



**Government of Bihar
Disaster Management Department**

The State Disaster Management Plan

Part One: DISASTER RISK MANAGEMENT

- Section — I : **Perspective**
Section — II : **Disaster Prevention, Mitigation,
Preparedness & Capacity Building**

Part Two: DISASTER CRISIS MANAGEMENT

- Section — III : **Disaster Response**
Section — IV : **"Build Back Better"**
Section — V : **The Roles & Responsibilities of &
Guidelines for Govt. Depts. &
Other Stakeholders**
Section — VI : **Pre-Requisites**
Section — VII : **Enclosures**

*In Association with
The State Government Departments & Other Stakeholders*

Prepared by



GPSCDMRD

**Prof. G. P. Sinha Centre
for
Disaster Management & Rural Development**

FOREWORD

After the paradigm shift from relief distribution to disaster management, the whole exercise of saving life and property and insulating developmental initiatives with disaster mitigation measures has become integrative and inclusive. It is not any more a state subject. It has now become an issue for all concerned.

Being the repository of all responsibilities concerning safety of life and property, it is a call for the State to share and prepare stakeholders to participate in the disaster management related exercise. They have to be provided space to have appropriate roles and responsibilities in minimizing loss of life and property due to disaster.

The Disaster Management Department on behalf of the State Executive Committee and the State Disaster Management Authority, after following due process, assigned the job of preparing the State Disaster Management Plan to Prof. G.P. Sinha Centre for Disaster Management & Rural Development. The Centre prepared the Plan as per NDMA Guidelines and in the process covered 18 of the 38 districts to interact with district administration, local bodies and communities.

Prof. G.P. Sinha Centre has prepared the State Disaster Management Plan in close association with the Disaster Management Department and has made a commendable attempt to include some innovative inputs within the framework given in the NDMA Guidelines.

The Plan is horizontally community centred and vertically local body based. And, since, multi-lateral Agencies, International NGOs, Business Associations, Corporate Houses and Trade Associations play major role in disaster response, an attempt has been made to provide them space to partner in disaster management from the disaster risk-management stage itself.

It is hoped that with the implementation of the Plan, the system will help in making disaster management a well orchestrated exercise reducing loss of life and property to the minimum and enhancing gain from prevention, mitigation and preparedness to the maximum.

I congratulate the Disaster Management Department, Prof. G.P. Sinha Centre and its team of experts and professionals involved in the preparation of the Plan for a commendable job done.

Chief Secretary
Govt. of Bihar

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P R E F A C E

It has been a privilege for Prof. G. P. Sinha Centre for Disaster Management and Rural Development to work on the State Disaster Management Plan, Bihar. It has given the Centre an opportunity to have, on the one hand, a look at the whole gamut of things in the State from the disaster point of view and, on the other, to view them as a whole from the State point of view.

The project provided Prof. G. P. Sinha Centre a platform and a perspective to interact with government functionaries at the State, district & block level and to learn from the functionaries of local bodies and other stakeholders at the state, district and community level, about the disasters suffered and management efforts made in the past.

The task gave us a reason to know the ground-level realities, to learn from the disasters suffered by the communities and to realize that the key to disaster response lied in mitigation and preparedness measures.

Putting all these together, the edifice of the State Disaster Management Plan has been made and placed on four pillars : the Disaster Management Act, 2005 & NDMA Guidelines, the State & Govt. Departments and other Stakeholders, Disaster Management related Specialized Institutions & other Organizations, and local bodies like Municipal Corporation, Nagar Panchayat, Panchayati Raj & the communities.

The point of view taken to build the edifice of the Plan may be stated as :

Life is endurance. Endurance lies in patience and perseverance which, in turn, requires trust and confidence. Disaster Management too needs trust and confidence to be operational to reduce risk and save life. Disaster Management, in a way, is endurance management.

Life needs a form to express itself. A form is a specific structure which, in turn, conditions the expression of life. For example, life in the form of a bird would fly; in the form of a lion, would prey; in the form of a goat, would get preyed and in the form of a human being, would be the 'paragon of all animals'. Disaster management, too, needs a form, a structure to act and its action is conditioned by the structure it is being given to operate through.

This Disaster Management Plan may create an impression as if disaster management was all that mattered. It is really so. Because the whole cosmos is dissolution centric. Life is death centric. The very existence derives its meaning from its termination. So does development. Its sustainability derives its extent from disaster management which is, to resist hazards inspite of all inevitability and to manage ecology and environment to keep life worth living. Here, resilience is all.

Initially the preparation of the State Disaster Management Plan seemed so complicated and complex. But the help and support, guidance and suggestions from well-wishing

functionaries, professionals and experts enabled us to complete the task with confidence and satisfaction. We owe a lot to them and would love to acknowledge that with gratitude. At the outset, we thank Principal Secretary, Disaster Management Department, Govt. of Bihar, Sri Vyasji, IAS for providing a platform to interact with experts from Delhi as well as Inter Agency Group of national level NGOs and fine tune the methodology for working out the Plan and for extending required support in getting various details from different sources. Our thanks to Sri Sunil Kumar, Special Secretary, DMD who, as Head of the Monitoring Committee, gave valuable suggestions about human resource development and support in getting statistical details from districts.

