreported.

Procedure for disseminating warnings to remote areas

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 predefined links with communities in remote areas. This should include;

- Local radio, which should be supplied with clear and accurate information
- Use of appointed community wardens with direct two-way radio or mobile telephone access to warning agencies and emergency authorities
- Local means of raising alarms, for example church bells, sirens, loud hailers, loudspeakers 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;
- High Priority Telegram
- Doordarshan and the local cable channels (TV channels & radio Channels including FM radio)
- Bulletins in the Press
- Satellite Based disaster Warning Systems
- Fax ,Telephone

10.1.4 Trigger Mechanism: plan Activation

The flood response system will be activated on the occurrence of a heavy rain. The Secretary of R & R will activate all the Departments for emergency response including the State EOC, other control rooms at the state level as well as district control rooms with full strength. He will issue instructions to include the following details:

- Specify exact resources required
- The type of assistance to be provided
- The time limit within which assistance is needed
- The state, district or other contact persons/agencies for the provision of the assistance
- Other Task Forces with which coordination should take place

Once the situation is totally controlled and normalcy is restored, the Secretary R & R declares End of Emergency Response and issues instructions to withdraw the staff deployed in emergency duties.

10.1.4 Roles and Responsibilities

s#	Response to be taken	Responsibility
1	**Flood Alert and Warning and Preparation** ➢ Receive rain fall warning from IMD website ➢ Communicate the warning to State authorities, all district collectors, and other stakeholders ➢ Ensure control rooms are on readiness position at all level ➢ Keep the manpower, equipments and critical supplies on standby position	State Emergency Operation Centre (SEOC) Sectretary R & R Director, DMU

	➢ Make provision for immediate evacuation of affected people to safer places ➢ Ensure food, water etc. are sufficiently arranged in affected areas ➢ Ensure all affected people will be evacuated in time and provided basic facilities in temporary shelters	
2	**Flood Declaration** ➢ Based on rainfall monitored by various agencies like IMD, CWC rainfall stations, State Irrigation Department, Central Water Commission and Agriculture Department the State Water Resource Department declares flood in affected areas. ➢ Report the occurrence of flood to Secy. R & R, MSDMA, Heads of line departments, Chief Secretary and Chief Minister's office and National Disaster Management EOC, GoI.	State Emergency Operation Centre (SEOC) Water Resouce Dept.
3	**Arrange Alternative Emergency Communication** ➢ Establish communication links by alternate communication equipments like phone, radio etc. in state/district EOC and Taluka control rooms. ➢ Deployment of Mobile Emergency Communication Units to affected areas for establishing communication links	State Emergency Operation Centre (SEOC)
4	**Emergency Meeting and Response Measures** ➢ Hold first meeting with Duty Officers of EOC ➢ Contact the Heads of all the line departments to reach State EOC ➢ Contact to district collector/s and take the emergency requirement report ➢ Dispatch of Search & Rescue teams to the affected areas. ➢ Report the Chief Secretary on the situation ➢ Contact the NDRF team if situation worsens ➢ Make arrangements for the aerial survey of affected areas	Secretary R & R
5	**Search and Rescue Operation** ➢ Deploy search and rescue teams in affected area ➢ Rescue and shift people to safer places ➢ Maintain law and order in affected areas ➢ Ensure medical treatment of flood victims	Secy. R & R Secy. Home Secy. Health
6	**Post Flood Situation** ➢ Prepare damage assessment report ➢ Ensure proper collection and distribution of relief materials ➢ Prepare the list of missing people, death and injured persons ➢ Take necessary steps for carcass management ➢ Restore and repair the basic infrastructures ➢ Develop reconstruction and rehabilitation plan	Revenue. Agriculture, PWD, Police, Health, Municipal Corporations,

Department-wise relief works

s#	Response to be taken	Responsibility
1	➢ Providing temporary shelters to evacuated persons	PWD, Revenue Dept.
2	➢ Providing food materials to the victims ➢ Providing fodder and animal feeds	Revenue, Civil Supplies Animal Husbandry
3	➢ Providing safe drinking water to the victims	Water Supply Dept.
4	➢ Provision of hygienic sanitation facilities	Health Dept., NGO, Community groups
5	➢ Provision of health assistance	Health Dept.
6	➢ Clothing and utensils	Civil Supplies
7	➢ Relief camps	PWD, Revenue Dept.
8	➢ Providing transport services to shelter sites	Revenue Dept. Transport Dept.

10.1.6 Relief Measures

Short-term relief measures

- Provide dry rations for home cooking.
- Supply clean and safe water for drinking, cooking and personal hygiene.
- Supply adequate of medicines, disinfectants, fumigants etc. to check outbreak of epidemics
- Distribute sufficient clothing materails, cooking and eating utensils.
- Provide 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.
- Relief camps also provide ***good temporary arrangements*** for people affected by flood. Adequate numbers of buildings or open space should be identified where relief camps can be set up during emergency.

Interim Relief Measures

- 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).
- 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 Dept.)
- 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 Dept.)

- Unclaimed/unidentified dead bodies to be disposed off with the help of pre identified voluntary Agencies at the earliest after keeping their records. (Home Dept., Revenue Dept., Health Dept. & Local Bodies)
- Additional manpower to be deployed in the affected areas for supplementing the efforts of the local administration. (GAD).
- Separate Cell to be established at state/district/taluka level to coordinate with the NGOs and outside donor/aid agencies. (Revenue Dept.)
- Regular meetings of the different stakeholders/departments should be organized at state level for sharing information, developing strategies for relief operations. (Secy. DM & Collectors at District Level).
- Information & Public Relation 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.

Assessment of Damage/Loss and Relief needs

- The Secy. R & R to issue instructions to the district collectors to provide the Need Assessment Report. The Secy. DM should consolidate the same and to prepare "State's Need Assessment Report".
- The Secy. R & R to issue instructions to the District Collectors to provide the Damage and Loss Assessment Report. The Secy. R & R to consolidate the same and to prepare State's Damage and Loss Assessment Report which will be useful in planning and implementing the relief operations for disaster victims.
- Adequate manpower, vehicles, stationery etc. should be provided to supplement the efforts for need/loss assessment. (Secretary of R & R Dept.)
- The relief need assessment report should be provided by the Collectors. (Secy. R & R & Collectors)
- Identification and demolition of dangerous structures in the affected areas to minimize further loss of life and injuries. (PWD Dept., Revenue Dept and Local Bodies)
- Arrangements for distribution of gratuitous relief and cash doles. (Revenue Dept., Panchayat & Rural Housing Dept., UD Dept. and Collectors) *(Sorce: SDMP Gujrat)*

10.2 Drought

Drought is a natural hazard that differs from other hazards since it has a slow onset, evolves over months or even years, affects a large spatial extent, and cause little structural damage. It is a creeping disaster.

It has broken the backbone of the farmers in Vidarbha or Marathwada regions in Maharashtra. Since 2012, farmers in two regions are badly affected. Falling rainfall levels, falling ground water levels, drying wells, rivers abd reservoirs and poor agricultural production warn the onset of drought.According to Indian Meterological 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.

10.2.1 Onset Type and Warning

Its onset and end and severity are often difficult to determine. Droughts are a normal part of climate variability for virtually all regions, it is important to develop plans to deal with these extended periods of water shortage in a timely, systematic manner as they evolve. Experience has shown that the democratic from of governance has handled droughts more efficiently than others, as demonstrated by the situation in India before and after independence.Like other hazards, the impacts of drought span economic, environmental and social sectors and can be reduced through mitigation and preparedness.

10.2.2 Authority

The Department of Agriculture of Government of Maharashtra is the nodal agency in the State to declare a situation as drought disaster consideining all the parameters set for it.

10.2.3 Drought Type

There are three kinds of drought: meteorological drought, hydrological and agricultural drought. *(Source: threeissues.sdsu.edu)*

1. **Meteorological drought** is related to shortage of rainfall. It occurs when the seasonal rainfall received over an area is less than 25% of its long term average value. It is called moderate if the deficiency in rainfall is in the range of 26-50%. It is called severe when the deficit exceeds 50% of the normal.

2. **Hydrological drought** is caused due to deficiencies in surface and sub-surface water supplies. Such a situation may arise irrespective of average or above average rainfall. For, it is caused by indiscreet usages of water by an ignorant and careless population.

3. **Agricultural drought** is caused by the combination of meteorological and hydrological droughts. It occurs when soil moisture and rainfall both are inadequate during the crop growing season. For, water demand of crops depend on the prevailing weather conditions, biological characteristics of the specific crop, its stage and rate of growth and the physical and biological properties of the soil where crop plantation happens to be. Thus, agricultural drought is caused by a combination of heterogeneous factors oked by chances together—meteorological, hydrological, plant, weather and soil. Besides, agricultural drought is also caused due to excessive sensitivity of agriculture to seasonal cropping with a weekly rainfall. Deficiency of even 5 cm from mid-May to mid- October (the Kharif season) may cause drought. Poorly drained soil with mineral deficiency needs constant watering before the monsoon and after the monsoon. In fact, during the period of sowing of kharif crops, and rabi crops , soils have to be kept sufficiently moist by watering, otherwise the yield is adversely affected.

10.2.4 Typical Effects of Drought

Drought is a creeping disaster. Its onset is difficult to demarcate and so also its end. Delay in the arrival of monsoon, failure of monsoon, irregular and scanty rainfall during kharif, falling of groundwater level, drying of wells and reservoirs and deficit in paddy

plantation indicate the onset of drought. Its impacts are generally non-structural and, therefore, difficult to quantify on immediate basis.Its spatial extent like that of floods denotes its severity. The fall in groundwater level, less food production, availability of less fodder for animals, migration of labourers, water crisis determines its long-term impact. Its impacts like those of floods are cumulative and its continuance over a period or season magnifies the impact manifold.

Drought unlike other hazards does not cause any structural damages. The typical effects include loss of crop, livestock, timber, fishery production, food shortage, dehydration, loss of life, increased poverty etc.In fact, the impacts of drought are generally categorized as economic, environmental and social. *(Source: threeissues.sdsu.edu)*

1. Economic impacts

Economic impacts denote loss of production in farm sector and also in nonfarm sectors like- forestry, fisheries, poultry, livestock because they depend upon surface and sub-surface water supplies. These losses result in loss of income and purchasing power among those rural people who depend on these for their livelihood. The processing industries based on agro- products suffer losses due to reduced supply of agro-products or supply at enormously increased prices. And losses both in primary and secondary sector result in unemployment, loss in revenue etc.

2. Environmental impacts

Environmntal impacts are seen in the depletion of flora and fauna due to reduced availability of water both for feeding and drinking the wild life habitats with the loss of forest cover, migration of wild life and their increased mortality due to preying by starving population. Continuance of drought for a longer period may result in the loss of biodiversity.

3. Social impacts

Social impacts are seen in the large scale migration of the population from the drought affected areas to areas less affected, thereby causing dissensions. Children prefer doing some wage earning rather than going to school. People start selling their possessions to manage two times meal for the family. The social status and dignity get compromised. Inadequacy of food supply causes starvation. Inadequacy of water supply generates social conflict. Thus the social capital and moral economy, the woof and warp of social fabric, is tattered and reduced to pieces.

10.2.5 Roles and Responsibilities of Govt. Deparments

Department of Disaster Management

- Drought being a slow on-setting hazard, response to it may be coupled with mitigation measures to hold it from further intensification
- Encourage Water Resources Department, Department of Minor Irrigation, Department of Agriculture and other specialized agencies to take up drought prevention and mitigation measures.
- To coordinate with Urban Development Department/Panchayati Raj Department/Rural Development Department/PWD/ Education Department/Health Department etc for

promotion of rain water harvesting measures as a drought prevention measure and encourage them

- To incorporate rain harvesting measures in all building construction works undertaken by the State Government.
- Work out drought prevention, mitigation and preparedness measures in association with Department of Agriculture, Rural Development Department and Department of Environment and Forest & through other specialized agencies.

Department of Agriculture

- Identification of drought prone areas through GIS mapping, rainfall estimation etc.
- Survey and study of identified drought prone areas
- Formulation of prevention, mitigation and preparedness measures along with budget allocations
- Formulation of policy and strategizing the implementation of rain harvesting programme & activities
- Working out Crop Contingency Plan
- Providing Agriculture Input subsidy
- Strategizing the storage and supply of seeds, fertilizers and pesticides
- Working out ecological betterment of the organizing the irrigation facilities
- Working out alternative cropping programme and activities

Department of Minor Irrigation

- Identification of drought prone areas, availability of water resource in the area, level of ground water in the area.
- Formulation of prevention, mitigation and preparedness measures.
- Strategesing the cropping pattern in association with gepartment of Agriculture and Creation of Irrigation facilities accordingly.
- Monitoring and supervision of the watershed and rain water harvesting facilities in the drought prone areas.

Department of Water Resources

- In association with the Department of Minor Irrigation,integrate its preventive & mitigation measures with those of Department of Agriculture for prevention, mitigation andpreparedness for drought

Department of food and Consumer Protection

- In consultation with Department of Disaster Management, setup centres for supply of food grains on subsidized rates or free, as decided.

Department of Health and Family Planning

- Organise medical camps in affected areas.
- Checklist of medicines and medicals facilities to have in the camps.
- Arrangements for the running of the camps on long term
- Arrangement of provisions for the medical staff manning the camps
- Making arrangements for community centered medical services rather than camp centered services.

Department of Public Health

- Installation of extra hand pumps to sustain the supply of drinking water
- Formulating rain harvesting practices and promoting the same in vulnerable areas.

10.2.6 Drought Mitigation Measures

Both structural and non-structural measures can be taken to mitigate the drought situation. As drought is directly related to water, soil and crop, priority must be given to manage these to minimize its effect.

Structural Measures

A.Water Management:

In the land of flooding rivers, if drought is a recurring feature then surely, it is a clear-cut case of poor water management. Keeping in view the drainage and irrigation as interdependent to maintain the quality of soil, following water conservation related measures are required to be taken in drought prone areas:

Construction works

- Construction of dams, reservoirs, lift irrigation, water sheds, tube wells and canals for surface irrigation
- Construction of percolation tanks, check dams, farm ponds, etc.
- Digging of recharge wells and water harvesting structures to conserve water through rain water harvesting and by developing the culture of roof water harvesting in each household.
- Spring water harvesting by diverting hill streams through small excavated channels, for irrigation and domestic use.
- Construction of warehouses and cold storages for preservation/storage of food grains.

Repairs, upgradation and strengthening

- Repairs, upgrading and strengthening of dams, reservoirs, lift irrigation and canals for surface irrigation
- Repair, upgrading and strengthening of percolation tanks, check dams. farm ponds, etc.

B. Soil Management:

The other factor responsible for drought conditions in Maharashtra is the nature of soil for which the first and foremost measures to be taken are:

- The use of organic fertilizers which not only enriches the soil with minerals but also slowly but surely enhances its water holding capacity. Besides, the use of organic fertilizer gets better values of the products in the market, specifically in the developed countries.
- Afforestation which helps in both water and soil conservation.Such plants that have shorter growing period should be preferred.

It helps the soils in enhancing its capacity to hold water and prevents erosion. It is also said to be the best method to contain the spread of drought.

C. Crop Management:

The third factor responsible for agricultural drought is kind of cropping being done. There are cropping patterns that help in soil conservation as well as in getting better farm yield.They are:

- Strip cultivation: Consist of cultivation of different crops in different strips simultaneously.
- Cover Cropping: In plantation fields where gestation period of trees is long., creeper crops are planted which spread fast and provide cover to the top soil and thereby conserve it.
- Crop rotation: Instead of grooming the same crop in the same field every year which tends to exhaust the same kind of mineral in the soil, as well as the moisture content in the soil. By rotating different types of crops soil fertility and moisture contents both are preserved.
- Alternate cropping: In deficit and/or irregular rainfall situations, alternate crops requiring less irrigation like maize, toria etc need to be sown.

D.Other Measures

Technol Legal

- Enactment and enforcement of laws regulating ground water level and exploitation of natural resources.
- Application of advanced agro-science technology and agro-engineering inputs to improve agriculture production

Forecsting and warning

- Strengthening and up gradation of existing drought forecasting system
- Establish infrastructure for drought warning and dissemination

Non-Structural

Capacity Building

- Departmental drought contingency plan
- drought related departmental action plan and SOP
- Imparting training to the stakeholders involved in drought mitigation and management
- Encourage people to use advance technology for drip and sprinkler irrigation
- Encourage water harvesting
- Encourage farmers to understand crop pattern to be adapted in their areas.
- Rational use of fertilizers and pesticides.
- Encourage the adaptation of technique for preservation of green folder

Awareness

- Dissemination drought risk to general public residing in drought prone zones
- Campaign for drought tips for agriculture, general public and industries
- Motivate farmers to adapt the drought resistant crops, new technology and off-farming activities

10.2.7 Relief Measures

- Ensure immediate supply of drinking water, food grains, and fodder
- Supply all necessary medicines and suppliments for children, women and other poor communities
- Distribute preventive animal health inputs for the time bound overcoming of desease challenges
- Provide off-faming business supports to needy families
- Sustenance funds to victim families for childrens education, health and purchasing daily needs.
- Government takes effective steps to control the market price of basic goods rice, wheat, pulses, edible oil etc.
- Ensure all government welfare schemes, projects and programmes are implementing properly in the drought prone areas.
- Make sure that agricultural products providing by government are reaching to the target beneficiaries without discrimination and administrative chaos.
- Strengthening local natural resource management
- Promoting conflict resolution mechanisms

10.3 Earthquake

Earthquakes in Maharashtra show major alignment along the west coast and Western Ghats region. Seismic activity can be observed near Ratnagiri, along the western coast, Koyna Nagar, Bhatsa and Surya areas of Thane district. Latur earthquake in Maharashtra occurred on Sept. 30, 1993 of 6.3 magnitude and caused a huge loss of lives and properties.

10.3.1 Onset Type and Warning

Earthquake is a sudden onset hazard. They occur at any time of year, day or night, with sudden impact and without any warning sign. There is no accepted method of earthquake prediction as on date

10.3.2 Disaster Declaration

Based on the information on occurance of earthquake in certain areas from local authority/district collrctor the SDMA declars as earthquake disaster affected areas.

10.3.3 Trigger Mechanism: plan Activation

An earthquake of magnitude 5 or more is likely to cause deaths and injuries to human beings and damage to all kinds of property, both private and public. Unfortunately there is very little warning available before the earthquake. Therefore planning should cater for a quick response at all levels to reduce the effects of the earthquake to the minimum. The Revenue department of the State will be the nodal department for formulating, controlling, monitoring and directing measures for earthquake preparedness, organizing rescue, relief and rehabilitation. All other concerned departments should extend full cooperation in all matters pertaining to the management of the earthquake disaster whenever it occurs. The occurrence of an earthquake may be reported by the Indian Meteorological Department (IMD) / National Geophysical Research Institute (NGRI) / Institute of Seismological Research (ISR) to the State Authority by the fastest means.

The State Crisis Management Committee (SCMC) under the chairmanship of the Chief Secretary should be activated immediately on the occurrence of any major earthquake. Besides these, the SEOC also receives reports on the earthquake from district and taluka levels. On receipt of the information, the SEOC verifies the authenticity of the reports and will inform the real situation to concerned authorities. The State government may, by notification published in the official gazette and in any one or more news papers having widest circulation in the area, declare such area to be disaster affected area.