The valuable guidance and suggestions about the structure of the Plan and how it had to be made implementable provided by Sri Anil Sinha, Hon'ble Vice-Chairman, BSDMA, need special mention. His presence during 4-day interaction meet with functionaries of different govt. departments helped us in drawing the line on which the Plan had to be worked out. Apart from these, making himself available to help and guide and ensuring our participation in interactive meets organized by BSDMA proved a boon for us in structuring the Plan.

In preparing the Plan, the team members consisting of Dr.(Prof.) T. Prasad, Ex. Principal, NIT, Patna, Capt. (Ex.) S.S.Singh, Water Resource and River Basin Expert, Col. R. K. Sinha, Well versed in Disaster Response, Dr.(Col.) A.K.Singh (Retd.), Health & Trauma Expert, Dr. R. P. Sinha, Agriculture Expert, Mr. Sanjay Kumar and Mr. Rabindra Kumar, Remote Sensing and GIS mapping specialists, Mr. Sanjeev Kumar, Agriculture & Rural livelihood expert, Dr. K.P. Singh (Retd.), Bihar College of Engg. Structural Engineer. Shri. Sudhakar Jha, Media & IEC expert, helped in preparing write-up and inputs for the Plan.

The fact and figure rich contributions of the team members covering each one's area of specialization were jelled together in the shape of a plan integrated with disaster management oriented system engineering by the Team Leader, Ashok Kumar Sinha, the Founder Executive Director of the Institute of Entrepreneurship Development, Bihar and Ex. Managing Director of the Bihar Industrial and Technical Consultancy Organization (BITCO). He was ably helped by Sri Sudhakar Jha, Formerly Senior Correspondent, and Times of India in coordinating with team members, on the one hand and govt. departments, on the other.

In the process of drafting the Plan the inputs and suggestions provided by Sri Jyoti Kumar Sinha, IPS (Retd), Hon'ble Member, NDMA, Sri Amit Jha, IAS, Jt. Secy. NDMA, Delhi, Prof. Santosh Kumar, faculty, NIDM; Sri Krishna Vats, UNDP, Prof. S. K. Singh, Director, CIRDAP, Bangladesh; Mr. S. S. Guleria, Commandant NDRF, Bihar; Sri Banku Bihari Sarkar, UNICEF, Patna, Sri L.B.Roy, Faculty, Civil Engineering, NIT, Patna; Prof, Rasbihari Prasad Singh, Faculty of Geography, P.U., Mr. Sanjay Srivastava, IFS, GTZ- Delhi, Mr. Gautam Chatterjee, General Manager, Times of India, Patna, Sri Vikrant, Coordinator, Sphere India; Sri R. N. Pandey, Ex-Director-in-Chief, Health Services, Bihar, Prof. N. K. Chaudhary, Faculty, Economics Department, Patna

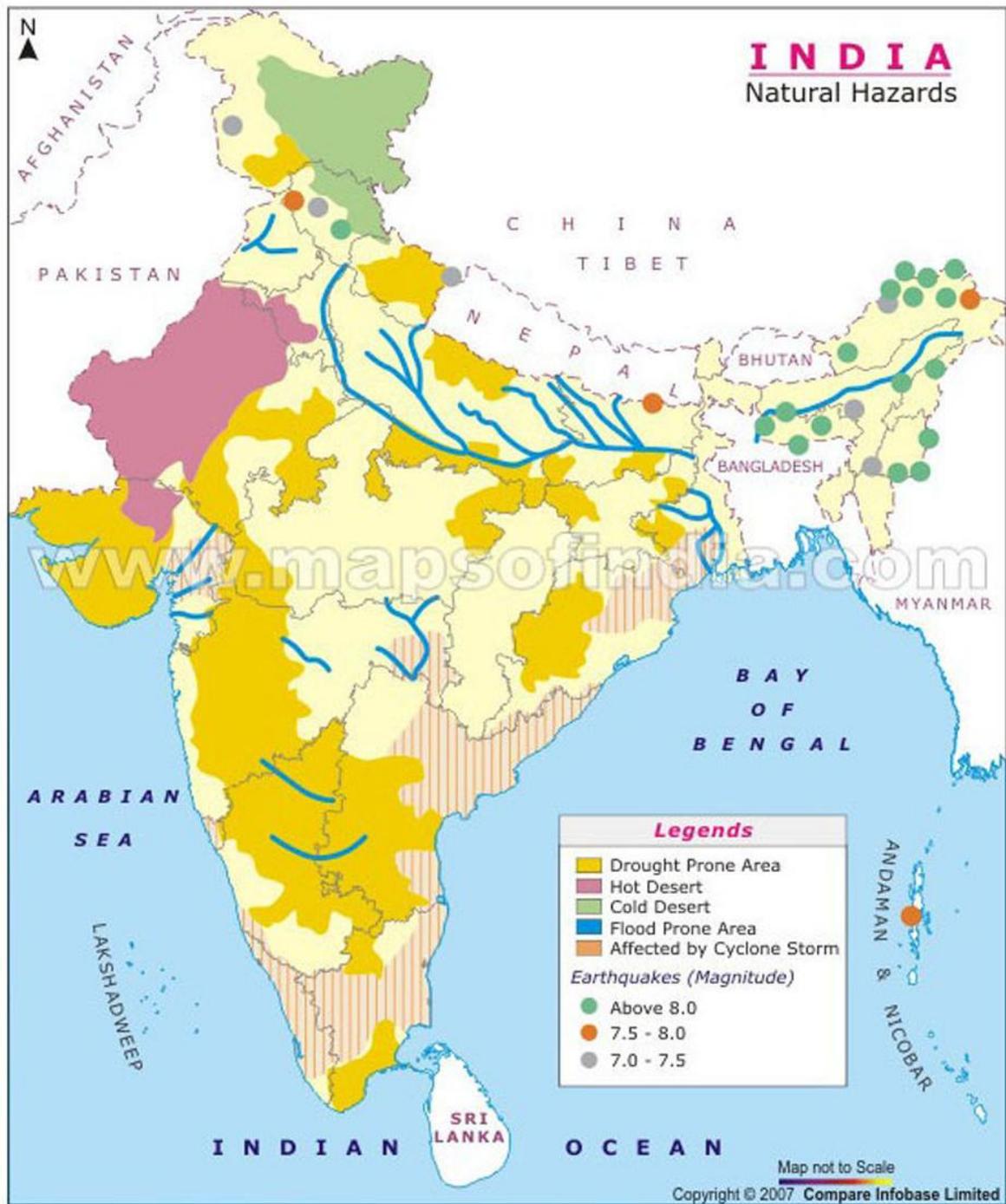
University and others require special mention. They helped us in making the whole Plan compact and workable. We also thank ITC Management, Munger for organizing the visit of the team members to the factory and for the brief given on the functioning of security system in the plant.

The district level interactions at the Headquarter level with functionaries of government departments led by respective DM and ADMs and at the Panchayat level with PRI representatives, local NGOs, elders of the communities and government functionaries like BDOs & COs in the districts of Gaya, Jehanabad, Saran, Ara, Muzaffarpur, Sitamarhi, Darbhanga, Madhubani, Saharsa, Madhepura, Purnia, Katihar, Bhagalpur, Banka, Munger & Jamui helped us in making the plan participatory & people centred and in creating space for stakeholders other than the government to play their roles. We thank all of the functionaries and participants for sharing their experience and making valuable suggestions.

Prof. (Dr.) S.M. Raza
Former Vice-Chancellor (VKSU)
& Chairman
Prof. G.P.Sinha Centre...,
Patna

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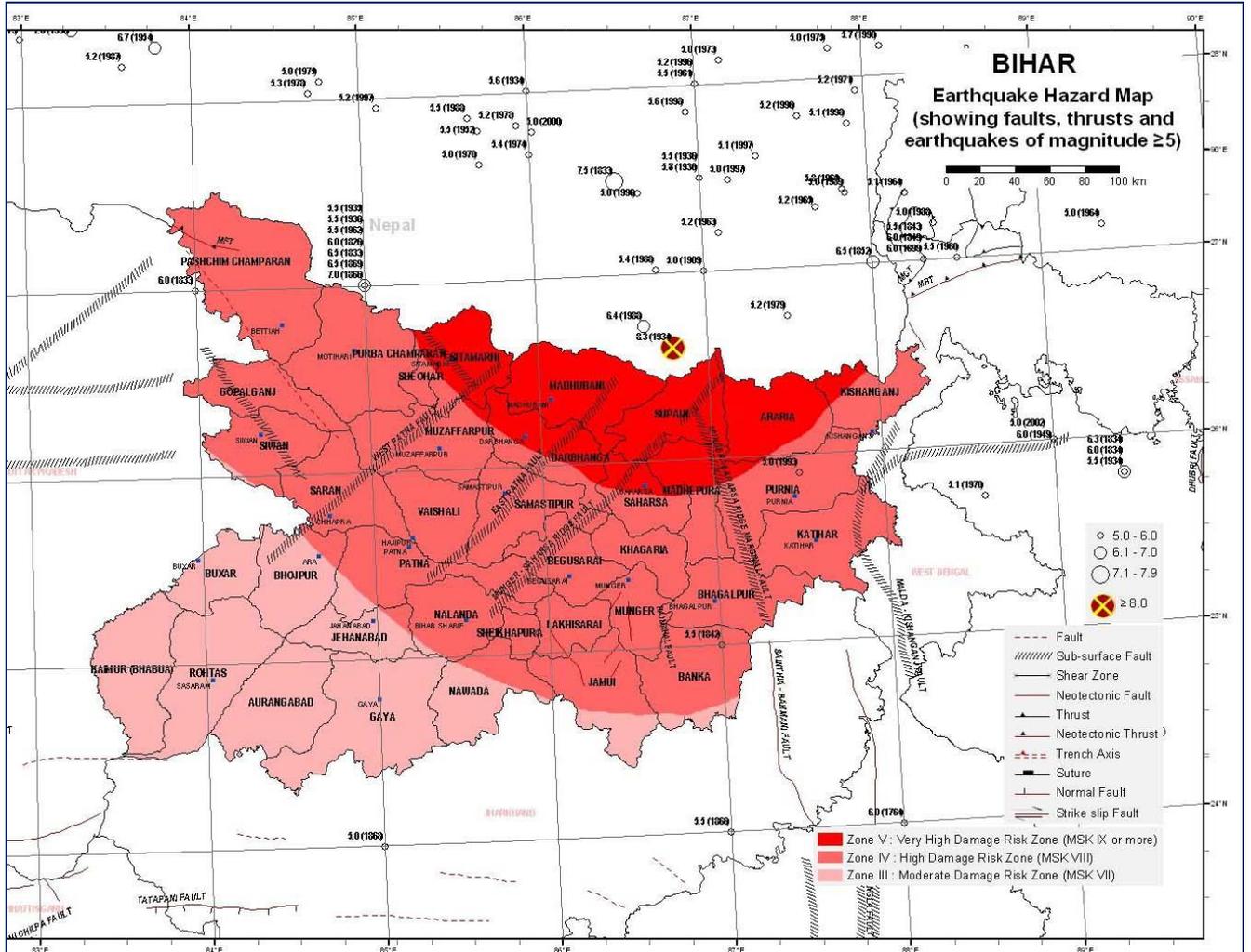
Map: 1- Natural Hazards prone areas in the country