10.3.4 Response Mechanism

Information and reporting:

- The agencies who provide information to the SEOC about the occurrence of an earthquake in the State are as shown below:

  - Indian Meteorological Department (IMD) , Mumbai
  - Institute of Seismological Research (ISR)
  - National Geophysical Research Institute (NGRI)
  - District Emergency Operation Centre (DEOC)

- The SEOC should be activated for emergency response on the occurrence of any major earthquake. The SEOC should initiate following activities:

  i. State EOC should report the occurrence of a major earthquake to the following:

     - Secretary and Director (Disaster Management)
     - Principal Secretary (Revenue)
     - Chief Secretary of the State
     - Members of State Executive Committee
     - Chief Minister
     - Revenue Minister
     - National Disaster Management EOC at MHA, GoI
     - Vice Chairman, National Disaster Management Authority (NDMA)
     - Secretary, MHA

ii. State EOC to alert state search and rescue machinery for emergency response as also fire brigade personnel.
iii. State EOC to verify the authenticity of the information from authorized scientific agencies as well as district and Taluka control rooms.
iv. State EOC to contact its regular and emergency staff to report immediately.
v. All Secretaries of the State Departments to be contacted to be available in the EOC immediately.
vi. State EOC to remain in constant touch with control rooms at national, district and taluka level.
vii. Overall management of state EOC shall be taken over by the Secretary and Director of State Disaster Management Unit.

- On receipt of information, Secretary and Director of DM Unit to:

  - Contact all member of Crisis Management Group to inform them about the venue and time of first meeting (chaired by Chief Secretary) to assess the situation and decide the course of action to be adopted by the State government.
  - Issue instructions to all departments to ensure that all state government employees to report for duty immediately in order to execute their responsibilities as mentioned in their departmental Earthquake Management Plan.
  - Instruct all line departments to ensure their duty officers to remain available round the clock in state EOC with full updated information of the activities of their departments.
  - Adapt the IRS to respond the emergency situation and start SAR operation
  - Prepare and submit daily situation report to Government of India, Chief Secretary, Principal Secretary (R & R), Chief Executive Officer, State Disaster Management Authority etc.
  - If necessary depute senior state level officers to worst affected talukas for effective implementation and supervision of Relief Operation.
  - Mobilize additional manpower from the departments to the affected district / talukas for supporting the Relief Operation. They should be provided task force action Plans of the concerned talukas / district prepared earlier.

- Management of Media (Press/TV Channels/Government Press Notes) to be carried out by the Secretary (Information & Broadcasting) with special emphasis on rumour control. He shall maintain constant liaison with Principal Secretary of Relief Rehabilitation.

Restoration of lines of communications and essential services to facilitate emergency response:

- Establishment of Emergency Communication
- Restoration of Communication Links (Rail, Road & Air)
- Restoration of power and electricity
- Supply of safe drinking water
- Restoration of essential lifeline infrastructure

Search, rescue and medical assistance

- Identification of areas where SAR Teams to be deployed
- Coordination of SAR teams for their quick deployment in allotted areas
- Provision of quick transport of SAR teams to affected areas.
- The department of Transport to evolve a mechanism for clearing access routes and debris in order to facilitate search and rescue operations.
- Mobilization of specialized equipments and machinery to affected areas.
- Cordoning of affected areas with control of entry and exit.
- Traffic Management by establishment of traffic points and check-posts.
- The Home Department to evolve a mechanism for providing security of properties of government and public in the affected areas.
- Setting up of field hospitals in the affected areas and deployment of mobile hospitals.
- Arrangements to be made for quick transportation of injured victims to the hospitals.
- Secretary (Health) to evolve a mechanism for speedy treatment of casualties.

Emergency relief (shelter, food, clothing, etc.)

a. Establishment of Temporary shelters for evacuees.
b. Ensuring provision of essential services as under:
   - Arrangement for food, clothing, blanket/bedding, drinking water, sanitation and hygiene, lighting arrangements and essential medicines.
   - Deployment of mobile hospitals in affected areas for treatment of victims.
   - Providing counselling services to the earthquake victims and their relatives.
c. Arrangement for providing transport facility to send dead bodies of non-locals to their natives. The administration should also ensure Law and Order during shifting of the dead bodies.
d. Ensure establishment of communication link between the affected people and their relatives outside.

Emergency Response Phase (First 72 Hours of the Incident)

S#	Task	Responsibilities
1	**Occurance of Earthquake and Information Dissemination** ➢ Verify the authenticity of the incident from agencies like IMD, ISR, and also from District / Taluka control rooms, Police and Fire Brigade control rooms ➢ Report the occurrence of earthquake to Director DMU, Secretary R & R, CEO - SDMA, Heads of all line departments, Chief Secretary and Chief Minister's Office and National Disaster Management EOC at MHA, GoI ➢ In case of L-2 level event, overall management of SEOC shall be taken over by Secretary R & R	Dy. Secretary (SEOC)
2	**Emergency Communication** ➢ Establish communication link by activating alternate communication equipment i.e. satellite phone, HF /	Dy. Secretary (SEOC) Duty officer (I

	VHF set, HAM Radio, VSAT etc. in State / District EOCs and Taluka control rooms ➢ Instruct to deploy the Mobile Emergency Communication Units to affected areas for establishing communication link	& P)
3	**Holding Emergency Meeting** ➢ Hold first meeting with Heads of all line departments and inform them to send responsible officers to SEOC. ➢ Alert Emergency Rescue Teams for quick mobilization to affected areas ➢ Inform GAD to ensure all State Government employees report for emergency duties within half an hour ➢ Senior State level officers to be deputed to the affected areas ➢ Contact Ministry of Defence for aerial / satellite imageries of the affected areas	Secretary R & R
4	**Deployment of Task Forces** ➢ Dispatch of Search & Rescue teams with equipments and materials to the affected areas ➢ Quick Medical Response Teams to the affected areas ➢ Request for the services of NDRF and Armed forces, if required through designated representative ➢ Activate Operations Section of IRS for Emergency Response Operation ➢ Instruct both regular and emergency staff of EOC to report for duty ➢ Instruct Quick Assessment Task Force to submit preliminary need and loss assessment report of the affected areas ➢ Make arrangements for aerial survey of the affected areas ➢ Instruct local administration to evacuate victims to safer sites	Secretary R & R, Secretary Health, Collector, Municipal Corporation
5	**Meeting with Crisis Management Group** ➢ 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 ➢ Crisis Management Group to assess situation, delegate responsibilities for organizing rescue and relief operations	Secretary R & R,
6	**Interdepartmental Coordination** ➢ Request may be made for assistance from Central	Chairman, SEC,

	Government (MHA and MOD), if required. Request the nearest headquarters of the Armed Forces to render assistance in emergency search, rescue and relief operations ➢ Inform Secretaries of the departments to provide necessary logistics support to emergency operation task forces ➢ Assess the conditions of road, rail and air communication link for quick mobilization of Emergency Teams and resources to affected areas and take follow up actions. ➢ Director, Information and Secretary - (I & P) to establish media management / information cell for public information, guidance and rumor control ➢ Inform Secretaries of the departments to provide necessary logistics support to emergency operation task forces ➢ Make suitable transportation arrangement for mobilization of quick response teams to the affected areas ➢ Maintain constant touch with the National / District and Taluka EOCs	Secretary R & R, Secretary Transport, Secretary (I & P)
7	**Assistance from External agencies** ➢ Contact private / public sector agencies in the State to assist in emergency rescue and relief operations ➢ If necessary, assistance may be asked from neighbouring states and outside agencies. ➢ Set up separate desks for each operation task force and NGO coordination desk in the SEOC for coordinating emergency operations ➢ Set up separate desks for each operation task force and NGO coordination desk in the SEOC for coordinating emergency operations	Chief Secretary, Secretary R & R, Director DMU
8	**Maintain Law and Order** ➢ Provide security in affected areas and maintain law and order situation ➢ Instruct to cordon affected areas and setting up of check posts to control entry and exit ➢ Open access routes and manage traffic for mobilization of equipment, machinery and volunteers to the affected areas ➢ Ensure safety and security of personnel deputed in affected areas for emergency response operation	Secretary Home
9	**Media Management** ➢ Instruct district information officers to establish information centre near affected areas to provide	Chief Secretary Secretary R & R, Secretary I &

	guidance to volunteers and aid agencies ➢ Establish Press / Media Centre for media management and information dissemination ➢ Arrange for press / media release for rumour control and public information and guidance ➢ Establish information centres at the arrival and departure points especially at the airports, railway stations and interstate bus terminus ➢ Prepare and circulate the situation report and prepare press notes twice a day	P
10	**Treatment of Injured persons** ➢ Alert all major hospitals to make necessary arrangement for treatment of injured ➢ Set up field hospitals near the affected areas & arrange to shift injured persons to field hospitals	Director DMU
11	**Relief Materials** ➢ Establish relief coordination centre at the airport, railway station, etc. for arrival of Search & Rescue and Medical Teams coming for humanitarian aid ➢ Establish central relief coordination centre nearer to State Head Quarters ➢ Mobilize relief materials i.e. tents, food materials, water, essential medicines, blankets, etc. to the affected districts and talukas ➢ Instruct district collectors to establish relief coordination centre and godowns near affected area and provide full security cover as well ➢ Arrange for distribution of cash doles to the victims	Secretary I & P and Secretary R & R, Secretary Transport, Secretary Civil Supplies, Collectors, Municiplities
12	**Temporary Shelters** ➢ Arrange to shift evacuated persons to temporary shelters and ensure provision of food, water facilities, blankets and storage of relief materials	Secretary R & R Collector/s
13	**Restoration of Essential Services** ➢ Restore essential services i.e. power, water supply, telecommunication facilities of SEOC, headquarter, AIR, Doordarshan, Governor, Chief Minister, senior officials of the State burequcracy on priority basis	PWD, BSNL, Water Supply, Electricity, AIR, Doordarshan
14	**Transpotation** ➢ Arrange road, rail and air transport at State / District headquarters for dispatch of relief materials to the affected areas	Secretary Transport
15	**Damage Asessment** ➢ Prepare quick need assessment report for planning of relief operation and mobilization of resources to the affected areas ➢ Conduct aerial survey and also mobilize quick	Secretary R & R Collector/s

	assessment teams to affected areas	
16	**Set up Public Grievance Desk** ➢ Arrange information centre at shelter site for maintaining records of victims and to provide guidance to relatives, NGOs, etc. ➢ Arrange for complaints regarding missing persons and initiate search in shelters, hospitals and police records	Director DMU, Collector,
17	**Disposal of dead Bodies** ➢ Arrange for identification, photograph, post mortem and maintenance of records for disposal of dead bodies ➢ Arrange for Sub-Divisional Magistrates empowerment for waiving off post mortem of dead bodies ➢ Arrange for additional manpower if necessary for disposal of dead bodies ➢ Arrange for transportation of dead bodies to their native places if so required ➢ Arrange for disposal of unidentified and unclaimed dead bodies ➢ Arrange for transportation of injured from field hospitals to base hospitals	Secretary Home, Secretary Health, Secretary Transport, Collector,

10.3.5 Relief Measures

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

The Secretary, 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/injured.
- Information centre should be established by the administration.

Interim Relief Measures

- Arrangements to be made for identification and maintenance of the records of disposal of dead bodies in the affected areas.
- 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.

- Sub-divisional magistrates to be empowered to exempt the requirement of post-mortem in case of mass casualties. Revenue Dept may depute additional SDMs to expedite disposal of the dead bodies.
- Unclaimed/unidentified dead bodies to be disposed off at the earliest after keeping their records.
- Additional manpower to be deployed in the affected areas for supplementing the efforts of the local administration.
- Separate Cell to be established at state/district/taluka level to coordinate with the NGOs and outside donor/aid agencies.
- Regular meetings of the different stakeholders/departments should be organized at state level for sharing of information, developing strategies for relief operations.
- 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.

Assessment of Damage / Loss and Relief needs

- The Secy DMU to issue instructions to the district collectors to provide the need and loss assessment report.
- 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.
- Arrangements to be made for survey of human loss and distribution of exgratia relief to the families of deceased persons.
- Teams to be formed and dispatched to the affected areas for detailed assessment of houses and property assessment.
- As reconstruction of houses will take a long period, arrangements to be made to provide interim shelters to the affected
- Identification of the site for interim shelter
- Allocation of areas to the affected families
- Providing essential services at the interim shelter sites such as water, power, drainage / sanitation, PDS shops, etc.
- Distribution of shelter materials to individual families *(Source: SDMP Gujrat)*

10.4 Cyclone

A violent storm often of vast extent, characterized by high winds rotating about a calm center of low atmospheric pressure. This center moves onward, often with a velocity of 50 km an hour.The coastal areas are risk prone to cyclones. Maharashtra has a coastal belt of over 720 kilometers between Gujarat to Goa. Thus the Konkan region including Mumbai becomes prone to cyclones. There are 386 marine fishing villages / hamlets with 17,918 boats, engaged in fishing in this coastal belt. Cylcones make impact by killing people, damaging property, crops and infrastructure. Mumbai has faced peripheral impact in 1976, 1982, 1988 and October 1996, and has been hit on two occasions by cyclones (1948 and

June, 1996). The data indicate that the city is prone to cyclones. The most recent to hit the State was cyclone Phyan in 2009 which had affected the coastal districts in the State.

The IMD has bifurcated the Very Severe Cyclonic Storm category for the Maximun Sustained Wind (MSW) speed of 118-221 kmph into two sub categories as Very Severe Cyclone Storm for the MSW 118-166 kmph and Extremely Severe Cyclone Storm for the MSW 167-221 kmph.

10.4.1 Onset Type and Warning

India Meteorological department (IMD), government of India is responsible for monitoring of formation of cyclone, its intensity and movement. On assessing the situation that the cyclone is likely to cross Indian coast then IMD issues the cyclone alert/warning. IMD follows **four stages** cyclone warning system and communicate to all concerned stakeholders including NDMA, SDMA and district authorities.

1.) **Pre-Cyclone Watch**
It is issued when a depression forms over the Bay of Bengal irrespective of its distance from the coast and is likely to affect Indian coast in future. The pre-cyclone watch is issued by the name of Director General of Meteorology and is issued at least 72 hours in advance of the commencement of adverse weather. It is issued at least once a day.

2.) **Cyclone Alert**
It is issued at least 48 hours before the commencement of the bad weather when the cyclone is located beyond 500 Km from the coast. It is issued every three hours.

3.) **Cyclone Warning**
It is issued at least 24 hours before the commencement of the bad weather when the cyclone is located within 500 Km from the coast. Information about time /place of landfall are indicated in the bulletin. Confidence in estimation increases as the cyclone comes closer to the coast

4.) **Post landfall outlook**
It is issued 12 hours before the cyclone landfall, when the cyclone is located within 200 Km from the coast. More accurate & specific information about time /place of landfall and associated bad weather indicated in the bulletin. In addition, the interior distraction is likely to be affected due to the cyclone are warned in this bulletin.

India Meteorlogical department recently have divided very sever cyclonic storm into two parts namely very severe cyclone and extremely severe cyclones. The revised nomenclature bas been shown I the following table.

Cyclone Storm Intensity, Expected Damagae and Suggested Actions

Intensity	Damage Expected	Action Suggested
Deeep Depression 50-61 kmph (28-33 knots)	Minor damage to loose and unsecured structures	Fishermen advised not venture into the open seas
Cyclonic Storm 62-88 kmph	Damage to thatched huts. Breaking of tree branches causing minor	Total suspension of fishing operations

(34-47 knots)	damage to power and communication lines.	
Severe Cyclonic Storm 89-117 kmph (48-63 knots)	Extensive damage to thatched roofs and huts. Minor damage to power and communication lines due to uprooting of large avenue trees. Flooding of escape routes.	Total suspension of fishing operations. Coastal hut dwellers to move to safer places. people in affected areas to remain indoors.
Very Severe Cyclonic Storm 118-166 kmph (64-90 knots)	Extensive damage to kachha houses.partial disruption of power and communication lines. Minor disruption of rail and road traffic. Potential threat from flying debris. flooding of escape routes	Total suspension of fishing opeations. Mobilise evacuation from coastal areas. Judicious regulation of rail and road traffic. People of affected areas remain indoors.
Extremely Severe Cyclonic Storm 167-221 kmph (91-119 knots)	Extensive damage to kachha houses. Some damage to old buildings. Large scale disruption of power and communication lines. Disruption of rail and road traffic due to extensive flooding. potential threat from flying debris	Total suspenson of fishing operations. Evacuation from coastal areas. Diversion or suspension of rail and road traffic. People in affected areas to remain indoors
Super Cyclone 222 kmph and more (120 knots and more)	Extremely structural damage to residential and indusrial buildings. Total disruption of communication and poer supply. Extensive damage to bridges causing large scale disruption of rail and road traffic. Large scale flooding and inundation of sea water. Air pull of flying debris	Total suspension of fishing operations. Large scale evacuation of coastal population. Total suspension of rail and road traffic in vulnerable areas. People in affected areas to remain indoors.

10.4.2. Disaster Declaration

On receiving information from IMD the SDMA declars the affected districts as cyclone disaster hit areas.

10.4.3 Trigger Mechanism: plan Activation

On the receipt of cyclone warning issued by the Indian Meteorological Department (IMD) SDMA will activate its Response Action Plan (RAP) & will issue instructions to include the following details:

- Specify exact resources (in terms of manpower, equipments and essential items from key dept. /stakeholders) required.
- The type of assistance to be provided

- The time limit within which assistance is needed
- Details of other Task/Response Forces through 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 immediately. The state Government may publish a notification in the official gazette, declaring such area to be disaster-affected area.

Once the situation is totally controlled and normalcy is restored, the SDMA declares End of Emergency Response and issues instructions to withdraw the staff deployed in emergency duties.