(Source: Vulnerability Atlas of India)

EQ Zone V- 10.9%	Wind Velocity m/s 55 & 50 - 5%	Flood Prone Area in % - 7.9%
IV- 17.3%	47- 40.2%	
III- 30.4%	44&39- 48%	
II- 41.4%	33- 6.7%	

**Map: 2- Natural Hazard Prone areas in Bihar
Earthquake Prone Areas**



Source: Vulnerability Atlas of India

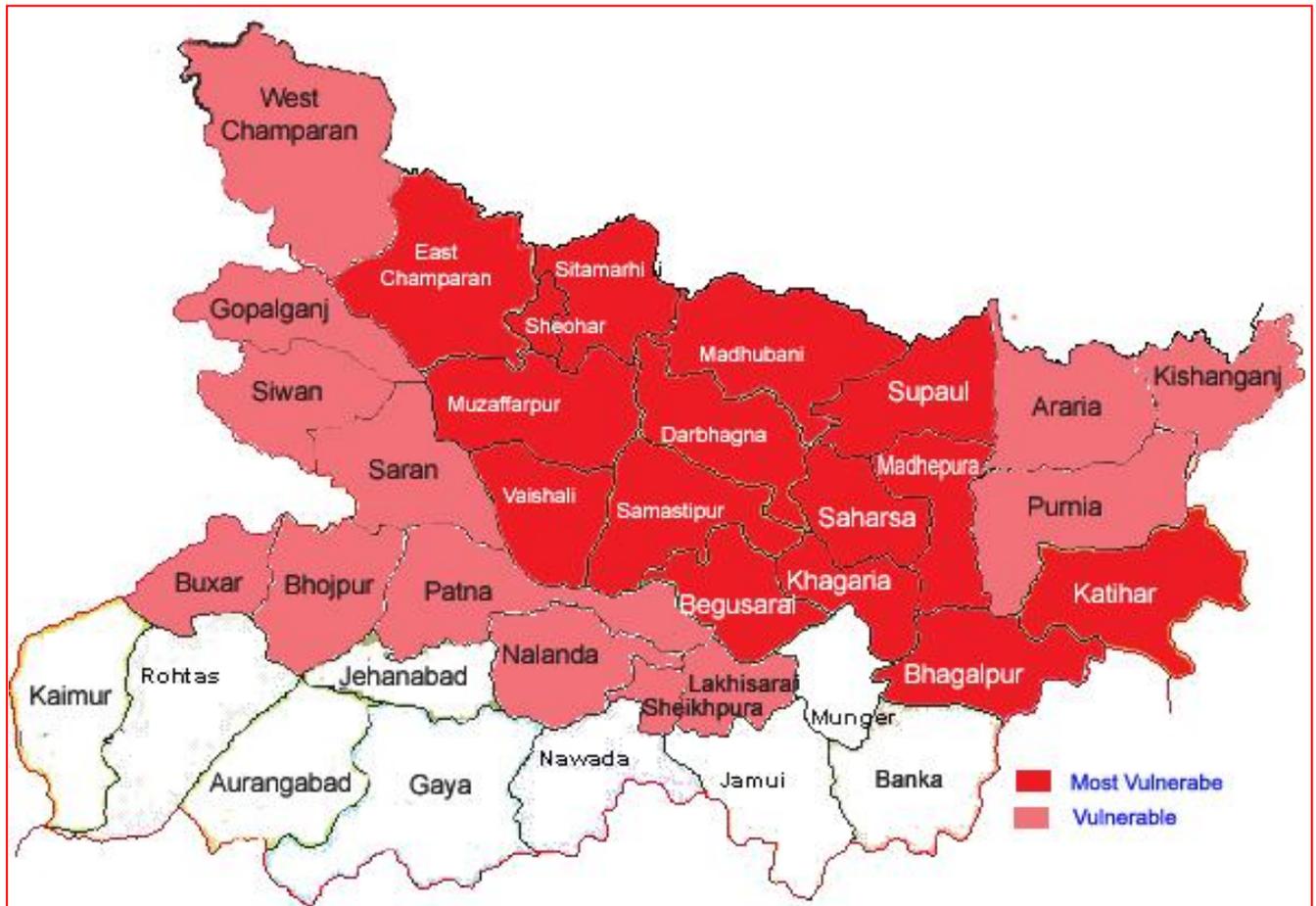
1. Earthquake

Total 15.2% area of Bihar Covered in Zone V

Total 63.7% area of Bihar Covered in Zone IV

Total 21.1% area of Bihar Covered in Zone III

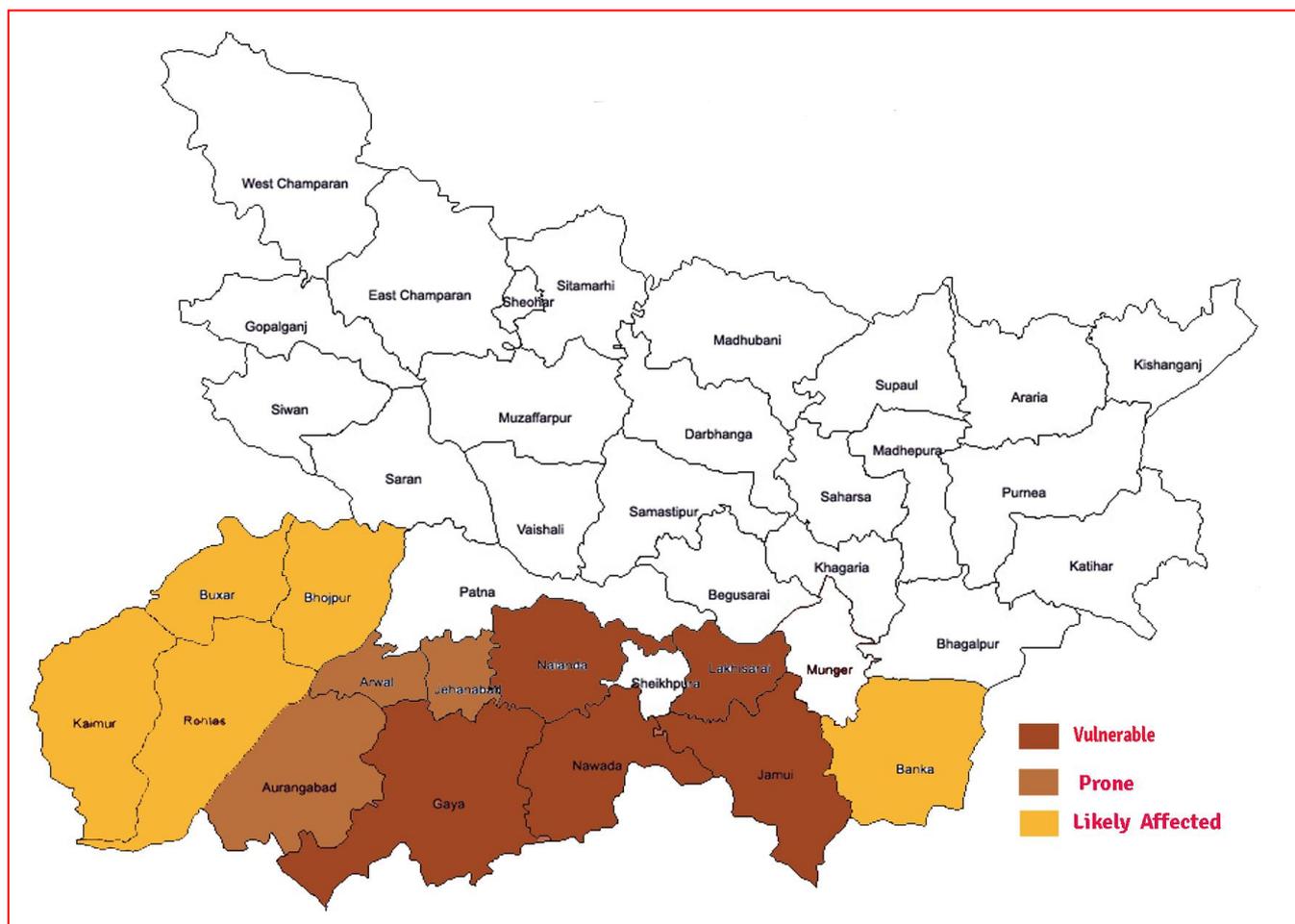
Map: 3-Flood Prone Areas



Source: Developed on Inputs from DMD, GoB

<p>2. Flood— Most Vulnerable</p>	<p>: East Champaran, Sheohar, Sitamarhi, Katihar, Madhubani, Vaishali, Muzaffarpur, Darbhanga, Samastipur, Madhepra, Supaul, Saharsa, Khagaria, Begusarai, Bhagalpur.</p>
<p>Vulnerable</p>	<p>: West Champaran, Gopalganj, Siwan, Saran, Buxar, Bhojpur, Patna, Nalanda, Lakhisarai, Sheikhpura, Purnia, Araria, Kishanganj</p>