10.4.4 Roles and Responsibilities

Task	Activities	Responsibility
Receipt and dissemination of cyclone warning	➢ Report the generation of Cyclone in Arabian Sea/ Indian Ocean after getting information from IMD to following officials; ➢ Secretary R & R ➢ Principal Secretary (Revenue) ➢ Chief Executive Officer, SDMA ➢ Chief Secretary of the State ➢ Members of Crisis Management Group ➢ Hon. Chief Minister ➢ Hon. Minister – Revenue ➢ National Disaster Management Authority, GoI. ➢ All concerned District Collectors as well as Control Rooms of the district/s likely to be affected as per preliminary warning of IMD. ➢ Ministers and Secretaries of all line departments ➢ Instruct all Collectors (of the districts likely to be affected) to activate District Control Room at full strength. ➢ Alert all response teams in the State for deployment. ➢ Remain in constant touch with control rooms at National & State Level. ➢ Instruct and alert all heads of departments of the key line departments to activate their departmental plan and SOPs for Cyclone response.	IMD, Secy.R & R
Establishment of interdepartment	Instruct all State government officers and employees in the State to report to their respective Head for emergency duties (Only if the	Secy. R & R, General Administratio

al coordination	warning is of a level 2 disaster or as per the decision taken in the meeting of the Crisis Management Group headed by Chief Secretary). ➢ Alert the District Collectors of districts not likely to be affected to be prepared for providing: ➢ Additional manpower ➢ Additional resources ➢ Machinery & equipment ➢ Relief material to the districts likely to be affected	n Dept.,
Activation of communication system	➢ Activate alternative communication equipments i.e. satellite phones, HF/VHF sets, Ham radio, VSAT in State EOC, District and Taluka control rooms ➢ Establish communication links with EOCs and Search & Rescue Teams in all Municipal Corporations and alert them to be in stage of readiness. ➢ Establish communication links with villages likely to be affected.	Secy.R & R
Organise situation review meeting and issue instructions and orders	➢ Establish contact with IMD, CWC, ACWC, ISRO and the defense ministry of GoI for aerial / satellites imageries of the latest Cyclone threat. ➢ Get the latest weather report from IMD/other international Web Sites to know the exact location of Cyclone and the likely area where landfall will take place. ➢ After reviewing the weather report and satellite images issue instructions and orders for emergency response to areas likely to be affected.	Secy.R & R
Management of EOC and communication system	➢ Take over full command of State EOC. ➢ Instruct line departments to depute representatives at the State and District EOCs. ➢ Hold a meeting with leaders of task forces and entrust them their tasks. ➢ Ensure that Cyclone information is disseminated to all who are at danger ➢ Arrange emergency meeting with State Crisis Management Group (SCG) to device a plan of action.	Revenue/DM
	➢ Arrange dissemination of information through various means of communication such as Radio, TV, Cable Network, SMS about	Director DMU

	Cyclone warning to districts/areas which are likely to be hit by Cyclonic Storm.	
Response preparedness (Areas likely to be affected)	➢ Based on the warning issued by IMD, pin point the districts and villages likely to be affected by Cyclone and start the procedure for identifying safe places/shelters for evacuation in those villages. ➢ Collectors/Village level officers should be contacted to know the status of the shelters with the capacity of the shelter and other available facilities at the site. ➢ Make transport arrangement for mobilization of all emergency response teams.	Revenue Dept., Transport Dept. and Dist. Collectors, Municipal Commissioner
	➢ Alert following teams to remain in readiness: ➢ Evacuation ➢ Emergency Medical Services ➢ Search and Rescue ➢ Alert following emergency response forces to remain in readiness: ➢ Fire & Emergency Services ➢ NDRF /SDRF ➢ Village Disaster Management Teams ➢ Police, Home Guards ➢ State Reserve Police Force ➢ Army (if required) ➢ Air Force (if required)	Director DMU
	➢ Ensure arrangements are in place to evacuate fishermen and salt workers if needed.	Ports & Fisheries Dept., Revenue Dept.,
	➢ Impose restriction on all transport activities heading towards coastal areas that are likely to be affected by Cyclone. .	Secretary Transport
	➢ Ensure safety of tourists visiting beaches along the coastline.	Tourism Dept.
	➢ Cordoning off coastal areas for restricting entries of rail or road traffic. ➢ Ensure law and order is maintained in areas likely to be affected.	Home Dept., Dist. Collectors,
	➢ Ensure that all critical activities (mainly industrial production) in areas likely to be affected are shutdown.	Line Dept.
	➢ Ensure that the schools and colleges are closed in areas likely to be affected by Cyclone and associated hazards.	Education Dept.
	➢ Ensure dissemination of information to	Dist. Collector,

	remote areas by local means. ➢ Ensure that local help lines are opened and effectively managed for public information, guidance and rumor control. ➢ Ensure that the information to public and media about the progress of Cyclone at periodic intervals is released.	Municipal Commissioner, Information Dept.
	➢ Make arrangements for logistic support to all emergency response teams.	Concerned Dist. Collector, Municipal Commissioner, Line Dept.
	➢ Health Department to activate their Departmental Cyclone Disaster Management Plan and Departmental SOPs for Management of casualties	Health Dept.
	➢ Assess need for fodder if required. ➢ Keep ready teams for carcass disposal	Animal Husbandry
Review of situation and reporting	➢ Establish contact with IMD, CWC, ACWC, ISRO and the defense ministry of GoI for aerial / satellites imageries of the latest Cyclone threat. ➢ After reviewing the weather report and satellite images issue instructions and orders for emergency response to areas likely to be affected areas.	Secretary R & R
	➢ Review and monitor following activities: ➢ Evacuation of people from coastal areas likely to be affected ➢ Positioning of Search and Rescue Teams ➢ Positioning of mobile communication units ➢ Positioning of quick medical response teams ➢ Mobilization of restoration teams of respective departments ➢ Requirement of armed forces in rescue and relief operations ➢ Dissemination of information to the vulnerable areas ➢ All preparedness measures to be taken by various authorities ➢ Keep in touch with National, District and Taluka Control Rooms ➢ Release information at appropriate time to media and public regarding response measures organized by the Government	Secretary R & R, information Dept
Emergency	➢ If reports regarding striking of Cyclone are	Secretary R &

evacuation and relief management	confirmed by IMD and other sources, start the emergency response and relief operations.	R
	➢ Divert the emergency services to areas likely to be affected as per the warning issued by IMD.	Director DMU, Dist. Collector
	➢ Inform the public residing in areas likely to be affected to evacuate through various means such as SMS, AIR, FM Radio, Doordarshan, etc. ➢ Start evacuation from the likely affected areas through Police support, if necessary	Secretary R & R, Dist. Collector, Municipal Commissioner, Home Dept.
	➢ To account for the exact number of fishermen in the sea and fishermen that have already reached the shore	Maharashtra Maritime Board/Coast Guard /Fishery
	➢ Ensure that the Relief Management work planned in the areas likely to be affected by the Cyclone are well organized.	R& R Dept.
	➢ Ensure that the arrangement for basic amenities(shown below) at evacuation/relief centres are made by the respective departments: ➢ Drinking water ➢ Food ➢ Clothing ➢ Sanitation and hygiene, ➢ Lighting ➢ Medicines and other Health Care	Secretary R & R, Civil Supply Dept., Revenue Dept. & Dist. Collectors, Municipal Commissioner Water Supply Dept., Health Dept.
	➢ Inform following agencies to be in a state of readiness for assisting in the Cyclone response measures (if required): ➢ Public sector agencies ➢ Private sector agencies ➢ NGOs ➢ CBOs ➢ Volunteer Organizations	Secretary R & R
	➢ Request for help (if needed) to MHA/National Disaster Management Authority	Secretary R & R
	➢ Make necessary arrangements for public information/guidance, public opinion and rumor control.	Information Dept.
	➢ Restriction may be imposed for transportation in threatened areas.	Transport Dept. and Dist. Collector, Municipal

		Commissioner
Disaster declaration	When Cyclone makes a landfall, Cyclone affected Dist. Collectors should send a communication to the State Govt. to declare the area as disaster affected, if necessary, (depending upon the nature and intensity of impact)	District Collector
Preliminary damage assessment, deployment of emergency response teams and information dissemination	➢ Dist. Collector/s should send teams to the affected areas to take stalk of the effects of Cyclone and associated rain. ➢ District Collector/s should send sector wise situation reports to: State EOC/SDMA	Dist. Collector, Municipal Commissioner
	➢ Deployment of following teams to Cyclone affected areas: ➢ Emergency Communication Teams ➢ Emergency Medical Services Teams ➢ Search and Rescue Teams (With Equipments) ➢ Preliminary damage Assessment Teams ➢ Need Assessment Teams	Secretary R & R, Dist. Collector, Municipal Commissioner
	➢ Establish communication link with affected districts by activating alternate communication equipments such as Satellite Phones, HF/VHF Sets, Ham Radio, V Set etc., in State/District EOCs and Taluka Control Rooms. ➢ Arrange dissemination of information about occurrence of Cyclone and areas that are affected by it to Media & Public.	Director DMU, Dist. Collector, Information Dept.
Mobilization and deployment of task forces	➢ Remain in constant touch with IMD for updates on weather forecast for the coming hours and plan accordingly. ➢ Immediate mobilization of following units/teams to areas affected by Cyclone and associated rains. ➢ S & R Teams of Fire and Emergency Services ➢ Quick Medical Response Teams ➢ Quick Damage & Loss Assessment Teams ➢ Quick Need Assessment Teams ➢ Teams for disposal of dead bodies ➢ Teams for disposal of carcasses ➢ Teams for debris clearance (if any) ➢ Teams for maintaining Law & Order in the affected areas ➢ Arrange for S & R teams of Air Force (If required).	Secretary R & R, Dist. Collector, Municipal Commissioner, Key line Dept.

Quick Response Measures	➢ State EOC, and the Collectors of the affected District/s should ensure that the following response activities are carried out immediately:	Secretary R & R, Dist. Collectors, Municipal Commissioner Line Dept.
	Clearance of access roads ➢ To survey the access roads/routes leading to the affected areas and manage traffic for mobilization of equipments, machinery and volunteers. ➢ Identify alternate roads/routes for evacuation. ➢ Undertake repairing/restoration of damaged roads leading to the affected areas. ➢ Identify and declare unsafe buildings/structures in Cyclone affected areas. ➢ Evacuate people from unsafe buildings/structures and shift them to relief camps/sites. ➢ Divert/stop transport activities (Rail + Road) heading towards Cyclone affected areas.	PWD Dept. , Transport Dept., Railways,
	Arrangement of basic facilities at relief centres ➢ To ensure that necessary arrangements at evacuation/relief centers is made with sufficient availability of: food, water, blankets/clothing, medicines, lighting, sanitation and hygiene etc. ➢ To ensure necessary security arrangements for the personals (Emergency responders/relief teams) who are working at Relief Centers and involved in distribution of Relief Materials. ➢ To ensure that law and order is maintained at evacuation/relief centers and in the affected areas as well.	Revenue Dept., Civil Supply Dept., Collectors, Municipal Commissioner, Water Supply Dept., Health Dept., Power & Energy Dept. Electricity Dept.& Local Authorities, Home Dept.
	Safety of fishermen and salt workers ➢ Immediate actions to be taken for safety of fishermen, salt workers and visitors at Cyclone affected coastal areas. ➢ Ensure that all the fishermen and salt workers have returned from the sea or those who are in the sea are rescued and evacuated to safer places.	Secretary R & R, Port and Fisheries Dept., Tourism Dept., Industrial Dept.
	Control of outbreak of diseases ➢ To establish camp hospitals near the affected	Health Dept., Transport

	areas. ➢ To make transportation arrangements to shift seriously injured persons to nearest Camp Hospitals, Taluka and District Hospitals, Regional and State Hospitals ➢ Ensure that the Hospitals are well prepared to deal with seriously injured persons. ➢ To ensure that the required medical assistance/aid and medicines are provided to the affected people at site as well as at evacuation/relief centers in the affected area and necessary records are maintained. ➢ Take sanitation and epidemic control measures for preventing any water borne disease. ➢ Keep adequate stock of essential medicines, first-aid etc. at taluka/district hospitals ➢ Take steps to purify drinking water sources ➢ Take the help of doctors/paramedics from the list of doctors/paramedics available at the taluka/district level for medical assistance.	Dept.
	Other important measures ➢ Prepare quick need assessment report for planning of relief operation. ➢ Additional assistance may be asked for emergency response/relief from GoI-NDMA (If needed). ➢ Prepare situation report and circulate it twice a day in the morning and evening to key Government functionaries. ➢ Maintain constant touch with National, District and Taluka EOCs and other control rooms. ➢ Remain in constant touch with IMD for updates on weather forecast for the coming days and plan accordingly. ➢ Conduct Arial survey of affected areas for taking a stalk of the situation. ➢ Activate evacuation & relief centers according to needs/situation. ➢ Maintain record of persons admitted at evacuation/relief centres.	Revenue
Review of situation and reporting	➢ Establish contact with IMD, CWC, ACWC, ISRO and the defense ministry of GoI for aerial / satellites imageries about further weather condition and plan accordingly.	SDMA

Restoration of critical infrastructure/essential services	➢ Ensure that the essential services/critical infrastructure of the affected areas have been restored or alternative arrangement is made for ensuring safety of people and smooth management of emergency response. ➢ Ensure that key administrative and lifeline buildings are brought back to operation quickly. ➢ Designate and deploy senior officers (as per the need) to worst affected area/s to oversee rescue/relief operation. ➢ Ensure following primary necessities are restored power,water, telecommunication, roads, and bridges	Secy. R & R, Line Depts., Dist. Collectors, Municipal Commissioner
Disposal of dead bodies	➢ Ensure following procedure is followed before disposal/handing over of dead bodies: ➢ Photographs of the dead bodies are taken, ➢ Identification of the dead bodies is done, ➢ Post Mortem where ever necessary and possible is carried out, ➢ Handing over dead bodies of persons known/identified to their relatives, ➢ Disposal of unclaimed and unidentified dead bodies.	Revenue Dept., Dist. Collector, Municipal Commissioner, Home Dept., Health Dept., Local Authorities
	➢ Animal Husbandry Department to ensure medical aid to cattle who are injured. ➢ Disposal of animal carcasses with the help of local bodies/health dept.	A. H Dept., Local Authorities, health dept.
Public information and media management	➢ Establish Media/Press Centre for media management and information dissemination ➢ Ensure that the information about progress of rescue and relief is provided to media/public in an organized manner at least twice a day. ➢ Establish help lines for facilitating communication between the victims and their relatives residing outside the affected area/s. ➢ Establish Information Centers at strategic locations for providing information about persons evacuated to the relief centres/hospitals. ➢ Ensure that the information to media/general public about the response of the State Government is released in an organized manner. ➢ Organize media briefing twice a day at pre-determined intervals.	Director DMU, Information Dept., Dist. Collector, Municipal Commissioner

Miscellaneous rescue and relief works	➢ Assess the situation and take appropriate action to accelerate the Search & Rescue Operations. ➢ Depute additional officers and supporting staff to Cyclone affected areas from non-affected areas (if required) to accelerate the rescue and relief operations.	Director DMU, Districts Collector, Municipal Commissioner
	➢ Ensure that the relief assistance received from outside is centrally received, stored and sent for distribution to Cyclone affected areas according to their need and proper accounts are maintained about both receipt and distribution.	Secy. R & R, Civil Supply Dept.
	➢ District Collector may oversee the functioning of relief centres and ensure adequate supply of relief materials.	Revenue Dept, Civil Supply Dept.,
	➢ Remain in constant touch with IMD for updates on weather forecast for the coming days and plan accordingly. ➢ Arrange for procurement of additional relief material required for relief operations (on the basis of need assessment). ➢ Mobilize additional relief material required for relief operations. ➢ Maintain constant touch with State & Districts EOCs.	Director DMU, Dist. Collectors, Civil Supply Dept.
	➢ Arrangement for transportation of injured from field hospital to base hospital ➢ Arrangement for transport of dead bodies to their native places.	Revenue Dept,. Health Dept. and Transport Dept
	➢ Ensure maintenance of record, timely reporting and information management. ➢ Ensure maintenance of record and information database.	Line Depts., Dist. Collector,
	➢ Remain in constant touch with IMD for updates on weather forecast for the coming days and plan accordingly. ➢ Review the restoration of all the public and essential in Cyclone affected areas. ➢ Review and follow-up all necessary arrangements for emergency response & relief in the affected area/s.	Director DMU
	➢ On receiving the message from IMD about degradation of Cyclone, inform the concern dist. Collector.	Director DMU, IMD
	➢ Organize a quick rapid visual survey of the	Secy. R & R,

	affected areas (through a technical team of engineers) to ascertain the safety of the structures decide on giving the go-ahead to people to move back to their respective houses.	Dist. Collectors, Municipal Commissioner, R & P Dept.
	➢ After receiving the massage of de-warning, ensure that people are moved back safely to their houses.	Secy. R & R, Collector, DSP
	➢ Ensure relief disbursement, allotment of funds and grants to line department and district collectors for organizing emergency response, relief and evacuation arrangements.	R&R dept

10.4.5 Relief Measures

Short-term Relief Measures

Search, rescue and medical assistance

- Identification of areas where SAR Teams to be deployed
- Coordination of SAR teams for their quick deployment in allotted areas
- Provision of quick transport of SAR teams to affected areas.
- The department of Roads and Buildings to evolve a mechanism for clearing access routes in order to facilitate search and rescue operations.
- Mobilization of specialized equipments and machinery to affected areas.
- Cordoning of affected areas with control of entry and exit.
- Traffic Management by establishment of traffic points and check-posts.
- The Home Department to evolve a mechanism for providing security of properties of government and public in the affected areas.

Emergency relief (shelter, food, clothing, etc.)

- Establishment of Temporary shelters for evacuees.
- Ensuring provision of essential services as under:
    - Arrangement for food, clothing, blanket/bedding, drinking water, sanitation and hygiene, lighting arrangements and essential medicines.
    - Deployment of mobile hospitals in affected areas for treatment of victims.
    - Providing counselling services to the cyclone victims and their relatives.
- Ensure establishment of communication link between the affected people and their relatives outside.

The Secy. 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/injured.
- Information centre should be established by the administration.

Interim Relief Measures

- Arrangements to be made for quick identification and maintenance of the records of disposal of dead bodies in the affected areas (Home, Revenue, Health Dept., Local Authorities).
- 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 Dept.)
- 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 Dept.)
- Unclaimed/unidentified dead bodies to be disposed off with the help of pre identified voluntary agencies at the earliest after keeping their records. (Home, Revenue, Health Dept. & Local Bodies)
- Additional manpower to be deployed in the affected areas for supplementing the efforts of the local administration. (GAD).
- Separate Cell to be established at state/district/Taluka level to coordinate with the NGOs and outside donor/aid agencies. (Revenue Dept.)
- Regular meetings of the different stakeholders/departments should be organized at state level for sharing of information, developing strategies for relief operations. (Secy DM & Collectors at District Level).
- Information & Public Relation 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.

Assessment of Damage/Loss and Relief needs

- The Secretary of Relief and Rehabilitation to issue instructions to the district collectors to provide the need assessment report. He should consolidate the same and to prepare state's need assessment report.
- The Secretary of Relief and Rehabilitation to issue instructions to the District Collectors to provide the damage and loss assessment report. The Secretary of Relief and Rehabilitation to consolidate the same and to prepare state's damage and loss assessment report which will be useful in planning and implementing the relief operation after the disaster for the victims of the disaster.
- Adequate manpower, vehicles, stationery etc should be provided to supplement the efforts for need/loss assessment. (The Secretary of Relief and Rehabilitation Dept.)
- The relief need assessment report should be provided by the Collectors. (The Secretary of Relief and Rehabilitation & Collectors)

- Identification and demolition of dangerous structures in the affected areas to minimize further loss of life and injuries. (R & R Dept., Revenue Dept and Local Bodies)
- Arrangements for distribution of gratuitous relief and cash doles. (Revenue Dept., Panchayat & Rural Housing Dept., UD Dept. and Collectors)
- Arrangements to be made for survey of human loss and distribution of ex-gratia relief to the families of deceased persons. (Revenue Dept.)
- Teams to be formed and dispatched to the affected areas for detailed assessment of houses and property damage assessment. (Revenue Dept and Local authorities)
- As reconstruction of houses will take a long period, arrangements to be made to provide interim shelters to the affected. (Revenue Dept and Line Departments like Water Supply Dept., PWD Dept. etc)

    - Identification of the site for interim shelter
    - Allocation of areas to affected families
    - Providing appropriate shelters to the affected families
    - Providing essential services as under in the interim shelter sites.

    (Source: SDMP, Gujrat)

10.5 Tsunami

Tsunami waves often affect distant shores, originates from undersea or coastal seismic activity, landslides, and volcanic erruptions. Whatever the cause, sea water is displaced with a violent motion and swells up, ultimately surging over land with great destructive power.

10.5.1 Disaster Declaration

The INCOIS Hyderabad monitors the generation of tsunami waves in the ocean. Whenever earthquake of magnitude 6 and above occurs undersea and is likely to become tsunami then INCOIS declars tsunami alert for coastal belts where it may affect.

10.5.2 Onset Type and Causes

If the earthquake of magnitude above 6.0 or under water land movement is near the coast then tsunami may strike suddenly and if the earth movement is far in the sea then it may take few minutes to hours before striking the coast. the general causes of Tsunamis are geological movements. The three major ways that cause tsunami are: earthquake, landslides and volcanic activity.

10.5.3 Early Warning

Public may be able to protect themselves from the Tsunami emergency if they are informed and educated before an emergency. Most of the time tsunami hazard is predictable so warning to public is important part of Action Plan.

The Action Plan is the set of routine activities to be followed by the staff at the tsunami warning centre for observation, evaluation, confirmation, and dissemination of bulletins. The Early Warning Centre continuously monitors the seismic activity in the two tsunamigenic source regions of the Indian Ocean through the network of national and international seismic stations. This network enables us to detect any tsunamigenic earthquakes within a time period of 10

minutes of occurrence. Tsunami bulletins are then generated based on pre-set decision support rules and disseminated to the concerned authorities for action, following the SOP.

The criteria given below is followed for generation of different types of advisory bulletin messages (Warning/Alert/Watch) for a particular region of the coast based on the earthquake parameters, available warning time (i.e. time taken by the tsunami wave to reach the particular coast) and expected run-up from pre-run model scenarios.

Warning/ Alert / Watch:
Based on earthquake parameters, region's proximity to the earthquake zone (Travel Times) and expected run-up from pre-run model scenarios Warnings to Far Source Regions: Issued only after confirmation of tsunami triggering based on real-time water-level observations and correction of scenarios. This will reduce possibility of false warnings.

The warning criteria are based on the premise that coastal areas falling within 60 minutes travel time from a tsunamigenic earthquake source need to be warned based solely on earthquake information, since enough time is not available for confirmation of water levels from Bottom Pressure Recorders (BPRs) and Tide Gauges. Those coastal areas falling outside the 60 minutes travel time from a tsunamigenic earthquake source are put under a watch status and upgraded to a warning only upon confirmation of water-level data, e.g. If a tsunamigenic earthquake happens in the coast of the Northern Indonesia, parts of the Andaman & Nicobar Islands falling within 60 minutes travel time of a tsunami wave are put under 'Warning' status. Other areas are put under 'Watch' Status and upgraded to a 'Warning' only if the BPRs or tide gauges reveal significant change in water level. This implies that the possibility of false alarms is higher for areas close to the earthquake source; however for other regions since the warnings are issued only after confirmation of water-level data, the issue of false alarms doesn't arise. To reduce the rate of false alarms even in the near source regions, alerts are generated by analyzing the pre-run model scenarios, so that warnings are issued only to those coastal locations that are at risk.

Category of tsunami advisory bulletins, time-line for generation, content of the alert and dissemination contact information is detailed below: Types Tsunami Bulletin Messages:

Earthquake Information Bulletin (T+20 Min) contains information about origin time, latitude and longitude of the epicenter, name of geographical area, magnitude and depth of an earthquake. This message also contains preliminary evaluation of tsunami potential based on the magnitude. (e.g. earthquake occurring on land or earthquake with < M6.5 or earthquake occurring > 100 Km depth or earthquake occurring in very shallow water column, etc. No tsunami is expected; for larger magnitude earthquakes in the ocean, a qualitative statement on the tsunamigenic potential may be given). No immediate action is required. Bulletins provided to Ministry of Home Affairs (MHA).

Tsunami Warning (T+30 Min) (RED) contains information about the earthquake and a tsunami evaluation message indicating that tsunami is expected. (e.g. For earthquakes with > M6.5 occurring in the Ocean within a depth of < 100 Km, a tsunami warning will be issued for those areas falling within 60 minutes travel time from the earthquake source and if expected run up is > 2 m). This is the highest level wherein immediate actions are required to move public to

higher grounds. Message also contains information on the travel times and tsunami grade (based on run-up estimates) at various coastal locations from pre-run model outputs. Information provided to Ministry of Home Affairs (MHA) and public.

Tsunami Alert (T+30 Min) (ORANGE) contains information about the earthquake and a tsunami evaluation message indicating that tsunami is expected. (e.g. For earthquakes with > M6.5 occurring in the Ocean within a depth of < 100 Km, a tsunami alert will be issued for those areas falling within 60 minutes travel time from the earthquake source and if expected run up is between 0.5 to 2 m as well as for those areas falling above 60 minutes travel time from the earthquake source and if expected run up is >2 m). This is the second highest level wherein immediate public evacuation is not required. Public should avoid beaches since strong current are expected. Local officials should be prepared for evacuation if it is upgraded to warning status. Message also contains information on the travel times and tsunami grade (based on run-up estimates) at various coastal locations from Pre-run model outputs. Information provided to Ministry of Home Affairs (MHA) and public.

Tsunami Watch (T+30 Min) (YELLOW) contains information about the earthquake and a tsunami evaluation message indicating that tsunami is expected. (e. g. For earthquakes with > M6.5 occurring in the Ocean within a depth of < 100 Km, a tsunami watch will be issued for those areas falling within 60 minutes travel time from the earthquake source and if expected run up is < 0.5 m and for those areas falling above 60 minutes travel time from the earthquake source and if expected run up is 0.5 to 2 m). This is the third highest level wherein immediate public evacuation is not required, Local officials should be prepared for evacuation if it is upgraded to warning status. Message also contains information on the travel times and tsunami grade (based on run-up estimates) at various coastal locations from Pre-run model outputs. Information provided to Ministry of Home Affairs (MHA).

Tsunami cancellation (GREEN) will be issued if the tsunami warning was issued on the basis of erroneous data or if the warning center determines from subsequent information that only an insignificant wave has been generated. In addition, tsunami warning may be canceled on a selective basis when a significant wave that has been generated clearly poses no threat to one or more of the areas the warning center warns, either because of intervening continents or islands which screen them or because the orientation of the generating area causes the tsunami to be directed away from these areas. To maintain credibility the warning center will use the terminology “non-destructive tsunami” in the cancellation message whenever applicable.

Tsunami All Clear (GREEN) bulletin indicates that the ‘Tsunami Threat’ is passed and no more dangerous waves are expected.

10.5.4 Trigger Mechanism: plan Activation

The tsunami response structure will be activated on the occurrence of a major tsunami. The The Secretary of Relief and Rehabilitation will activate all the Departments for emergency response including the State EOC.

Once the situation is totally controlled and normalcy is restored, the The Secretary of Relief and Rehabilitation declares End of Emergency Response and issues instructions to withdraw the staff deployed in emergency duties.

10.5.5 Roles and Responsibilities

Task	Activities	Responsibility
Tsunami Warning receipt and dissemination	➢ Report the occurrence of Tsunami generating earthquake to following officials; ➢ Secretary DM ➢ Principal Secretary (Revenue) ➢ Chief Executive Officer, SDMA ➢ Chief Secretary of the State ➢ Members of Crisis Management Group ➢ Hon. Chief Minister ➢ Hon. Minister – Disaster Management ➢ National Disaster Management Authority, GoI. ➢ All concerned District Collectors as well as Control Rooms of the district/s likely to be affected as per preliminary warning of IMD. ➢ Ministers and Secretaries of all line departments ➢ Instruct all Collectors (of the districts likely to be affected) to activate District Control Room at full strength. ➢ Alert all response teams in the State for deployment. ➢ Remain in constant touch with control rooms at National & State Level. ➢ Instruct and alert all heads of departments of the key line departments to activate their departmental plan and SOPs for Tsunami response.	IMD
Set up inter-departmental coordination	Instruct all State government officers and employees in the State to report to their respective Head for emergency duties (Only if the warning is of a level 2 disaster or as per the decision taken in the meeting of the Crisis Management Group headed by Chief Secretary). ➢ Alert the District Collectors of districts not likely to be affected to be prepared for providing: ➢ Additional manpower ➢ Additional resources (Machinery & Equipment ,Relief material to the districts likely to be affected)	Secretary R & R, GAD
Activate EOCs with communication system	➢ Activate alternative communication equipments i.e. satellite phones, HF/VHF sets, Ham radio, VSAT in State EOC, District and Taluka control rooms ➢ Establish communication links with EOCs at all	Director DMU
Review of situation and	➢ Establish contact with IMD, INCOIS, ISRO and the defense ministry of GoI for aerial / satellites	Director DMU

issue of instructions and orders	imageries. ➢ After reviewing the satellite images issue instructions and orders for emergency response to areas likely to be affected.	
Management of EOC and Tsunami Response	➢ Take over full command of State EOC. ➢ Instruct line departments to depute representatives at the State and District EOCs. ➢ Hold a meeting with leaders of task forces and entrust them their tasks. ➢ Ensure that Tsunami information is disseminated to all who are at danger ➢ Arrange emergency meeting with State Crisis Management Group to devise a plan of action. ➢ Arrange dissemination of information through various means of communication such as Radio, TV, Cable Network, SMS about Tsunami to districts/areas which are likely to be hit.	Secretary R & R
	➢ Impose restriction on all transport activities heading towards coastal areas that are likely to be affected by Tsunami.	Secretary Transport
	➢ Mobilize following teams: ➢ Evacuation ➢ Emergency Medical Services ➢ Search and Rescue ➢ Mobilize following emergency response forces: ➢ Fire & Emergency Services ➢ NDRF ➢ Village Disaster Management Teams ➢ Police, Home Guards ➢ State Reserve Police Force ➢ Army (if required) ➢ Air Force (if required)	Secretary R & R
Preparedness measures for timely response to coastal areas (likely to be affected)	➢ Based on the warning issued by IMD, pin point the districts and villages likely to be affected by Tsunami and start the procedure for identifying safe places/shelters for evacuation in those villages. ➢ Village wise data of safe sheltering for evacuation available with district collector should be referred and the dist. collectors/village level officers should be contacted to know the status of the shelters with the capacity of the shelter and other available facilities at the site. ➢ Make transport arrangement for mobilization of all emergency response teams.	Director DMU , Transport Dept., Dist. Collector, Municipal Commissioner
	➢ Ensure arrangements are in place to evacuate	Ports &

	fishermen and salt workers if needed.	Fisheries Dept., Revenue Dept.,
	➢ Ensure safety of tourists visiting beaches along the coastline.	Tourisim Dept.
	➢ Cordoning off coastal areas for restricting entries of rail or road traffic. ➢ Ensure law and order is maintained in areas likely to be affected.	Home Dept., Dist. Collector, Municipal Commissioner
	➢ Ensure that all critical activities (mainly industrial production) in areas likely to be affected are shutdown.	Industry Dept. other line septs.
	➢ Ensure dissemination of information to remote areas by local means. ➢ Ensure that local help lines are opened and effectively managed for public information, guidance and rumor control. ➢ Ensure that the information to public and media about the progress of Tsunami at periodic intervals is released.	Dist. Collector, Municipal Commissioner, Information Dept.
	➢ Health Department to activate their Departmental Tsunami Disaster Management Plan and Departmental SOPs for Management of casualties	Health Dept
	➢ Assess need for fodder if required. ➢ Keep ready teams for carcass disposal (if required).	Animal Husbandry
Review of situation and reporting	➢ Review and monitor following activities: ➢ Evacuation of people from coastal areas likely to be affected ➢ Positioning of Search and Rescue Teams ➢ Positioning of mobile communication units ➢ Positioning of quick medical response teams ➢ Mobilization of restoration teams of respective departments ➢ Requirement of armed forces in rescue and relief operations ➢ Dissemination of information to the vulnerable areas ➢ All preparedness measures to be taken by various authorities ➢ Keep in touch with National, District and Taluka Control Rooms ➢ Release information at appropriate time to media and public regarding response measures organized by the Government	Secretary R & R, Information Dept.
Emergency Preparedness for	➢ Ensure that the Relief Management work planned in the areas likely to be affected by the Tsunami	Secretary R & R

Relief Management	are well organized.	
	➢ Ensure that the arrangement for basic amenities(shown below) at evacuation/relief centres are made by the respective departments: ➢ Drinking water ➢ Food ➢ Clothing ➢ Sanitation and hygiene, ➢ Lighting ➢ Medicines and other Health Care	Civil Supply Dept., Revenue Dept. & Dist. Collector, Municipal Commissioner, Municipal Commissioner, Water Supply Dept., Health Dept.
	➢ Inform following agencies to be in a state of readiness for assisting in the Tsunami response measures (if required): ➢ Public sector agencies ➢ Private sector agencies ➢ NGOs ➢ CBOs ➢ Volunteer Organizations ➢ Request for help (if needed) to MHA/National Disaster Management Authority	Revenue Dept.
	➢ Make necessary arrangements for public information/guidance, public opinion and rumour control.	Information Dept.
Disaster Declaration	➢ Record the reports in detail with time, source of reports etc. and declare the area as disaster affected, if necessary, (depending upon the nature and intensity of impact)	Director DMU, Dist. Collector,
Preliminary damagement assessment, deployment of emergency response teams and dissemination of information	➢ Dist. Collector/s should send teams to the affected areas to take stalk of the effects of Tsunami. ➢ District Collector/s should send sector wise situation reports to: State EOC/ Secretary DM & SDMA	Dist. Collector, Municipal Commissioner
	➢ Deployment of following teams to Tsunami affected areas: ➢ Emergency Communication Teams ➢ Emergency Medical Services Teams ➢ Search and Rescue Teams (With Equipments) ➢ Preliminary Damage Assessment Teams ➢ Need Assessment Teams	Secretary R & R, Dist. Collector, Municipal Commissioner,
	➢ Establish communication link with affected districts by activating alternate communication equipments such as Satellite Phones, HF/VHF Sets, Ham Radio, V Set etc., in State/District EOCs and Taluka Control Rooms.	Director DMU, Dist. Collector, Municipal Commissioner, Information

	➢ Arrange dissemination of information about occurrence of Tsunami and areas that are affected by it to Media & Public.	Dept.
Mobilization and deployment task forces	➢ Immediate mobilization of following units/teams to areas affected by Tsunami. ➢ S & R Teams of Fire and Emergency Services ➢ Quick Medical Response Teams ➢ Quick Damage & Loss Assessment Teams ➢ Quick Need Assessment Teams ➢ Road Clearance Teams ➢ Teams for disposal of dead bodies ➢ Teams for disposal of carcasses ➢ Teams for debris clearance (if any) ➢ Teams for maintaining Law & Order in the affected areas ➢ Arrange for S & R teams of Air Force (If required).	Secretary R & R, Municipal Commissioner, Concern line Dept.
Measures for quick and organized response	➢ State EOC, the Collectors of the affected District/s should ensure that the following response activities are carried out immediately:	Secretary R & R, Collector, Municipal Commissioner, Line Dept.
	Clearance of access roads ➢ To survey the access roads/routes leading to the affected areas and manage traffic for mobilization of equipments, machinery and volunteers. ➢ Identify alternate roads/routes for evacuation. ➢ Undertake repairing/restoration of damaged roads leading to the affected areas. ➢ Identify and declare unsafe buildings/structures in Tsunami affected areas. ➢ Evacuate people from unsafe buildings/structures and shift them to relief camps/sites.	PWD Dept. , Transport Dept., Dist. Collector, Municipal Commissioner, Railways, Revenue
	Arrangement of basic facilities at relief/evacuation centres ➢ To ensure that necessary arrangements at evacuation/relief centers is made with sufficient availability of: food, water, blankets/clothing, medicines, lighting, sanitation and hygiene etc. ➢ To ensure necessary security arrangements for the personals (Emergency responders/relief teams) who are working at Relief Centers and involved in distribution of Relief Materials. ➢ To ensure that law and order is maintained at evacuation/relief centers and in the affected areas	Revenue Dept., Civil Supply Dept., Collector, Municipal Commissioner, Water Supply Dept., Health Dept., Power & Energy Dept., Local Authorities,

	as well.	Home Dept.
	Safety of fishermen and salt workers ➢ Immediate actions to be taken for safety of fishermen, salt workers and visitors at Tsunami affected coastal areas. ➢ Ensure that all the fishermen and salt workers have returned from the sea or those who are in the sea are rescued and evacuated to safer places.	Revenue, Port and Fisheries Dept., Tourism Dept., Industrial Dept.
	Control of outbreak of diesease ➢ To establish camp hospitals near the affected areas. ➢ To make transportation arrangements to shift seriously injured persons to nearest- Camp Hospitals, Taluka and District Hospitals, Regional and State Hospitals ➢ Ensure that the Hospitals are well prepared to deal with seriously injured persons. ➢ To ensure that the required medical assistance/aid and medicines are provided to the affected people at site as well as at evacuation/relief centers in the affected area and necessary records are maintained. ➢ Take sanitation and epidemic control measures for preventing any water borne disease. ➢ Keep adequate stock of essential medicines, first-aid etc. at taluka/district hospitals ➢ Take steps to purify drinking water sources ➢ If required, take the help of doctors/paramedics from the list of doctors/paramedics available at the taluka/district level for immediate medical assistance. **Other important response measures** ➢ Prepare quick need assessment report for planning of relief operation. ➢ Additional assistance may be asked for emergency response/relief from GoI-NDMA (If needed). ➢ Maintain constant touch with National, District and Taluka EOCs and other control rooms. ➢ Conduct Arial survey of affected areas for taking a stalk of the situation.	Secretary Health, Secretary Transport, Secretary R & R.
Public Information and media management	➢ Establish Media/Press Centre for media management and information dissemination ➢ Ensure that the information about progress of rescue and relief is provided to media/public at	Director DMU, Information Dept., Dist. Collector,

	least twice a day at pre-determined intervals. ➢ Establish help lines for facilitating communication between the victims and their relatives residing outside the affected area/s. ➢ Establish Information Centers at strategic locations for providing information about persons evacuated to the relief centres/hospitals.	Municipal Commissioner
Restoration of critical infrastructure/essential services	➢ Ensure that the essential services/critical infrastructure of the affected areas have been restored or alternative arrangement is made for ensuring safety of people and smooth management of emergency response. ➢ Ensure that key administrative and lifeline buildings are brought back to operation quickly ➢ Ensure following primary necessities are restored- Power, Water, Telecommunication, Roads, Bridges	Revenue, Line Depts., Dist. Collector, Municipal Commissioner,
Disposal of Dead bodies	➢ Ensure following procedure is followed before disposal/handing over of dead bodies: ➢ Photographs of the dead bodies are taken, ➢ Identification of the dead bodies is done, ➢ Post mortem where ever necessary and possible is carried out, ➢ Handing over dead bodies of persons known/identified to their relatives, ➢ Disposal of unclaimed and unidentified dead bodies.	Revenue Dept., Collector, Municipal Commissioner, Home Dept., Health Dept., Local Authorities
	➢ Animal Husbandry Department to ensure medical aid to cattle who are injured. ➢ Disposal of animal carcasses with the help of local bodies/health dept.	Animal Husbandry Dept, Local Authorities, health dept.
Miscellaneous Rescue and Relief works	➢ Assess the situation and take appropriate action to accelerate the Search & Rescue Operations. ➢ Depute additional officers and supporting staff to Tsunami affected areas from non-affected areas (if required) to accelerate the rescue and relief operations.	Director DMU, Districts Collector, Municipal Commissioner,
	➢ Ensure that the relief assistance received from outside is centrally received, stored and sent for distribution to Tsunami affected areas according to their need and proper accounts are maintained about both receipt and distribution.	Revenue, Civil Supply Dept.
	➢ District Collector may oversee the functioning of relief centres and ensure adequate supply of relief materials.	Revenue Dept, Civil Supply Dept.,

	➢ Arrange for procurement of additional relief material required for relief operations (on the basis of need assessment). ➢ Mobilize additional relief material required for relief operations. ➢ Maintain constant touch with State & Districts EOCs.	Director DMU, Dist. Collector, Municipal Commissioner, Civil Supply Dept.
	➢ Arrangement for transportation of injured from field hospital to base hospital ➢ Arrangement for transport of dead bodies to their native places.	Revenue Dept,. Health Dept., Transport Dept
	➢ Ensure maintenance of record, timely reporting and information management. ➢ Ensure maintenance of record and information database.	
	➢ Review the restoration of all the public and essential in Tsunami affected areas. ➢ Review and follow-up all necessary arrangements for emergency response & relief in the affected area/s.	Secretary R & R
	➢ After receiving the massage of de-warning, ensure that people are moved back safely to their houses.	Secretary R & R, Collector, Dy.SP
	➢ Organize a quick rapid visual survey of the affected areas (through a technical team of engineers) to ascertain the safety of the structures decide on giving the go-ahead to people to move back to their respective houses.	Secretary R & R, Dist. Collectors, Municipal Commissioner,
	➢ Ensure relief disbursement, allotment of funds and grants to line department and district collectors for organizing emergency response, relief and evacuation arrangements.	Revenue Dept.