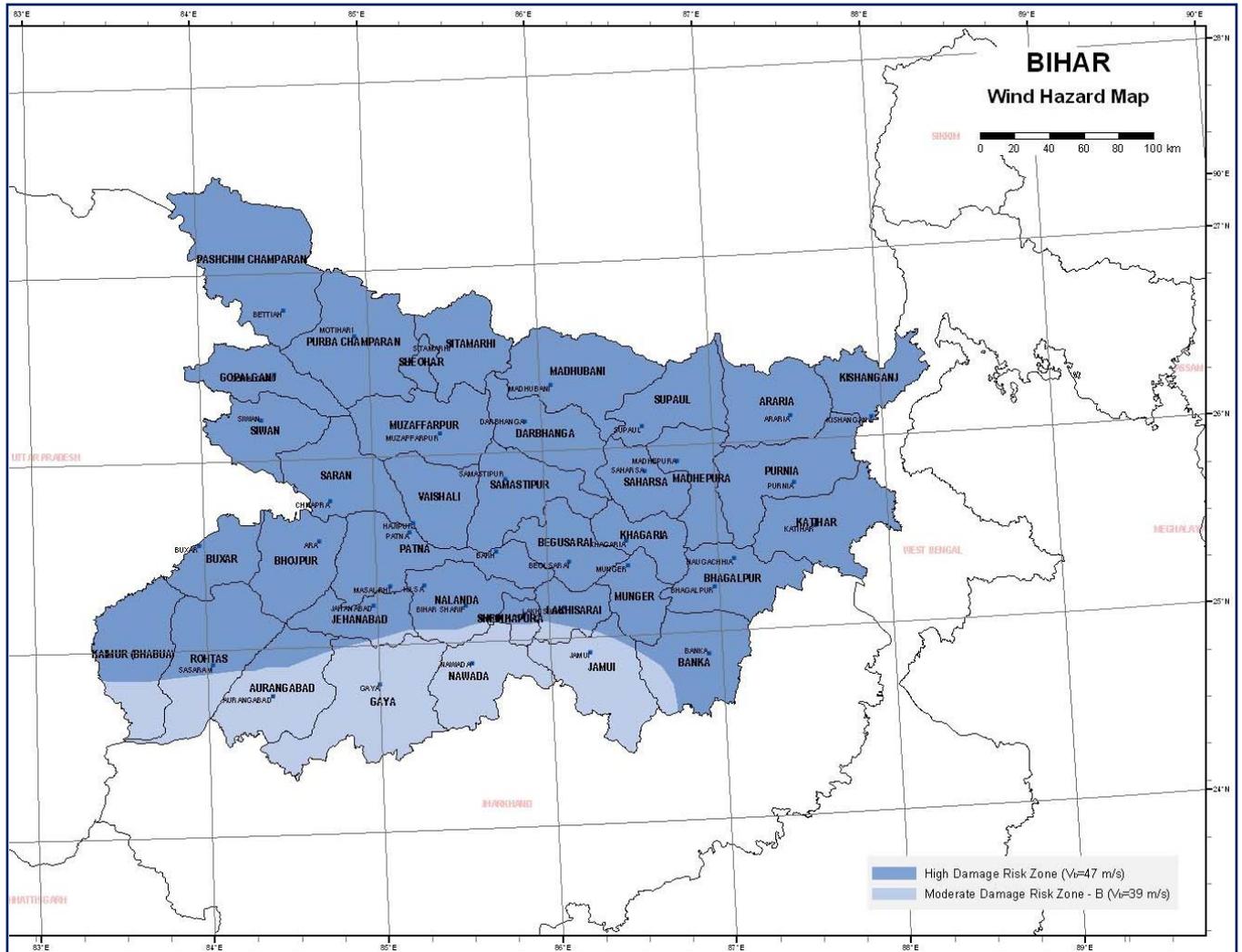
Map: 4- Drought Prone Areas



Source: Developed on Inputs from DMD, GoB

3. Drought — Vulnerable District	:	Gaya, Nawada Jamui, Nalanda, Lakhisarai
Prone District	:	Jahanabad, Arwal, Aurangabad
Likely District	:	Kaimur, Bhojpur, Buxar, Rohtas, Banka

Map: 5-High Speed Wind/Gale /Hail Storm Prone Areas



Source: Vulnerability Atlas of India

4. High Speed Wind /Gale /Hail Storm — Around 86% of area of Bihar prone to cyclone of 47 m/s intensity
 — Around 14% of area of Bihar prone to Cyclone of lesser intensity

The State at a Glance

Map: 6 – District Map of Bihar



1. **Location** : 24°—20'—10" to 27°—31'—15" north latitude
: 82° —19'—50" to 88°—17'—40" east longitude
2. **Height** : 173 feet above Sea level (52.73 meter)
3. **Total Area** : 94,163.00 Sq.kms
 - Rural (97.97%) : 92,251.49 Sq.kms
 - Urban (02.03%) : 01,911.51 Sq.kms
 - Area Under cultivation : 56,05,798 (ha)
 - Barren Land : 05,03,381 (ha)
 - Forest Land : 06,47,300 (ha)
 - Area under Non-Agri Use : 13.95,340 (ha)
 - Flood Prone Area : 68,80,000 (ha)
 - Water Logged area : 9,41,630 (ha)
4. **Population** : Persons : 10,38,04,637
(2011 Census) : Female : 4,96,19,290
Male : 5,41,85,347
 - 0-6yrs. Age Children : 1,85,82,229
 - Girls : 89,66,949
 - Boys : 96,15,280
 - Decadal Population growth (2001-2011)
 - Absolute : 2,08,06,126
 - Percentage : 25.07
 - Density : 1,102