10.5.6 Relief Measures

Short-term relief measures

1. Provide temporary shelter to affected people
2. Temporary shelter site should be safe, and easily accessible.
3. Continue to provide essential services to the affected people, (food, water, clothing sanitation, medical assistance and power)

The Secretaries of Line Departments and concerned Collectors to ensure the following in the relief camps:-

➢ Special emphasis on hygiene and sanitation aspects should be given in relief camp sites. (Health Dept.)

- Separate area should be earmarked within the relief camp for storage of relief materials. (Civil Supply & PWD Dept.)
- Adequate manpower and transport facilities for the camp site. (Transport Department)
- Arrangements to be made for trauma management. (Health Department)
- Mobile medical units to be sent to remote areas with a view to provide medical assistance to the victims/injured. (Health Dept.)
- Information centre should be established by the administration. (I. & P. Department)

Interim Relief Measures

- Arrangements to be made for quick identification and maintenance of the records of disposal of dead bodies in the affected areas (Home, Revenue, Health Dept., Local Authorities).
- 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 Dept.)
- 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 Dept.)
- Unclaimed/unidentified dead bodies to be disposed off with the help of pre identified voluntary Agencies at the earliest after keeping their records. (Home, Revenue, Health Dept. & Local Bodies)
- Additional manpower to be deployed in the affected areas for supplementing the efforts of the local administration. (GAD).
- Separate Cell to be established at state/district/Taluka level to coordinate with the NGOs and outside donor/aid agencies. (Revenue Dept.)
- Regular meetings of the different stakeholders/departments should be organized at state level for sharing of information, developing strategies for relief operations. (Secy. R & R & Collectors at District Level).
- Information & Public Relation 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 & P Dept)

Assessment of Damage/Loss and Relief needs

- The Secy. R & R to issue instructions to the district collectors to provide the need assessment report. The Secy. R & R should consolidate the same and to prepare state's need assessment report.
- The Secy. R & R to issue instructions to the District Collectors to provide the damage and loss assessment report. The Secy. R & R to consolidate the same and to prepare state's damage and loss assessment report which will be useful in planning and implementing the relief operation after the disaster for the victims of the disaster.
- Adequate manpower, vehicles, stationery etc should be provided to supplement the efforts for need/loss assessment. (Secy. R & R Dept.)
- The relief need assessment report should be provided by the Collectors. (Secy. R & R & Collectors)

- The damage assessment Performa is also attached in the annexure. (Secy. R & R & Collectors)
- Identification and demolition of dangerous structures in the affected areas to minimize further loss of life and injuries. (PWD Dept., Revenue Dept and Local Bodies)
- Arrangements for distribution of gratuitous relief and cash doles. (Revenue Dept., Panchayat & Rural Housing Dept., UD Dept. and Collectors)
- Arrangements to be made for survey of human loss and distribution of ex-gratia relief to the families of deceased persons. (Revenue Dept.)
- Teams to be formed and dispatched to the affected areas for detailed assessment of houses and property damage assessment. (Revenue Dept and Local authorities)
- As reconstruction of houses will take a long period, arrangements to be made to provide interim shelters to the affected. (Revenue Dept and Line Departments like Water Supply Dept., PWD Dept. etc)
- Identification of the site for interim shelter
- Allocation of areas to affected families
- Providing appropriate shelters to the affected families
- Providing essential services as under in the interim shelter sites. (Water,Transportation,Power, Road,Drainage/Sanitation)

10.6 Landslides

Landslides are a natural hazard. They are slippery masses of rock, earth or debris which move by force of their own weight down mountain slopes or river banks. Landslides of different types occur frequently in the geo-dynamically active domains in the Himalayan and North-Eastern parts of the country as well as relatively stable domains in the Western Ghats and Nilgiri hills in the Southern part of the country by this hazard, mostly during the monsoons. *(Source: Hazards, Disasters and your community)*

The Western Ghats, overlooking the Konkan coast, though located in a relatively stable domain, experience the fury of this natural hazard due to steep hill slopes, overburden and high intensity rainfall. The Western Ghats bear the innumerable scars of landslides due to their location in a zone of high intensity and protracted rainfall where overburden is sensitive to over-saturation.

Onset type and warning

Sudden sliding can occur without warning. They may take place in combination with earthquake, floods and volcanoes. It is difficult to predict the actual occurrence of landslides since there is no established early warning system in place. Areas of high risk, largely hill stations, can be determined by use of information on geology, hydrology, vegetation cover, past occurrence and consequences in the region.

Authority & Disaster Declaration

The district administration deals this disaster with the help of local authorities and inform the same to State Authority. Based on the information on occurrence of landslide in certain areas from local authority/district collector the SDMA declares as landslide disaster affected areas.

Causes of Landslides

Geological Weak Materials
Weathered materials, jointed materials, contrast in permeability and contrast in stiffness.
Soil Erosion
Wave erosion of slope toe, glacial erosion of slope toe, subterranean erosion (vegetation removal)
Heavy Rainfall
Intense rainfall lasts for few hours or few days caused abundant landslides.
Human Excavation
Human excavation of slope and its toe, loading of slope/toe, draw down in reservoir, mining, deforestation, irrigation, vibration/blast, water leakage from services.
Earthquake Shaking
Seismic activity has triggered landslides in many different topographic and geologic settings. Rock falls, soil slides and rock slides from steep slopes,.
Volcanic Eruption
Deposition of loose volcanic ash on hillsides commonly is followed by accelerated erosion and frequent mud or debris flows triggered by intense rainfall.

Risk Elements

The most common elements at risk are the settlements built on the steep slopes, built at the toe and those built at the mouth of the stream emerging from the mountain valley. All those buildings constructed without appropriate foundation for a given soil and in sloppy areas are also at risk. Roads, communication line and buried utilities are vulnerable.

Hazardous Areas

Canyon bottoms, stream channels, areas near the outlets of canyons, and slopes excavated for buildings and roads are the most hazardous areas for landslides

Typical Effects

Physical Damage: Landslides destroy anything that comes in their path. They block or bury roads, lines of communication, settlements, river flow, agricultural land, etc. It also includes loss to agricultural production and land area. In addition physical effects such as flooding may also occur.

Causalities: They cause maximum fatalities depending on the place and time of occurrence. Malin landslide in Pune district of Maharashtra is an example of such type which killed many people.

Major Mitigation Strategies

Hazard Mapping

Hazard mapping will identify the landslides prone locations and helps to develop proper mitigation and preparedness measures in advance. The settlement plan will be appropriate to reduce the risk and makes the resources more productive.

Land Use

- Areas with less vegetation in upper slopes to be afforested with suitable plants and more attention to be paid to preserve the existing vegetation and forest patches.
- In landslides prone areas all development activities should be carried out only after proper planning and protective measures
- Natural drainage system should be protected while making roads, cannels, railway tracks, and other developmental works in landslide vulnerable areas.
- It should be mandatory not to develop settlements in landslide prone hill stations, sloppy areas and newly constructed road sides susceptible to landslide risk etc.
- In advance relocate the infrastructures and settlements in the risk zones.

Retaining Walls

In hilly area retaining walls are important to stop the landslides from slipping. These are common and inevitable along the rod sides and largely reduces the risk of landslides.

Engineered Structures

In order to control landslides the strong engineering structures help a lot. Obviously, the engineering structures with strong foundations can withstand or take the ground movement forces. Largely, the underground installations (pipes, cables etc.) should be made flexible to move in order to withstand forces caused by the landslides.

Surface drainage Control Works

The surface drainage control works are implemented to control the movement of landslides accompanied by infiltration of rain water and spring flows.

Increasing Vegetation Cover

Vegetation controls the soil erosion and landslides effectively. It is also one of the cheapest and widely accepted mitigation measures. The surface soil becomes stickier and stronger because of good vegetation. It helps to bind the top layer of the soil with layers below, while preventing excessive run-off and soil erosion

Insurance

The houses that prone to landslides or any other natural disasters should be insured in time. In case of disaster, the houses may partly or fully get damaged, which is unbearable to any house owner. Thus, insurance is the best way to reconstruct the houses immediately after disaster.

Trigger Mechanism: Plan Activation

The landslide response system will be activated on the occurrence of landslide. At State level the SEOC will be activated immediately after having information from district or local authorities. The Secretary Relief & Rehabilitation will also activate all line departments to

get ready for response works. For emergency response he will issue instructions to all line departments for the following.

- The type of assistance to be required at site
- Specify exact rescue and relief materials
- Coordinate with task forces for timely departure to the affected sites
- Contact with government departments and private agencies for disaster response resources, skilled manpower and critical supplies

Response Mechanism

- The SEOC should be activated for emergency response.
- Report the information to the higher authorities at State and National level.
- Alert the State search and rescue teams and consult with district administration for their deployment in affected areas if necessary.
- Stay in touch with district administration and local authorities and send search and rescue team and necessary rescue equipments as and when required.
- Communicate with NDRF in time and alert it to get ready for SAR operation if district administration needs.
- Inform all government line departments to support district administration with resue and relief materials, manpower and other critical supplies.

Relief Measures

- Set up temporary shelters for evacuees.
- Make provision for essential services like food, clothing, blankets/bedding, drinking water, light, and essential medicines.
- Deployment of First Aid team and medicines.
- Arrange transportation for patients to take them to hospitals in case of serious condition.
- Maintain law and order in the affected sites.
- Take special care of old persons, pregnant women, disables and children.

10.7 Nuclear and Radiological Emergencies

The growth in the application of nuclear science and technology in the fields of power generation, medicine, industry, agriculture, research and defence has led to an increase in the risk of occurrence of Nuclear and Radiological emergencies.

As on date, 17 power reactors and five research reactors are in operation in India, six power reactors are under construction, and plans exist to set up thorium-based reactors to meet the ever-increasing energy needs. Further, India is also one amongst the seven declared nuclear weapon states which uses nuclear technology for strategic purposes.

Maharashtra is one of the Nuclear Plant states in the country. It holds an important position in the nuclear energy sector of India. Thus, nuclear disasters may not be ignored in future on account of terrorist attacks, technical errors or natural activities which include geological activities like earthquakes, natural fires, floods etc.

10.7.1 Scope of the Action Plan

This plan document has tremendeous scope to addesss the issues from receiving of emergency intimation to the immediate response actions.

Nuclear and Radiological Emergency/Disaster Scenarios

- An accident taking place in any nuclear facility of the nuclear fuel cycle including the nuclear reactor, or in a facility using radioactive sources, leading to a large-scale release of radioactivity in the environment.
- A "criticality" accident in a nuclear fuel cycle facility where an uncontrolled nuclear chain reaction takes place accidentally leading to bursts of neutrons and gamma radiation (as had happened at Tokaimura, Japan).
- An accident during the transportation of radioactive material.
- The malevolent use of radioactive material as Radiological Dispersal Device (RDD) by terrorists for dispersing radioactive material in the environment.
- A large-scale nuclear disaster resulting from a nuclear weapon attack (as had happened at Hiroshima and Nagasaki in Japan) which would lead to mass casualties and destruction of large areas and properties.

10.7.2 Regulatory Body

- The Atomic Energy Regulatory Board (AERB) is the nuclear regulatory authority in India which, as per the legal framework of Atomic Energy Act, 1962, has the mandate for issuance of licenses to nuclear and radiation facilities upon ensuring compliance with the applicable standards and codes.
- It is emphasised that the AERB, which oversees nuclear and radiological safety in the country, has the powers to not only licence the operation of a facility but also the power to order partial or full shutdown of any facility that violates its guidelines.
- The AERB has been playing a very crucial role in the prevention of nuclear/radiological accidents by ensuring that proper safety design features and operating procedures in all nuclear and radiation facilities are in place.

10.7.3 Authority

- The Department of Atomic Energy (DAE) has been identified as the nodal agency in the country for providing the necessary technical inputs to the national or local authorities for responding to any nuclear or radiological emergency in the public domain.
- The Ministry of Home Affairs (MHA) is the nodal ministry in such emergencies. For this purpose, a Crisis Management Group (CMG) has been functioning since 1987 at DAE.
- In the event of any radiological or nuclear emergency in the public domain, the CMG is immediately activated and will co-ordinate between the local authority in the affected area and the National Crisis Management Committee (NCMC). The CMG comprises of senior

officials drawn from various units of DAE like the Nuclear Power Corporation of India Ltd. (NPCIL), Bhabha Atomic Research Centre (BARC). It also includes a senior official from the regulatory authority, the Atomic Energy Regulatory Board (AERB). Each member is backed by an alternate member, so that the CMG can be activated at a very short notice. Several Resource Agencies from BARC also back up the CMG. They can provide advice and assistance in the areas of radiation measurement and protection and medical assistance to radiation affected personnel.

- For an effective response to any major nuclear emergency, an immediate communication 18 Emergency Response Centres (ERCs) have been established across the country, by BARC and DAE which is given below.

(Location of the Emergency Response Centres (ERCs) established by BARC – Mumbai BARC, Nodal ERC, Tarapur, Kakrapar, Indore, Kota, Jaipur, Delhi, Narora, Shilong, Kolkata, Jaduguda, Nagpur, Hyderabad, Kaiga, Bangalore, Kalpakkam, Aiwaye and Kudankulam)

- In case of Maharashtra, the ERC at Mumbai BARC and other national resources such as the Armed Forces etc. shall deal with the situation. The role of the State Government and its agencies such as the Maharashtra State Disaster Management Authority (MSDMA) will only be supportive and be at the directions of the CMG.

10.7.4 Trigger Mechanism

The Trigger Mechanism prescribes the manner in which the disaster response system shall be automatically activated after receiving early warning signals of a disaster happening or likely to happen or on receipt of information of an incident. As a basic regulatory requirement, emergency preparedness exists at BARC to respond to any on-site emergency in their areas. But to handle radiological emergencies arising from a transport accident or from movement/handling of "orphan sources" (radioactive sources that have lost regulatory control) or due to malevolent acts like explosion of a Radiological Dispersal Device (RDD), Radiation Exposure Device (RED) or Improvised Nuclear Device (IND) any time or anywhere in the State, a network of 18 number of Emergency Response Centres (ERCs) has been established by Bhabha Atomic Research Center (BRAC) and Department of Atomic Energy (DAE). This network is basically meant for responding to such emergencies and also for providing timely advice and guidance to the first responder at the State and National level. The ERC (BARC) is equipped with radiation monitoring instruments, protective gear and other supporting infrastructures. Various units of Nuclear Emergency Response Teams (ERTs), consisting of personnel from different DAE units are also being raised. The centralised agency, called the management activities not only by activating these ERC and ERTs but also by mobilising the resources from all DAE facilities, at the time of crisis.

Line of Communication and Responsibility for the State

Nuclear Disaster is a situation, where chances of receiving any early warning are very low. In such a situation where no early warning signals are available, the primary objective of the trigger mechanism shall be to mount immediate isolation. The following procedure shall be followed in such situations:

- For metropolitan areas, the Incident Commander for all nuclear hazards shall be the Commissioner of Police (CP). For other areas it will be the District Magistrate (DM).

- The field functionary at ground zero shall inform the District Emergency Operation Centre (DEOC), the Commissioner of Police in a metropolitan area and the District Magistrate of the incident. DEOC / District Magistrate/ Commissioner of Police shall inform the State Emergency Operation Center (SEOC), Emergency Response Centers (ERCs), the Secretary of DM and MSDMA.

Immediately thereafter, personnel from the AERC will determine the source of the radioactive emission and its strength (*See below, IAEA-EPR-FIRST RESPONDERS 2006) and report the same to the Commissioner of Police. In non-Metropolitan Area, the District Collector will inform the MSDMA, Emergency Response Centers for carrying out the function.

- The Secretary R & R or MSDMA shall convene an immediate meeting of the Crisis Management Group under the Chief Secretary.
- The Secretary R & R shall inform National Emergency Operation Center (NEOC) and if required coordinate with Bhabha Atomic Research Center (BARC) for specialised support team from the 18 ERCs.
- The Commissioner of Police in a metropolitan area and the District Magistrate in others shall review the situation and activate coordination, command and control.
- The Secretary of Health (SoH) shall place medical and para-medical teams if required at the disposal of the Incident Commander.
- The Fire Brigade as well as personnel/vehicles/equipments from MSDMA's Emergency Response Centers (ERCs) will report to the Incident Commander.
- The Secretary R & R shall also coordinate immediate evacuation of potentially affected civilians with the Commissioner Police (CP), Municipal Commissioner and Collector.
- Team for Rapid Assessment of damage shall be deployed
- Chemical Biological Nuclear and Radiological team (CBRN) shall be formed and deployed to ground zero by the incident commander, i.e. Commissioner of Police in metropolitan areas and by the District Magistrate (DM) in other areas.

*Suggested Radius of Inner Cordoned Area (Safety Perimeter) for Radiological Emergencies (IAEA-EPR-FIRST RESPONDERS ২০০৬)	
Situation	Initial Inner Cordened Area (Safety Perimetre)
Initial Determination (Radiological Emergency in Open Area)	
Unshielded or damaged potentially dangerous source	৩০ m around
Major spill from a potentially dangerous source	৭০০ m around
fire, explosion or fumes involving a potentially dangerous source	৩০০ m radius
Suspected bomb (potential RDD) exploded or unexploded	400m radius or more to protect against an explosion
Initial Determination (Radiological Emergency Inside a Building)	
Damage, loss of shilding or spill involving a potentially dangerous source	Affected and adjacent areas (including floors above and below)
Fire or other event involving a potentially dangerous source that can spread materials	Entire building and appropriate outside distance as indicated below

throughout the building (e.g., through the ventilation system)	
Explosion Based on Radiological Monitoring	
Ambient dose rate of 100pSv/h	Whenever these levels are measured

10.7.5 Response Mechanism

Response measures are those which are taken instantly prior to, and following, a Nuclear & Radiological emergency aimed at limiting injuries, loss of life and damage to property and the environment and rescuing those who are affected or likely to be affected by it. National Executive Committee (NEC) will ensure that the functions and responsibilities of the nuclear facility operators and response organisations are clearly defined and understood by all stakeholders. The MHA and the NEC will also determine the actions that need to be performed by each organisation during an emergency and whether it has the necessary resources and capabilities needed for the purpose. The advice of National Crisis Management Commiteee (NCMC) will also be sought in this matter.

Emergency	Activity	Responsibility
Off-Site Emergency	➢ Declare an off-site emergency in consultation with Site Emergency Director. ➢ Activate an offsite emergency control centre. ➢ Establish immediate communication with ERC, State Government and the CMG, DEA. ➢ Arrange an immediate deployment of various ERTs in affected sector(s).	Collector
	➢ Arrange an evacuation of the public to safer places. ➢ Activate systems of the State machinery to meet the necessary requirements of the public in the camp till the people are in a position to go back to their homes after the affected areas are cleared and declared safe. ➢ Deploy Quick Reaction Medical Teams (QRMTs)/Medical First Responders (MFRs) consisting of physicians, triage officer, Radiological Safety Officer (RSO), nurses and paramedical staff.	Collector, Municipal Commissioner, Home Dept., Health Dept.,
	➢ To ensure that necessary arrangements at evacuation/relief centers is made with sufficient availability of: food, water, blankets/clothing, medicines, lighting, sanitation and hygiene etc. ➢ To ensure necessary security arrangements for the personals (emergency responders/relief teams) who are working at Relief Centers and involved in distribution of Relief Materials.	Secretary R & R, Civil Supply Dept., Collectors, Municipal Commissioner, Water Supply Dept., Health

	➢ To ensure that law and order is maintained at evacuation/relief centers and in the affected areas as well.	Dept., Power & Energy Dept., MSEB & Local Authorities, Home Dept.
	➢ Make an arrangement for providing timely and appropriate information to the public in the event of a nuclear or radiological emergency. ➢ Ensure that the information to media/general public about the coordinated response is released in an organized manner.	Director DMU, Collector, Info. Dept., Municipal Commissioner,
	➢ Immediately activate and co-ordinate between the local authority in the affected area and the National Crisis Management Commiteee (NCMC).	Crisis Mgnt. Group
Nuclear/Radiation emergency	➢ Recognise the existence of an abnormal situation. ➢ Identify and characterise the source and its origin. ➢ Initiate a quick and reliable monitoring methodology to detect the onset of an accident/emergency condition and assess its magnitude. ➢ Communicate the situation to fire fighting and medical services, police, civil defence, transport, and other agencies. ➢ Estimate the dose via the relevant pathways. **(*Dose Limits for exposures to ionising radiations for occupational workers given here below)**	ERC,DEA, AERB, CMG, Dist. Collector, Commissioner of Police, Municipal Commissioner,
	➢ Support decision making on protective measures for the population and the environment. ➢ If required, distribute iodine tablets at the earliest (iodine prophylaxis). ➢ Respond quickly to the situation and mobilise resources at short notice. ➢ Initiate countermeasures at the earliest (for relief and rescue operations on the basis of actual radiation dose levels prevailing in different zones). ➢ Make sure an immediate measures need to be taken as the situation develops. ➢ Ensure that the actions taken by the various agencies are well coordinated.	Dist. Collector, Municipal Commissioner, Health dept., Police dept
	Send prior information (in respect of dos and don'ts) to those likely to be affected by the accident/emergency. These include: ➢ Evacuation/temporary relocation of the affected population, if required.	Director DMU. Home Dept., State EOC, Civil Supply Dept., Animal

	➢ Withdrawal and substitution of supplies of food and drinking water (based on actual measurement of contamination found in food and drinking water). ➢ Animal husbandry and agriculture department personnel to ensure radiological protection following a nuclear emergency. ➢ Initiation of the recovery phase at an appropriate time.	and Husbandry dept., Information dept.
"Criticality" Accidents	➢ Critical Situation in a nuclear facility is a situation of national emergency. In case of Maharashtra, the ERC at Maharashtra and other national resources such as the Armed Forces etc. shall deal with the situation. The role of the State Government and its agencies such as the Maharashtra State Disaster Management Authority will only be supportive and be at the directions of the Crisis Management Group set up by the Union /Central Government.	ERC, CMG, NEC, DEA
Transportation of Radioactive Materials	On discovery of any such accident, the District Magistrate in a district or the Commissioner of Police in a metropolitan area, shall inform the following – ➢ The ERC at Mumbai (Nodal ERC) ➢ The SEOC at Mantralay, Mumbai ➢ The Secretary of Relief and Rehabilitation ➢ The Secretary, DMU	DM or SP
Radiological Dispersal Device Emergency	➢ Mobilise and operate incident command ➢ Oversee victims triage ➢ Make sure that the site is cordoned and the perimeters are controlled and managed ➢ Ensure notification and activation of special teams ➢ Ensure traffic and access control ➢ Ensure protection to at risk and vulnerable population ➢ Gender issues must keep in mind ➢ Provide resources support and requests for assistance ➢ Ensure public works coordination ➢ Ensure public information, outreach, and communication activities. ➢ Seal off the inner zone of 400m radius from the blast point as „no entry area" except for emergency measures. ➢ Perform life-saving rescue and emergency first aid for seriously injured. ➢ Remove injured persons as far away as practical from the incident scene, especially in case of fire. ➢ If medical attention is needed, assist in	CMG, Dist. Collector, SP, Municipal Commissioner, EOC EOC, Director DMU, Info. Dept., Home Dept., local authority, Health Dept. Civil supply Dept.,

	arrangements for medical assistance. ➢ The medical personnel will be informed that radioactive contamination might exist on the victims and/or their clothing. ➢ Identify all those who may have been exposed to a possible release of radioactive material. ➢ Identify those involved with the incident or potentially contaminated by the incident at the scene, except those requiring emergency medical evacuation. ➢ All individuals will be monitored and decontaminated. ➢ Record names, addresses, destinations, and telephone numbers of those individuals who cannot be persuaded to stay at the incident scene. ➢ Prohibit eating, drinking and smoking in the incident area ➢ Advice to the Local Public following a Radiological Dispersal Device Explosion *The public living in approximately twice the radius of the inner cordoned area are advised the following:* ➢ If present in the inner zone, to get monitored at the earliest. ➢ Move away from the immediate area ➢ Not to eat food until certified free from contamination. ➢ Avoid any smoke/dust. ➢ Turn on local radio/TV channels for advice from emergency response centres/health authorities. ➢ Remove contaminated clothes and place these in a sealed plastic bag; ➢ Take a shower to wash off dust and dirt. This will reduce total radiation exposure. ➢ If radioactive material was released, local news broadcasts will advise people where to report for radiation monitoring and for blood and other tests to determine whether they were in fact exposed and steps to be taken to protect their health	
Loss or Theft of Radioisotopes/Radioactive Material	➢ It is the user's responsibility to maintain an inventory of all sources at all times so in case of loss or theft of a radioactive source, the matter needs to be reported to the police, CMG and AERB immediately. ➢ Theft of sources should be dealt jointly by law and order enforcement agencies and radiation	Home Dept., Dist. Collector /DM

	protection experts.	

*Dose Limits

AERB has prescribed the following dose limits for exposures to ionising radiations for occupational workers.

A) Effective dose[1] (whole body)

1. 20 mSv averaged over five consecutive years, calculated on a sliding scale of five years2; (The cumulative effective dose in the same five year period shall not exceed 100 mSv)
2. a maximum of 30 mSv in any year.

B) Equivalent dose (Individual Organs)

1. Eye lens 150 mSv per year and
2. Skin3 500 mSv per year
3. Extremities 500 mSv per year

(hands and feet)

C) Pregnant woman

1. Equivalent dose limit to the surface of the woman"s lower abdomen (for the remaining period of pregnancy) 2 mSv
2. Annual Limit on Intake (ALI) for radionuclides (for the remaining period of pregnancy) 0.05 ALI

D) Apprentices and students (above the age of 16 years)

Effective dose ((whole body): 6 mSv per year
Equivalent dose (Individual Organs)

1. Eye lens 15 mSv per year
2. Skin 50 mSv per year
3. Extremities 50 mSv per year

(hands and feet)

In addition, investigation limits are also prescribed by AERB at which investigation of exposure cases exceeding these limits are carried out by an AERB committee.

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1. Effective dose means summation of the tissue equivalent doses, each multiplied by the appropriate tissue- weighting factor.
2. Sliding scale of five years means current year and previous four years.

3. Average dose over 1cm² of the most highly irradiated area of the skin.

(Source: SDMP, Gujrat)

10.8 Industrial Chemical Disasters

In the event of fires, chemical leaks or explosions occurring in industrial facilities, people are exposed to dangers like fire, poision/chemical gas, low oxygen level and contamination of land, water and air.Maharashtra, being a highly industrialized State is prone to chemical and industrial hazards. Most of the hazardous factories are in Thane, Raigad, Mumbai, and Pune districts. Chemical industries, handling a large number of chemicals as raw materials, in processes, products, and wasters, with flammable, explosive, corrosive, toxic and noxious properties are likely to cause major industrial and chemical hazards. Any accident involving these may have an adverse impact on both the community and the environment.

Maharashtra Industrial Development Corporation (**MIDC**) is a project of the government of Maharashta state in India and is the leading corporation of Maharashtra. It provides businesses with infrastructure such as land (open plot or built-up spaces), roads, water supply, drainage facilities and street lights. MIDC areas are spread all over the state of Maharashtra. The MIDC started in 1962 with Wagle estate, Thane as its first industrial area.

MIDC's major industrial areas are in Tarapur, Boisar, TTC (Trans Thane Creek) near Thane and Navi Mumbai, Pimpri-Chinchwad near Pune, Satpur, Ambad, Sinnar, Gonde near Nashik, Butibori 5 Star MIDC, Nagpur, Kagal 5 Star MIDC, Kolhapur, Gokul Shirgaon MIDC, Kolhapur, Shiroli MIDC, Kolhapur, Nanded 5 Star MIDC, Nanded, Satara MIDC, Satara, Degaon 5 star MIDC, Satara, Kupwad, Sangli, Miraj, Sangli, Latur, Latur, Waluj near Aurangabad, Islampur near Sangli

10.8.1 Onset type and warning

Onset in case of industrial disaster can be either rapid (minutes to hours) or sudden (no warning) depending on the nature of occurance. Chemical disasters, in general, may result from: fire, explosion, toxic release and poisoning.

As there is a series of processes and reactions involved the onset may vary accordingly. Release of chemicals may be because of human error, technological failure or natural activities which include geological activities like earthquakes, natural fires, floods etc. The industrial facility should have monitoring and warning system for fire and building up of dangerous conditions. Exploison in some cases can be anticipated.

10.8.2 Sources of Chemical Disasters

Chemical accidents may originate in:

1. Manufacturing and formulation installations including during commissioning and process operations; maintenance and disposal.
2. Material handling and storage in manufacturing facilities, and isolated storages; warehouses and godowns including tank farms in ports and docks and fuel depots.
3. Transportation (road, rail, air, water, and pipelines).

10.8.3 Authority

Enforcement and monitoring of chemical safety and emergency Management involves various central/state ministries/departments viz. Ministry of Home Affairs (MHA), Ministry of Environment and Forests (MoEF), Ministry of labour and Employment (MoLE), Ministry of Agriculture (MoA), Ministry of Petrolium and Natural Gas (MoP & NG), Ministry of Chemicals and Fertilisers (MoC & F), Ministry of Shipping, Road Transport and Highways (MoSRT & H), Ministry of Commerce and Industries (MoC & I), DEA, Ministry of Finance (MoF) etc. The MoLE, MoEF and MoSRT & H are responsible for enacting regulations.

At the State Level

At the State level, the State Crisis Group (SCG) is an apex body to deal with major chemical accidents and to provide expert guidance for handling them. The same existing and established structure could be used for handling Chemical Disasters also. SCG, under the Chairmanship of Chief Secretary.

At the District Level

At the District level, the District Crisis Group (DCG) is an apex body to deal with major chemical accidents and to provide expert guidance for handling them. The same existing and established structure could be used for handling Chemical Disasters also. The DCG includes District Collector, SDM and Dy. Collector, DDO, Dy. Director – Industrial Safety & Health, DSP, PI, Fire Superintendent of the City Corporations or important Municipalities, Chief District Health Officer, Civil Surgeon, SE, Chief Officer, Dy. Chief Controller of Explosives, Commandant – SRPF, Group-I, Dy. Director – Information to name a few.

10.8.4 Flow of Information (Communication)

A procedure has to be laid out to communicate the accident / attack to the District Control Room (DCR) giving details such as location of incident, chemical(s) involved, severity of incident, casualties (if any), etc. The person in-charge at DCR shall then inform the first three responders i.e. Police, Fire & Emergency Services and Medical Department. He will then inform the District Collector and all other members of the DCG. The District Collector, in turn, would inform the Maharashtra State Disaster Management Authority (MSDMA) and the SCG about the incident and ask for additional help in terms of resources and manpower (if at all required) after assessing the situation on site. The SCG or the MSDMA would then inform the Central Crisis Group (CRG) about the incident along with other relevant details on hand. The first responders, after reaching the site, will secure more information about the incident and try to establish communication with the concerned agencies / departments for deploying resources / personnel as per the need of the situation.

10.8.5 Regulatory Framework

The regulatory framework on chemical safety can be traced to the Factories Act, 1948 and chemical class-specific regulations like the Explosives Act, 1884; the Insecticide Act, 1968; and The Petroleum Act, 1934. Later, an umbrella Act, the Environment (Protection) Act, 1986, was enacted, which also deals with chemical management and safety. A number of regulations covering safety in transportation, insurance, liability and compensations were enacted thereafter. The Government of India has further reinforced the legal framework on chemical safety and management of chemical accidents by enacting new rules and by way of amendments to them.

10.8.6 Trigger Mechanism for Industrial (Chemical) Disasters

On getting the first hand information about an emergency/disaster, the in-charge of the DEOC should immediately inform the District Collector and the first three responders i.e. Police, Fire & Emergency Services and Medical Services. Informed District Collector then runs down to DEOC, where Dy.Director of Industrial Safety and Health (DISH) and two experts will join him. The notification should specify the location of the incident, the type of chemical released/used (if known), possible consequences and provide written reports on actions taken and on health effects. The District Collector should then inform the State Control Room (SCR)/SEOC, the MSDMA and the Chairman of the SCG about the incident. The SEOC will then issue alert or direct all the Emergency Responder Agencies at the State and District level for providing their services immediately. The SCR/SEOC will immediately take decision to deploy SRTs in the affected area/s.

During the initial stages of the emergency it is likely that the reports may be unclear and conflicting. Therefore, the first responders conducting the on-site assessment should secure reliable sources of information to allow an objective assessment of the situation. The assessment should include casualty, material damages, and the likely health consequences.

It should also suggest antidotes and treatment regimes for those affected by medical care if the type/nature of chemical released/used during the attack is known. The State Crisis Group (SCG), after analyzing the information received from the District Collector and the first responders would then decide on mobilization of additional resources, medical aid and rescue equipment as required through various sources. The SCG should also instruct the Fire & Emergency/Rescue Services and Hospitals of the neighbouring districts to be on alert in case their services are needed. The Team Commander of the ERT should cordon off the affected area. He should instruct the neighbouring population to stay away from the site. He should instruct the medical unit to detect the substances used during the attack through the available equipment/kit. He should also decide the place for establishing the decontamination unit at an appropriate location in consultation with doctors and paramedics. The Search & Rescue unit of the ERT should rescue and evacuate the affected people to a safe location.

10.8.7 Response for Industrial (Chemical) Disasters

Response measures are those which are taken instantly prior to, and following, a Industrial (Chemical) emergency/attack aimed at limiting injuries, loss of life and damage to property and the environment and rescuing those who are affected or likely to be affected by it. SCG will ensure that the functions and responsibilities of the chemical facility operators and response organisations are clearly defined and understood by all stakeholders. The Central Crisis Group (CCG) and the SCG/DISH will also determine the actions that need to be performed by each organisation during an emergency and whether it has the necessary resources and capabilities needed for the purpose.

For the fastest response, it is very important that the person who is receiving the information shall immediately pass on to the first responders, Dist. Collector, Sub Div. Magistrate. If he receives, further information after making the first call, he will convey that also in same order. Alternatively, if the information is more relevant to any particular department, he will first pass that information to its head.

The specific activities and role & responsibilities are as under;

Task	**Activity**	**Responsibility**
Disaster declaration and Plan Activation	➢ In consultation with SCG declare an off-site emergency and activate an off-site emergency plan. ➢ Activate DCG. ➢ Establish immediate communication with DEOC, SEOC, and SDMA	Collector
Deployment of SAR and First Aid Teams	➢ Deploy the Emergency Response Teams of Fire, Police, S&R, and Medical in affected locations immediately. ➢ Evacuate the affected/likely to be affected people to safer places and arrange the temporary shelters and medical assistance for them. ➢ Deploy the SAR and First Aid teams including doctors, nurses, triage officers and paramedical staff in affected area with all medical equpments and critical supplies. ➢ Keep people in temporary shelters until the affected areas are cleared and declared safe. ➢ Coordinate with State Authority for necessary arrangement in affected areas.	Collector, Municipal Commissioner, Home Dept., Health Dept., Industry/Industrial Association,
Resource mobilization and security	➢ Ensure that evacuation/ relief centres have sufficient food, water, medicines, clothes, blankets, lights and sanitation facilities and are running with regular supervision of district administration. ➢ Ensure that the collection and distribution of relief materials is systematic and transparent. ➢ Ensure that the law and order situation of relief centres is maintained properly ➢ Ensure that the security of emergency responsders is well.	Secy. R & R, Civil Supply Dept., Collectors, Municipal Commissioner, Water Supply Dept., Health Dept., Power & Energy Dept., MSEB & Local Authorities, Home

		Dept.
Addressing Health related issues	➢ Ensure sufficient stock of emergency medicines, antidotes, etc in all hospitals at district and taluka level. ➢ Keep all hospitals on ready position with manpower and medicines to address any emergency situation. ➢ Ensure that the required medical assistance/aid and medicines/antidotes are provided to the affected people at site as well as at evacuation/relief centers in the affected area and necessary records are maintained. ➢ Contact with State authority for any additional help like doctors, medicines, equipments etc. ➢ Mobilise doctors/paramedics If required, from one district/taluka to other.	Health Dept.
Media management	➢ Make provision for dissemination of accurate and reliable information to the public and media in case of a chemical attack. ➢ Ensure that the information to media/general public about the coordinated response is released in an organized and timely manner.	Director DMU, Collector, Commissioner of Info., Municipal Commissioner
Disposal of Dead bodies	➢ Ensure following procedure is followed before disposal/handing over of dead bodies: ➢ Photographs of the dead bodies are taken, ➢ Identification of the dead bodies is done, ➢ Post Mortem where ever necessary and possible is carried out, ➢ Handing over dead bodies of persons known/identified to their relatives, ➢ Disposal of unclaimed and unidentified dead bodies	Revenue Dept., Collector, Home Dept., Health Dept., Local Authorities, Industry/Industrial Association
Animal Care and disposal of dead bodies	➢ Animal Husbandry Department to ensure medical aid to cattle that are injured. ➢ Disposal of animal carcasses with the help of local bodies/health dept.	Animal Husbandry Depts., Local Authorities, health dept.

10.8.8 Role and Responsibility of First Responders (Police, Fire, Medical, SAR Teams)

Police Department (Home Dept.)

- Control and divert the traffic near the affected area.
- Ensure law and order at the incident site during chemical emergency/disaster and at evacuation centres too.
- Provide security in evacuated areas

In case of Chemical attack;

- Secretary, Home and Director General of Police (DGP) will direct the participation of police in the emergency response. Secretary, Home and DG, Police will constitute an integrated command.
- The Secretary, Home and DGP will report to the SEOC immediately upon the receipt of information about the disaster.
- The DGP will establish contact with the District Police Control Room immediately. He will get a situation estimate and assess the operational requirements for the police.
- The DGP will issue an alert to the Dy Iinspector General and the surrounding districts. He will direct all the police officials and forces in adjacent Districts to be deployed if necessary. The DG will ensure that the police forces required for traffic management, evacuation and law and order are available with the District administration.
- The DGP will review the dissemination of warning and the need for evacuation. He will help the Fire & Emergency Services and the Deputy Director, Industrial Safety and Health with Police Wireless sets, so that there is continuous communication among the first responders in the emergency situation.
- The DGP will ensure that the police force will not enter the area under disaster without the permission of the Fire & Emergency Services and Health officials.
- In case of big explosion and fire, the DGP will assess the situation and suggest a Plan of Action based on his assessment of the immediate causation.
- The DGP will order deployment of the police force for evacuation of the people from the zone of the danger.
- The DGP will send instructions for the cordoning off of the area. People should not be allowed access anywhere close to the site of the disaster.
- The DGP will review the traffic management in the area. The primary aim would be to ensure the transport of the injured to the hospital, easy access for emergency responders and safe evacuation of the people from the danger zone.
- The DGP will also issue directives that all the Private and Public Transport (trains and buses) be diverted from the disaster area.
- The DGP will contact the DIG and ask him to organize the deployment of police force from other Districts, based on the need assessment. The DGP will also contact the Central Industrial Security Forces, and other paramilitary forces to seek their deployment, if needed.
- The DGP will supervise law and order situation. He will take all the possible precautions to ensure that public order is maintained, and no one takes undue advantage of the situation.

Fire and SAR (Fire and Emergency Services (F&ES), Municipal Corporation, MIDC)

- Reach at the site soonest possible and assess the situation. (information about the chemical leak/spill, the action taken and current status)
- In case of fire, start fire fighting with suitable media and also take care of surrounding storages/tanks to be over heated so that reduce the chances of further spreading.
- In case of chemical leak, try to plugging/stopping of leak.
- Secretary, Industries will coordinate redeployment of MIDC Fire Tenders from other places, as required.