• Sex Ratio		:	916/1000
• Literacy	Total	:	63.82%
	Female	:	53.33%
	Male	:	73.39

5. Administrative Setup

• Division	:	9
• District	:	38
• Sub-Division	:	101
• C.D. Block	:	534
• Police District	:	40
• Police Station	:	853
• Urban Clusters	:	14
• Statutory Town	:	139
• Non-Statutory	:	60
• Revenue Village	:	44874
• Average Population of a district	:	27,31,701

6. Local Bodies	:	* Nagar Nigam – 10 * Nagar Parishad – 42 * Nagar Panchayat – 87 * Gram Panchayat- 8471
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7. Annual Rainfall (Normal)	:	1120 mm/ann
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8. Natural Resources	:	Fertile land Water resource – surface & ground Limestone Silica Sand
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9. Livestock	:	Cows, Buffalo, Goat, Poultry, Pigs, Sheep.) (3,13,67,900)
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10. Fisheries	:	Fresh water product 2.58 lakh tonnes.
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11. Annual Growth Rate (2004-05 to 2010-11)	:	11.36%
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12. Total GSDP (at 2004-05 prices)	:	Rs. 1,44,472.0 Crore
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13. Per Capita Income	:	Rs. 14,865.0
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14. Total GSDP (at current prices)	:	Rs. 2,17,814.0 Crore
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15. Per Capita Income	:	Rs. 22,411.0
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* 16. Agriculture & Horticulture	:	Foodgrain – 144.10 lack tonnes Cereals – 96.86 lack tonnes Pulses – 47.24 lack tonnes Vegetables – 173.14 lack tonnes Fruits – 131.96 lack tonnes Flowers – 00.60 lack tonnes
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 - c. State of Tamil Nadu
 - d. State of West Bangal

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Abbreviations

BESC	Block Emergency Support Centre
BSIDM	Bihar State Institute Disaster Management
CBOs	Community Based Organisations
CD	Civil Defence
CEZ	Chief Engineer Zones
CVC Room	Command & Video Conferencing Room
DDMA	District Disaster Management Authority
DEOC	District Emergency Operation Centre
DMD	Disaster Management Department
ESF	Emergency Support Functions
FMIS	Flood Management Information System
GIS	Geographical Information System
GWh	Gigawatt hours
HDI	Human Development Index
IC	Information Collection
IMR	Infant Mortality Rate
IMT	Incident Management Team
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Scheme
NDMA	National Disaster Management Authority
NGOs	Non-Government Organizations
NIDM	National Institute of Disaster Management
PCDE	Per-Capita Development Expenditure
PAPK	Panchayat Apada Prabandhan Kendra
SDMA	State Disaster Management Authority
SDMS	State Disaster Management System
SDRF	State Disaster Response Force
SEC	State Executive Committee
SEOC	State Emergency Operation Centre
SGSY	Swarnajayanti Grameen Swarozgar Yojana
SOP	Standard Operating Procedure
SPA	Special Purpose Area

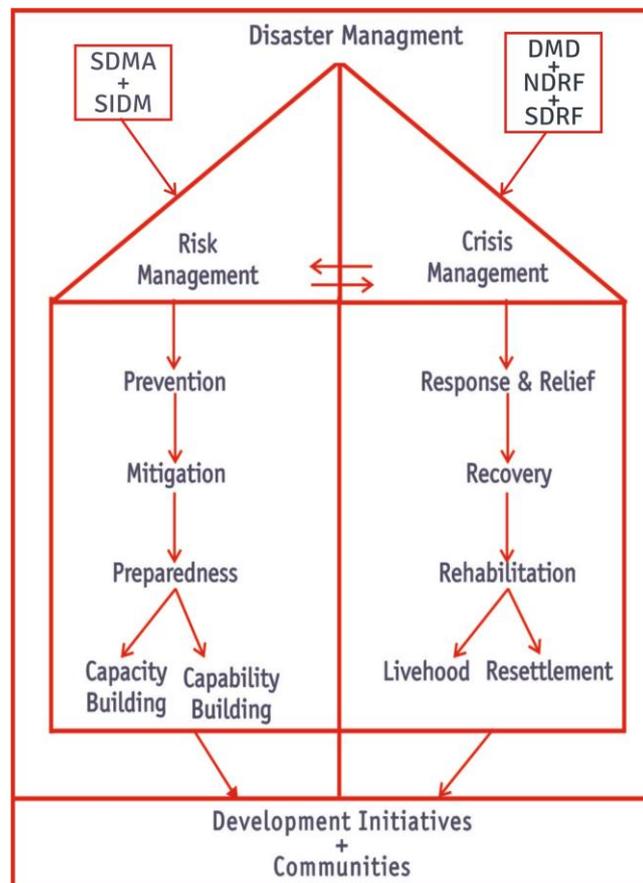
Structure of the State Disaster Management Plan

"To plan is to produce a scheme for future action, about specified results, at specified cost in a specified period of time. It is a deliberate attempt to influence, exploit, bring about and control the nature, direction, extent, speed and effects of change. It may even attempt deliberately to create change. It is a carefully, controlled and coordinated activity."