- Secretary, Industries will also coordinate with the Private and Public Sector industries for deployment of their Fire Brigades to the site of the disaster.
- The SCG, in consultation with the District Collector and other local officials will ensure that Chief Fire Officer, Fire Services, Dy. Director - Industrial Safety and Health, Officer in charge Police and Health Personnel all work closely with full coordination.
- Mumbai, Pune, Nashik, Nagpur and Aurangpur are the main providers of Fire Services in the state. The District Control Room will decide upon the deployment of Fire Services, based on distance and accessibility.
- Search and identify the risk and nullify the sources of leak / toxic release. If any unclear or unidentified substance or source is identified or detected, the team should send them immediately to the laboratory for further investigation / analysis
- To search and evacuate the affected population from the site of the incident.

Medical Services (Dept. of Health and Family Welfare)

- The Secretary - Health, and emergency medicine experts will provide the necessary expertise and specialized services to the SCG.
- The SCG will consider the level of exposure on the basis of situation estimate received from the District administration. It will consider the intrinsic toxic potential of the chemical, its concentration, the duration of exposure, and the health status of the people exposed.
- Based on the information upon the level and extent of contamination, the SCG will decide on the issue of alert and warning to the people in the affected areas through the All India Radio, Doordarshan, and Cable TV.
- The SCG will contact the Civil Surgeon and the District Health Officer of the concerned district and ask them to deploy all the necessary medical facilities including doctors, nurses, medicines, and ambulances.
- The SCG will alert major hospitals in the area, and ask them to be in readiness for receiving patients.
- In case the nature of contamination requires much greater intervention, the SCG will inform the CCG and ask for the necessary medical assistance of experts, doctors and equipments. The relevant agency for emergency medicine in the Government of India is the Directorate General of the Health Services (DGHS) in the Ministry of Health and Family Welfare. The DGHS has set up the Emergency Medical Relief cell, for dealing with these contingencies.
- The SCG will review the diagnostic support services: clinical laboratory, blood banks, radiology, pathology, pharmacy, paramedics, Red Cross, NGOs and volunteer personnel. It will seek all the steps to organize the necessary medical help through the deployment of doctors, paramedics, and provision of blood and medicines, as required.
- The SCG will review the administrative support required for the situation, which includes communications, transport of the victims and of the personnel, feeding of the personnel and patients, and supplies.
- The SCG will collect information on the number of deaths and persons injured; the nature of injuries and the likely long-term consequences.
- The SCG must assess the medical needs of the area on the basis of likely long-term consequences and take steps to equip local medical facilities for treating people on a

long-term basis. The SCG must also make financial provision for spending on long-term treatment.

Responsibilities after the disaster

Once the situation at the site is under control, fire has been extinguished; the emission of vapours to the atmosphere has been effectively checked, the following actions have to be performed by various sub-teams of the SRT and the respective line departments as well as the district administration:

Search & Detection of Leak / Toxic Release - The Search & Detection Team would identify the risk and nullify the sources of leak / toxic release. If any unclear or unidentified substance or source is identified or detected, the team should send them immediately to the laboratory for further investigation / analysis. The Team should also preserve the samples from the site of the incident such as sand, water, air and other infected substances for further investigation which could aid in strengthening the case later on. Technical expertise of Maharashtra Polution Control Board, Fire & Emergency Services and the Health Department may be used by the Search & Detection Team in carrying out the activities if required.

Structural Inspections after Fires or Explosions - A major explosion could damage or destroy numerous buildings and any nearby bridges or tunnels. Similarly large fires can have major effects on buildings and other infrastructure facilities over a vast surrounding area. In either case, residents / owners of the partially damaged buildings will want to know if the structures are safe to occupy while they await repairs. Questions pertaining to the safety of highway or railway bridges must also be resolved quickly to avoid traffic complications. It must be ensured that the inspection personnel have special precautions (i.e., chemical protective gear) in addition to normal safety equipment in those cases where the structure may still be contaminated by hazardous residues. Fire & Emergency Services personnel along with the structural experts from the PWD Department shall be responsible for inspecting the structural integrity of damaged buildings, bridges, or other structures in the aftermath of a fire or explosion.

Search, Rescue And Evacuation - After getting the go ahead from the technical personnel responsible for ensuring structural safety of the buildings in and around the incident site, the Search & Evacuation Team should carry out their job and evacuate the affected population from the site of the incident. They should brief the Information Officer about the rescue and evacuation status (including the place of temporary shelter) to ensure that no rumours are spread to avoid any panic amongst the general public. The Team, with the help of Police personnel should also stop general public from moving towards the danger zone. The Team should provide guidance to people regarding evacuation route, first aid and decontamination area. They should also help the Medical Team in rushing the victims to nearby hospitals.

Post-Incident Testing for Contamination - The De-contamination Team would be responsible to decontaminate the affected area, population, members of the SRT and equipment used during the operation on the site of the incident. In addition, the Team should also be responsible for erecting the decontamination chambers for the affected population. After the operation is completed in all respects, the Team should ensure that the site is totally decontaminated from the toxic substances. The Team should also ensure that the water that

was used for decontamination is properly discharged preferably to a sewerage system outlet.Technical personnel from the MPCB, Fire & Emergency Services and the nearby industrial units as well as the personnel from the Medical Team should help the De-contamination Team to carry out their duty. Further, the Team shall also check crops, water (ground & surface), homes, stored foods, and animals for possible chemical contamination.

Providing Medical And First Aid To The Victims - The Medical Team should provide first aid to the victims of the incident. If need arises, the Team should also help the hospital staff of the hospital where the victims would be transported from the incident site. They should monitor the level of triage of the victims through checking their breathing and pulse. They should also decide on the type of decontamination (either wet or dry) depending upon the substances / chemicals used during the disaster. The Team should also identify the trauma cases and counsel them appropriately.

Provision of Alternate Water Supplies - There are a number of circumstances under which a potable water supply may become unfit for human consumption for a time and require replacement. This is most commonly accomplished by bringing in supplies of bottled water and / or tankers / trailers capable of carrying water. The district administration must ensure the availability of potable water for consumption of affected population as well as first responders engaged at the incident site.

Re-Entry Into Evacuated Areas - Based on the assessment of the situation at the site, the DCG would take a decision on the termination of emergency. However, before taking this decision, several other actions needs to be ascertained such as restoration of electricity, gas, and water supplies in the affected areas / buildings, transport arrangements for bringing the affected population back from the temporary shelters, restoration of law & order in the affected area /s, etc. through the concerned Teams / departments.

Responsibility of the other Statutory Authority The designated authority under various statues like Indian Boiler Act, Factory Act, E.P. Act, Explosive Act, Static and Mobile Pressure Vessel Act etc. shall perform post emergency activities prescribed and also as directed by District Collector under Maharashtra State Disaster Management Authority..

(Source: SDMP, Gujrat)

Chapter -11

Cross Cutting Issues

11.1 Gender and Disaster Management

Gender equality: Refers to both men and women having the freedom to develop their personal abilities and make choices without the limitations set by stereotypes, rigid gender roles, or prejudices. It does not mean that men and women have to become the same, but that their rights, responsibilities and opportunities should not depend on whether they are born male or female. Gender inequality predominantly impacts negatively on women and girls, as men tend to have more decision-making power and control over resources than women. Because of this, efforts to advance gender equality need to focus primarily on improving the situation and status of women and girls in their societies. Specific actions may be taken to ensure that women's views and priorities are adequately and directly heard in disaster management committees.

Gender equity: Refers to fairness of treatment for women and men according to their respective needs. This may include equal treatment, or treatment that is different but considered equivalent. For example, specific outreach strategies may be developed to ensure that relief assistance reaches female-headed households in societies where the mobility of women is restricted. Likewise, general distribution centres may be created or certain livelihood recovery activities may be designed and implemented specifically by and for women.

Gender issues in Disaster Management

The relationships between men and women are powerful forces in every culture. The way these relationships are defined creates differences in the roles and responsibilities of men and women. It also leads to inequalities in their access to, and control over, resources and decision-making powers. Women and girls generally tend to be the main victims of natural disasters. A few commonly recorded reasons for higher death tolls among women and girls include:

- cultural constraints on female mobility which hinder self-rescue, for example, women may not leave the home without male permission, they may be reluctant to seek shelter because shared communal facilities do not have separate, private spaces for women or clothing may have been damaged
- lack of skills such as swimming or tree climbing, which are traditionally taught to males
- less physical strength than males, in part due to biological differences but, in some cases, also due to the effects of prolonged nutritional deficiencies caused by less access to food than men and boys.

At the same time, gender-based behaviours and stereotypes can also have negative effects on men and boys. Poverty is known to be a key factor in the vulnerability of both men and women during hazard events, but there can be gender differences among poor people that further compound the risks. For instance, poor women may have heightened vulnerability to hazard events that occur during the daytime, as many live in unsafe areas and houses and tend to spend more time indoors and near the house than their male relations. As men usually form the majority of poor migrant labourers, their wives and children, as well as older people remaining in the family home, may be more exposed to the impacts of local disasters.

In addition to gender-based stereotyping and discrimination, women and men may face further discrimination based on race, ethnicity, age, language, disability, sexuality, class or religion, further increasing their vulnerability

Disaster Response

The following are some key gender considerations that should be taken into account when planning and implementing emergency response assistance.

Emergency needs assessment: In the case of quick-onset disasters, rapid assessments normally take place within the first 24 to 72 hours of the emergency. At the minimum, data should be collected at this time on the age, gender, and diversity of the affected population. Whenever possible, this data should be supplemented with any available information on the pre-existing gender and socio-economic context and on the impact previous disasters may have had on different groups.

Emergency response teams: Assessment and response teams should include equal numbers of male and female members in order to facilitate accessing women and men separately during needs assessments. The proportional representation of, and consultation with, male and female representatives of different groups in the affected communities (the elderly, youth and minorities), is also very important for the same reason.

Beneficiary registration and relief distribution systems: Procedures for relief registration and distribution should recognize the need for, and ensure access to, assistance by all types of vulnerable and needy households, as well as individuals within households. Relief materials should not be distributed in the name of only male heads or on the basis of physical damage and losses. Food aid is far more likely to reach children if it is distributed directly through women However, the system for doing so must be carefully developed with the participation of community and other local leaders to avoid misunderstandings and backlashes against the targeted groups.

Female heads of household or female family members with limited physical mobility may need help accessing distribution locations or may need relief aid transported to them. This may also be the case for the elderly and for those with disabilities. This situation can be compounded when women face multiple mobility constraints This may require door-to-door visits to those with mobility constraints, as well as consulting men and women separately and scheduling community meetings at times that are convenient for both.

Appropriateness of relief items: Gender and culture-specific needs should be taken into consideration when designing relief packages. Women and men should be consulted on the contents of relief supplies to ensure they are suitable and to avoid costly waste, preferably as part of disaster preparedness planning for the pre-stocking of relief items. Women and older girls also have particular sanitary needs that should be taken into account. Relief packages need to contain supplies for menstrual blood absorption that are in line with what women would normally use (sanitary pads and clean strips of cloth), and should include underwear for women and girls. As women tend to be reluctant to approach men regarding their personal hygiene requirements, and

can be easily embarrassed or humiliated during the distribution of sanitary and undergarment supplies, it is generally preferable that males are not involved in their distribution. Similarly, pregnant and lactating women have special needs for ensuring adequate milk production and for other crucial nutrients and vitamin supplements that can be incorporated into family or mother and baby assistance packages.

Addressing health issues: Disaster relief efforts need to pay attention to specific female health needs. Often, pregnant women have lacked access to obstetric care and have miscarried or delivered babies under unsanitary and unsafe conditions. The availability of female and male medical personnel is particularly important after a disaster. This is especially true when cultural norms may not allow women to be examined by male physicians, and when women's mobility may be restricted.

Ensuring the safety and security of those displaced by disasters is also a key priority. Displaced women and girls face heightened risks of unwanted and high-risk pregnancies and rape. Those affected by disasters also frequently face a higher exposure to contagious diseases including HIV/AIDS. Condoms, reproductive health kits and midwifery kits, along with reproductive health information are key post-disaster needs.

Domestic violence and alcohol abuse prevention counseling should be incorporated into the provision of post-disaster psychosocial services whenever possible. Increased rates of alcoholism and alcohol-related violence are frequent in disaster affected areas. Men may also need counseling to help them cope with changes in gender roles, i.e. caring for young children after the loss of their spouse. Sports programmes for men and women may also be helpful in relieving tensions.

Ensuring appropriate safe shelter, human settlements and water and sanitation: Shelter and human settlement planning needs to take into account the socio-cultural and economic needs and preferences of both men and women, as well as safety considerations. Following natural disasters, the threat of physical and sexual violence often increases; this threat is magnified in relief camps.

The location and set-up of shelters can affect both the perceived and actual safety of those displaced by a disaster. Locating shelters close to the original home whenever feasible provides extra safety due to intimacy with the shelter's physical surroundings. Women are often in charge of collecting firewood and water, and are therefore particularly affected by the security of access routes to these resources. The spacing and design of shelters is important in ensuring adequate privacy for female members of households from neighbours or passersby. Secure doors and adequate lighting can be important factors in safety. Cooking, bathing and toilet arrangements also need to be adequate, safe and culturally appropriate. This requires participation by both male and female beneficiaries in designing such facilities.. Female and male bathing areas should be placed at some distance from each other and near areas with adequate lighting. Whenever culturally necessary, women's bathing and toilet areas should also include a separate area for washing and drying menstruation cloths. Furthermore, kitchens should be adapted to local food preparation customs.

Disaster Recovery

The following are key considerations to ensure gender sensitive recovery.

Recovery assessment: A full gender analysis should be conducted as an essential component of recovery needs assessments. Following the initial emergency assessment of a quick-onset disaster, a more in-depth assessment of community needs, vulnerabilities, and coping strategies is usually undertaken by the response and recovery operation. This includes the detailed identification of vulnerable groups with special needs within the local context (single parents, orphans and landless tenants for example). Vulnerability and Capacity Assessment (VCAs), Participatory Rapid Appraisals, and other forms of social analysis to be used to determine those that are the poorest and most vulnerable within disaster-affected communities with whom they are currently working or plan to work.

As with emergency assessments, ensuring gender balance on the team conducting the assessments is essential to achieving a reliable result.

Housing, human settlements, and water and sanitation: It is vital that women and men from all social and economic groupings in disaster-affected communities actively participate in the design and location of new housing and communal infrastructure, such as water and sanitation facilities and community halls, as well as the repair of existing structures. Many reconstruction programmes have resulted in near-empty settlements or the re-creation of unsafe living conditions, because of a lack of understanding of the livelihoods and social needs of the inhabitants. This includes cases of homes that were designed to be safer when in reality the so-called improved features were unacceptable to the beneficiaries due to cultural or practical reasons. Congested kitchen causes smoke hazards to women. Local participation in physical reconstruction should be encouraged. Women should be co-owner of the houses.

Re-establishing livelihoods: The roles women play in contributing to a household's food security or income, whether as family members or heads of the household, need to be understood, and livelihood recovery activities should be designed that meet their needs, in addition to those of the men in the household. This is especially the case when households were already poor, were particularly affected by the disaster, or had their coping mechanisms badly eroded. Women's means-producing activities can include cultivating home vegetable gardens, playing key roles in crop and fish production and marketing, raising livestock, running small businesses such as selling snacks or making cakes and day labour.

Disaster Preparedness and Mitigation Measures

Disaster preparedness and risk reduction activities: Recovery processes can include disaster preparedness and risk reduction activities that assist in building community resilience towards future disasters. Undertaking these activities during a recovery process is highly favourable, as people currently affected by a disaster are usually highly motivated to learn new ways of protecting themselves

Community-based disaster risk reduction and preparedness starts by working with communities to map the most significant locally prevalent natural and human-made hazards and to understand their patterns of vulnerability. It is also important to have a strong understanding of community demographics and existing social capital. Much of this information can be collected by undertaking community Vulnerability and Capacity Assessments. From these, communities can devise local ways to manage hazards and reduce their exposure and vulnerability.

Some Key considerations for ensuring gender-sensitive disaster risk reduction are as follows.

Physical mitigation works: The gender-related issues involved in the development of physical mitigation works - be it the building of check dams or health clinics, the planting of mangroves, the improvement of the safety of housing and public buildings or other such activities - are similar to those outlined in the recovery sub-section on "Housing, human settlements and water and sanitation". Women are often not adequately consulted or involved in the selection, design and implementation of these mitigation activities. Opportunities can also be created for women to be trained in non-traditional areas, such as cyclone-resistant roof construction, which would contribute to both their personal income and community safety.

Early warning systems: Ensuring that vital information reaches all segments of the community is of paramount importance when designing community-based early warning systems. In the past, there have been examples of assumptions that communicating the danger to one part of the community would ensure the passage of the information to all concerned, when in reality this was not the case. Additionally, in some situations where women and other groups had restricted mobility, they were overlooked. Community-based early warning systems should specifically address this concern.

Information, education and communication: Taking gender into account when planning the content of disaster preparedness training and designing the training in accordance with the risk profiles of gender groups can be beneficial. For example, the high-risk nature of some courses of action, and the existence of alternate, safer rescue methods may need to be emphasised with men. The methods chosen for information dissemination should also take into account gender differences in literacy, mobility and access to public venues (some women may need home visits by other women), labour schedules (day fishermen or factory workers may only be available in the evening), and general preferences for the means of participation.

Advocacy: Convincing local government officials and community leaders to fully involve both women and men from communities in disaster management activities and decision-making can be challenging. Local government has to undertake an advocacy role regarding the needs of these disadvantaged women and men. This diplomatic role can be adopted during DRR, relief and recovery phases. There is a window of opportunity following disasters when there is great humanitarian caring and a willingness to eliminate potential barriers so that beneficiaries can have equity in relief and recovery processes. This period of time can be well utilized to bring about positive change within legislation, community attitudes and values. Finally, identifying a group of advocates for gender inclusiveness among respected local leaders, as well as through groups representing these interests, women's groups and NGOs for example, can be highly

effective. These advocates should be encouraged to educate and motivate their peers on gender issues. The establishment of an advisory committee or working group comprised of these individuals can also help. However, it should be noted that sometimes support is initially required to strengthen the capacity of the interest groups.

(Source: Practical guide to gender sensitive approaches for disaster management)

11.2 Livestock Care during Disaster

Natural disaster is an event that is responsible for a social, economical, cultural and political devastation and affects people and communities at large. During natural calamities attention usually goes primarily towards human welfare, however, welfare of animal is also of paramount importance considering their causalities from drought and flood prone diseases, epidemics and different feed poisoning. Livestock rearing in the State is a source of employment of many more people.Nevertheless grave implications of natural calamities on both the livestock and their owners, disaster management of livestock has yet to receive any serious attention in India.

Issue to be taken in consideration

Prevent flooding, fire or earthquake from harming livestock: Safely transport, communicate and obtain medical assistance for livestock in disasters: evacuate, feed and identify livestock in a disaster: take steps to ensure that animal-related business fully recovers from a disaster : apply the four phases of emergency management to the care of livestock in disasters

The care of livestock

Many farms are vulnerable to natural disasters and require special consideration in the protection against disasters. Their owners depend on the farm's income for their livelihood. There are often many chemicals, such as fertilizer, herbicides and pesticides that can be spilled in a disaster. In this section, you will learn about some of the basic principles of disaster mitigation for livestock.

Farms in disasters are of concern for many reasons, some of which are listed below. :

- The safety of the human food supply depends on the health of food-producing animals. : Owners have personal and financial investments in their animals.
- Farm owners may be injured or killed attempting to rescue their animals in disasters.
- For many States and businesses, livestock, poultry and horses are a vital source of revenue.
- Protecting and saving human life is the first priority of disaster relief.

Protecting property is of secondary concern. Because of this, emergency management officials are not trained to deal with animals as property or the restoration of animal-related businesses. Therefore, farm owners should work with their emergency management agency and other groups before a disaster. Though, they should remember that the care of and responsibility for all animals lies with their owner or designated care provider.

1. Mitigation

There are many things that can be done on farms to mitigate disasters. Some of these are listed below.

- Build and repair buildings to meet or exceed construction codes and consider ease of evacuation.
- Replace or cover glass windows with materials that will not shatter and injure animals or personnel.
- Make sure that drainage ditches have grass covering (maintain sod). : prevent ground-burrowing animals from damaging dams and levees.
- Avoid accumulating piles of trash that can spill onto other persons' property and injure animals and people.
- Store chemicals in storm-proof buildings and secured containers.
- Do not leave construction materials unsecured. In high winds, these may become projectiles.
- Drain or build levees around ponds that could flood.
- After evacuating the barn, always close the barn doors to prevent animals from running back inside the barn.

Flooding

Many farms are in floodplains, but some farm owners and managers have a false sense of security. The animal husbandary department can provide maps and floodrisk assessment information on every property in their State. Farm owners should gather this information, review the location of their property, and engineer access to their property that will not leave them stranded during flooding. Civil engineers can help in the design and construction of flood-protected farm accesses and make recommendations on suitable locations for barns, stables, paddocks and high-lying areas that may be used as pasture ground in the event of a flood.

A common aftermath of flooding is the overflow of manure pits and waste lagoons. This can contaminate the environment, rivers and the drinking water supply. If this occurs, the environmental department will be interested in the environmental impact and will be concerned with river contamination and potential fish kills. Farmers can be fined for violations against regulations of environment departments. To prevent this from happening, farmers should take the following precautions.

- Have lagoons regularly inspected.
- Diligently keep records on the impact lagoons have on the environment and water shed.
- Discuss plans to divert manure from streams and rivers

Another common problem on farms in disasters is hazardous materials spills. Storing hazardous materials in locked buildings with securely strapped containers should prevent these from leaking into the environment and water supply.

After floods there may be an increase in infectious disease.

- Animals that have stood in contaminated flood water will be at increased risk and may develop infections of the hooves and skin (dermatitis).
- Cuts acquired from disaster debris make animals more susceptible to tetanus and contaminated floodwater may contain toxins, including botulinum toxin from rotting carcasses. Contact with wildlife may also increase the potential for rabies.

Fire Safety

Barn fires tend to break out in the winter and summer months when barn doors are closed and the demand for heating, cooling (fans) and lighting is at its highest. Many livestock facilities are built of flammable materials and some contain gas heaters. Safety measures to prevent the damage caused by fires include the following.

- Fire extinguishers, sprinkler systems, smoke detectors and enforced no smoking policies can greatly reduce the risk of fires.
- Electrical wiring of barns and stables should meet appropriate safety standards and be installed by qualified electricians. Professional advice is available to help with these.
- The State department of building and fire safety and most local fire departments provide low-cost inspections and recommendations on fire safety for properties. The recommendations are detailed and will provide the highest standards by which to prevent fires.
- Farm owners should consult with their local fire department on how to fireproof their stables. This also familiarizes farm owners and local firefighters with one another. This familiarity is helpful in the event of an emergency. Knowing where a farm is located, how to access facilities, how many animals are there, and where large volumes of water are available can make the difference when firefighters are responding.

Power Supply and Miscellaneous repairs

Priority for restoration of power following an emergency is usually based on human population density. Because many farms are in rural areas, it could be some time before power is re-established. Many livestock operations depend heavily on electrical power to milk cows, provide heat and cool air (fans), and operate feed elevators and machinery. Owners can find out about the relative priority of their farm from their local utility company. This important information can help farmers prepare for times without power. Farm owners should consider securing a generator for emergencies.

2. Preparedness

The priorities for disaster planning for farms varies to some extent with the type of animals and facility. In general terms, the greatest priorities, i.e., the most likely disasters to occur, are trailer accidents, floods, fires, power outages and contagious disease outbreaks. Some locations will have additional hazards to consider, such as high winds, landslides, and hazardous materials. Owners should consult their local livestock officers and take necessary suggestions.

Safety in Animal Transport

Transportation accidents are one of the most common disasters that livestock owners will encounter. Preventive measures include regular inspection of trailers and tow vehicles for safe operation.

Veterinary preparedness in disasters

The priorities in veterinary care vary with each disaster.

- In high winds, tornadoes and hurricanes, traumatic injuries will predominate.
- In droughts and in severe winter weather, starvation and dehydration may be problems.

- Following fires, smoke inhalation and burn wounds will be issues that require veterinary attention.

Many disasters also have distant effects on animals, e.g., debris on pastures many miles from a tornado touchdown and moldy corn following a flood can be a problem after a disaster. If you are concerned about diseases that may result from a disaster you should consult your veterinarian. If animals die or have to be euthanized, it is recommended that a post-mortem examination be performed so that insurance and legal claims can be settled.

In disasters, farm animals may be forced to congregate. Livestock from several farms may mix resulting in contagious diseases. Be aware that changing social structure may result in aggressive behavior leading to injury. Some measures can safeguard the health of livestock in disasters — vaccinations, deworming, and Coggins tests for horses.

Veterinarians can also instruct their clients on first aid for horses and livestock and advise on the contents and appropriate use of first aid kits.

Before Disaster Strikes

Recommended items for a livestock disaster box include:

- Tack, ropes, halters
- Concentrated feed, hay, supplements, and medicines
- Copies of ownership papers
- Buckets or feed nets
- Garden hose
- Flashlight or lantern
- Blankets or tarps
- Lights, portable radio and spare batteries
- Livestock first aid supplies

Additional Recommendations
Consider the following prior to floods, cyclones, fires, blizzards, and other natural disasters.

- Learn what disaster risks are prominent in your area and what conditions accelerate that occurrence.
- Contact local law enforcement and emergency response agencies and familiarize yourself with their response patterns, criteria and capability. Make sure you also contact the official in charge of disaster response.
- Visit with neighbors or local groups about organizing a management or evacuation system for livestock.
- Evaluate your own handling capabilities including manpower, equipment and alternatives.
- Contact friends or families and make emergency arrangements with them for temporary livestock care.
- Identify facilities and resources that may be available 15 to 40 miles from your site. This works well with agriculture producers and stables for the same contingency.

- Make sure you have legal and adequate markings to prove ownership of your livestock. Consider having ID tags (such as luggage tags) on hand that you can attach to any animals that are halter broke. You might consider having livestock marker crayons or bright-colored paint convenient to mark your animals and your premises. For less domesticated livestock you may be dependent on brands, ear tags, and ear notches. Have individual and group photographs of all livestock in your livestock *disaster box.*
- Practice loading your animals so you and the animals are familiar with the effort.
- Monitor television and local radio broadcasts regularly if risk factors are present.
- Identify an alley, lane or pen that can easily be used to confine animals and is readily adjacent to where a trailer or truck can access them.
- Utilize cell phone technology to monitor neighbors, families, and livestock.

3. Response

Evacuation

Farm evacuations present unique problems. Appropriate planning is essential. Evacuations are best coordinated with neighbors, friends, and neighbours. Both the destination and the method of transport need to be sorted out well in advance of any need.

Feeding

When livestock and horses are evacuated and housed in large numbers, adequate amounts of feed may be difficult to procure.

- Develop lists of feed and hay suppliers in your area.
- Avoid dietary changes. When the diets of horses or livestock change, they become predisposed to colic, laminitis and metabolic diseases.

Feeding diets that have moderate energy levels and meet the minimum nutritional requirements reduces the likelihood of illness. Use the following table to judge how much water and feed your animals may need.

Identification of Animals

In large-scale disasters when many animals are evacuated, identification of the animals and their owners is difficult. Ideally all animals should be uniquely and permanently identified. Consider that identification serves two purposes:

- The owner can positively identify their animal, and
- Others can trace the owner

Horses can be permanently identified by microchips, freeze marking or tattoo. Owners should have current front and side view photographs. However, when this is not the case, e.g., when livestock and horses have to be evacuated suddenly, emergency identification methods can be used. These include:

- Painting or etching the hooves,
- Body marking with crayon,

- Clipping phone numbers or farm initials in the hair,
- Neck banding,
- Identification tags on halters, and
- Glue-on numbers.

Hazardous Materials

During floods, following cyclones and earthquakes, hazardous materials can be knocked over and contaminate the environment and animals. While farmers are often qualified to handle hazardous materials commonly used on their farms, farm owners should be aware that proper training and hazardous materials certification are required to deal with releases and the potential contamination of the food supply. Untrained persons should not deal with hazardous materials at all.

4. Recovery

Farms are traditionally concerned with restoring the animal industries following a disaster.

- The long-term recovery phase of a disaster can be protracted, with substantial adjustments occurring in the disaster-stricken community.
- Restoration of businesses is facilitated through low-interest loans supplied by local banks. Businesses with appropriate insurance coverage are most likely to have the best recoveries.
- Farms often have special claims programs for recovery from disasters — farmers should pay special attention to these and consult their emergency management officials and county extension educators on what is available. In the past, farmers have been unaware of the sources of funding available to them to help recovery.

Relocation

Every farm owner should have alternative accommodations planned for their animals in the event of a disaster. These contacts should be confirmed at least once per year. Be sure when selecting facilities to choose those that will not likely be affected by the same disasters you are planning for. Consideration should be given to how large amounts of manure will be disposed — this will accumulate and pose a significant animal and human health problem. Plans should be made for disposal of carcasses.

Restoration of Farms as Business

Farms are often affected by local disasters, such as fires, floods, chemical spills, and cyclones. It is estimated that only few small businesses affected by a major disaster ever recover to a functional state. This is likely due to inadequate insurance coverage. Farms without sufficient records will have a difficult time making an adequate insurance claim. Major concerns for small businesses, including farms, in disasters include the following.

- Personnel,
- Cash flow,
- Continued income for employees,

- Continued provision of quality care for animals,
- Restoration of a functional business,
- Changes in community infrastructure, and
- Customer, buyer and supplier loyalty.

Many of these issues can be addressed before a disaster by obtaining adequate insurance coverage and entering into agreements with neighboring farms to share facilities and resources.

In addition, farms may obtain assistance from local banks, insurance companies, animal husbandy department, agriculture department and forest department to recovery the farms affected.

11.3 Risk Reduction Measures for Disabled Persons

(Source: Incheon Strategy to "Make the Right Real" for persons with Disabilities in Asia and Pacific.)

Governments of the Economic and Social Commission for Asia and the Pacific (ESCAP) region gathered in Incheon, Republic of Korea, from 29 October to 2 November 2012 to chart the course of the new Asian and Pacific Decade of Persons with Disabilities for the period 2013 to 2022. They were joined by representatives of civil society organizations, including organizations of and for persons with disabilities. Also in attendance were representatives of intergovernmental organizations, development cooperation agencies and the United Nations system. The High-level Intergovernmental Meeting on the Final Review of the Implementation of the Asian and Pacific Decade of Disabled Persons, 2003–2012, was organized by ESCAP and hosted by the Government of the Republic of Korea. The Meeting marked the conclusion of the second Asian and Pacific Decade of Disabled Persons, 2003–2012, and launched the new Decade.

The Governments at the High-level Intergovernmental Meeting adopted the Ministerial Declaration on the Asian and Pacific Decade of Persons with Disabilities, 2013–2022, and the Incheon Strategy to "Make the Right Real" for Persons with Disabilities in Asia and the Pacific. The Incheon Strategy provides the Asian and Pacific region, and the world, with the first set of regionally agreed disability-inclusive development goals. Developed over more than two years of consultations with governments and civil society stakeholders, the Incheon Strategy comprises 10 goals, 27 targets and 62 indicators. The Incheon Strategy builds on the Convention on the Rights of Persons with Disabilities and the Biwako Millennium Framework for Action and Biwako Plus Five towards an Inclusive, Barrier-free and Rights-based Society for Persons with Disabilities in Asia and the Pacific.

The Incheon Strategy will enable the Asian and Pacific region to track progress towards improving the quality of life, and the fulfilment of the rights, of the region's 650 million persons with disabilities, most of whom live in poverty. The ESCAP secretariat is mandated to report every three years until the end of the Decade in 2022, on progress in the implementation of the Ministerial Declaration and the Incheon Strategy.

Out of 10 major goals the disaster risk reduction and management for disabled persons is one.

Goal 7: Ensure disability-inclusive disaster risk reduction and management

The Asia-Pacific region is the region that is most adversely affected by disasters, including those caused by climate change. Persons with disabilities and other vulnerable groups are at higher risk of death, injury and additional impairments, as a result of exclusion from disaster risk reduction policies, plans and programmes. Public service announcements are often issued in formats and language that are not accessible by persons with disabilities. In addition, emergency exits, shelters and facilities tend not to be barrier-free. Regular participation of persons with disabilities in emergency preparedness drills and other disaster risk reduction measures at the local and district levels could prevent or minimize risk and damage when disasters occur. Physical and information infrastructure that incorporates universal design principles would improve the chances of safety and survival.

Target 1, Strengthen disability-inclusive disaster risk reduction planning

Target 2, Strengthen implementation of measures on providing timely and appropriate support to persons with disabilities in responding to disasters

Indicators for tracking progress Core indicators

1. Availability of disability-inclusive disaster risk reduction plans.

Task	**Activities**	**Responsibility**
Provisions for disabled persons in DM Plans	➢ Identification of disabled persons in society, schools, and offices ➢ Identify and include issues for their safety with regard to any disasters in DM plans in school, village, takuka, district and state level	➢ Education Dept. ➢ Revenue Department ➢ Zilla Parisad ➢ Municipal Corporation

2. Availability of disability-inclusive training for all relevant service personnel

Task	**Activities**	**Responsibility**
Capacity Building Trainings	➢ Organise capacity building trainings on fire rescue, emergency exit in case of fire and earthquake to disabled school children, community people and office staff. ➢ oranise training on safe evacuation for disabled persons during disasters	➢ Education Dept. ➢ Revenue Department ➢ Social Welfare Dept. ➢ Zilla Parisad ➢ Municipal Corporation

3. Proportion of accessible emergency shelters and disaster relief sites Supplementary indicators.

Task	Activities	Responsibility
Safe shelters management at disaster affected site for disabled persons	➢ Identify temporary safe shelters before disasters ➢ Ensure basic facilities with water, food, light, toilets and sanitation ➢ Ensure special provision for disabled persons at toilets, walking place, sleeping halls etc.	➢ Education Dept. ➢ Revenue Department ➢ Social Welfare Dept. ➢ Zilla Parisad ➢ Municipal Corporation

4. Number of persons with disabilities who died or were seriously injured in disasters

Task	Activities	Responsibility
Set up disabled help desk	➢ List out the died and injured disabled persons ➢ Circulate the list to concerned government departments ➢ Confirm their identity from relatives ➢ Dispose the dead bodies in consultation with relatives/kins and confirm all formalities that to be maintained	➢ Health ➢ Police. ➢ Revenue Department

5. Availability of psychosocial support service personnel that have the capacity to assist persons with disabilities affected by disasters

Task	Activities	Responsibility
Trauma Counselling for disaster victims	➢ Identification of trauma victims. ➢ Counselling the disaster victims specially disabled persons ➢ Ensure their regular participation in trauma Centres ➢ Provide all supports to make their lives normal	➢ Health Dept. ➢ Social Welfare Dept.

6. Availability of assistive devices and technologies for persons with disabilities in preparing for and responding to disasters

Task	Activities	Responsibility
Provision of Assistive devices and technologies for disabled persons	➢ Prepare a list of devices that every disabled person needs. ➢ Distribute the devices to them on time ➢ An orientation on how to use may	➢ Social Welfare Dept. ➢ Zilla Parisad ➢ Municipal Corporation

	organize for beneficiaries	

Disaster Mitigation for Persons with Disabilities

Some key principles should guide disaster relief:

1. Accessible Disaster Facilities and Services

Communications technology is vital for people with disabilities during a disaster to help assess damage, collect information, and deploy supplies. Access to appropriate facilities -- housing, beds, toilets, and other necessities -- must be monitored and made available to individuals with disabilities before, during, and after a disaster. This access also must be ensured for those who incur a disability as a result of a disaster. Appropriate planning and management of information related to architectural accessibility improves the provision of disaster services for persons with disabilities.

2. Accessible Communications and Assistance

As communications technology and policy become more integral to disaster relief and mitigation, providing accessibility to the technology for people with disabilities becomes more essential. For example, people with hearing impairments require interpreters, Time-division duplexing (TDD) communications, and signaling devices. In addition, written materials must be produced on cassette tape, on CD-ROM, or in large print for people with visual impairments. People with cognitive impairments, such as those with developmental disabilities, Alzheimer's disease, or brain injury, require assistance to cope with new surroundings and to minimize confusion factors. It is crucial that people with disabilities help develop accessible communications and reliable assistance technologies.

3. Accessible and Reliable Rescue Communications

Accessible and reliable communications technology is critical to ensuring fast, effective, and competent field treatment of people with disabilities. Current satellite and cellular technology as well as personal communication networks permit communication in areas with a damaged or destroyed communication infrastructure. Communications technologies can assist field personnel in rescue coordination and tracking and can be combined with databases that house information on optimal treatment for particular disabilities or that track the allocation of post disaster resources.

4. Partnerships with the Disability Community

Disability organizations must join with relief and rescue organizations and the media to educate and inform their constituents of disaster contingency and self-help plans. A nationwide

awareness effort should be devised and implemented to inform people with disabilities about necessary precautions for imminent disaster. In the event of a sudden natural disaster, such a program would minimize injury and facilitate rescue efforts. In addition, more young people with disabilities should be encouraged to study technology, medicine, science, and engineering as a way of gaining power over future technological advances in disaster relief and mitigation.

5. Disaster Preparation, Education, and Training

Communications technologies are crucial for educating the public about disaster preparedness and warning the people most likely to be affected. Relief and rescue operations must have the appropriate medical equipment, supplies, and training to address the immediate needs of people with disabilities. Affected individuals may require bladder bags, insulin pumps, walkers, or wheelchairs. Relief personnel must be equipped and trained in the use of such equipment. In addition, relief personnel should provide training, particularly for personnel and volunteers in the field, on how to support the independence and dignity of persons with disabilities in the aftermath of a disaster.

6. Partnerships with the Media

Many natural disasters can be predicted in advance. Disaster preparedness for people with disabilities is critical in minimizing the impact of a disaster. The media -- in partnership with disability and governmental organizations -- should incorporate advisories into emergency broadcasts in formats accessible to people with disabilities. Such advisories alert the public, provide a mechanism for informing rescue personnel of individual medical conditions and impairments, and identify accessible emergency shelters. The creation and repetition of accessible media messages is critical for empowering people with disabilities to protect themselves from disasters.

11.4 Use of ICT in Disaster Management

Communication plays a important role in Disaster Management in providing information to all stakeholder which would help in SAR, relief and rehabilitation activities. Natural Disasters cannot be prevented but their impact can be minimised by using appropriate science and technology tools in managing disasters in a proactive way. It has now been recognised that disaster prevention, mitigation, preparedness and relief along with environmental protection are closely interrelated with sustainable development. Therefore mainstreaming of disaster management activities in the developmental plans and their effective implementation at all the levels of administration is the key. Information and communication technology would play a major role in bringing all the stakeholders on a common platform in order to ensure a sustainable development.

As per the NDMA guidelines, the State would undertake activities to establish a all-encompassing, integrated, multilateral, reliable, responsive and dedicated state of the art Digital

Information and Communication Support Infrastructure on the lines of the National Disaster Management Information and Communication System (NDMICS)

Steps would be taken use ICT in HRVA, knowledge management, resource management, early warning system and last mile connectivity creation of relevant database and development of the Decision Support System and also for creating Public Awareness.