— Cyril L. Hudson

The State Disaster Management Plan is in two parts: *Disaster Risk Management & Disaster Crisis Management*. **Disaster Risk Management** part consists of sections on the Perspective and on Prevention, Mitigation and Preparedness. The **Disaster Crisis Management** part consists of sections on Response & Relief, 'Built Back Better' dealing with reconstruction and resettlement, Roles and Responsibilities of Govt. Depts. and other stakeholders and Pre-Requisites for the implementation of the Plan.

The Risk Management and Crisis Management parts have been wedded through Institutional Mechanism and made community and development centric



Note: Organisational role wise SDMA & SIDM shall be in lead in the Risk Management areas and DMD, NDRF & SDRF in crisis management area.

Executive Summary

- i. The point of view on which the State Disaster Management Plan has been based is :

Disasters are inevitable. Life is endurance. Disaster Management, in a way, is endurance management.

- ii. The edifice of the Plan has been placed on four pillars:
 - The Disaster Management Act, 2005 and NDMA Guidelines.
 - The State and Government Departments & other Stakeholders.
 - Disaster Management related specialized institutions & other organisations and
 - Local bodies like Panchayati Raj, Institutions & the communities.
- iii. The edifice of the plan has been structured in two parts : Disaster Risk Management and Disaster Crisis Management, both converging as being community and development centric.
- iv. The Disaster Risk Management part consists of
 - The perspective containing the State, Hazard and Vulnerability profiles,
 - Hazard wise prevention, mitigation and preparedness measures,
 - Setting up a two way early warning system so that information about localized disaster like fire, major road and boat accidents, industrial disaster, on the one hand, may reach the state authorities and about impending disaster like flood, earthquake , High Speed Wind and Drought may reach the communities, on the other.
 - The Sankalp Kendra a concept in community based disaster management where community and development support and sustain each other to the extent possible, against all odds.
 - The shadow state level emergency operation centre at Gaya to function in the SEOC at Patna becomes dysfunctional
- v. The State Profile has been drawn from geography, history, people, resources and environment points of view:

- from Geography point of the state has been seen as divided in seven river zones:
 - Ghaghara – Gandak Zone
 - Gandak – Bagmati Zone
 - Bagmati – Kosi Zone
 - Kosi – Mahananda Zone
 - Karmnasa – Sone Zone
 - Sone – Punpun Zone, and
 - Punpun – Sakri Zone
- These broadly divided river zones also roughly correspond to specific cultural zones such as – Bhojpur, Tirhut, Mithila, Magadh, Anga etc.
- These areas, also known for water harvesting method of their own, suffer from water syndrome: four of them on the northern side of the Ganges suffer from flood and three on the southern side, from drought.
- from History point of view the state has been a seat of political and religious innovations – from the first Republic to Buddhism, Jainism and Sikhism— took birth here and flourished all over the world.

Shershah Suri of the state gave three vital systems on which the edifice of modern governance rests – revenue based administrative system, infrastructure as the bed-rock of development and annual budget as the basis for taxation.

- From the People point of view, right from the battle of Buxar in 1764 till the year when Lord Cornwallis proclaimed the permanent settlement, from 1850 to 1947 and beyond, the people have seen and suffered more dissensions, exploitations and narrowing of boundaries than the people of any other state.

As a result, people of the state have become excessively dependent on the system, have developed double faced personality – one native and the other migrant. Problems of life and living get multiplied by the density of population, excessive dependence on disaster prone agriculture leading to poverty, malnutrition and sickness.

- From Natural Resources point of view the State is blessed with highly fertile land, abundant water resources, silica sand and livestock.

Apart from agriculture and horticulture, the state is blessed with sericulture, jute and other aqua-products.

Being rich in natural resources, the state also suffers owing to the excess of it. Being excessively dependent on rain, the state suffers due to paucity of water, as well.

- vi. The hazard profile of the state makes it literally the House of Hazards – the whole of state is earthquake prone, over 70% of the area flood prone, over 30% of the area drought prone and again the whole of state cyclonic storm prone and fire prone.
- vii. The vulnerability profile of the state is highly disarming. A population of 1,57,78,305; kachacha house 7,65,591; brick walled house 13,95,927; house of other materials 11,18,464 and 43,67,012 livestock are liable to be destroyed by earthquake in Zone-V; a population of 6,60,99,997; 30,10,383 kutchha house, 54,88,923 brick walled houses and 43,97,911 house of other materialious and 1,71,71,525 livestock in Zone-IV and a population 2,18,94,969 living in 9,97,159 kutchha house, 18,98,151 brick walled houses and 14,56,765 of other materials and 56,87,899 livestock in Zone-III are liable to be destroyed by earthquake.
- viii. In 28 flood affected districts (15 districts most vulnerable & 13 vulnerable), around 7,99,82,950 persons out of which 3,97,23,905 women, 1,50,14,935 children of 0–6 yrs., 93,75,555 BPL families, 1,26,32,914 dwellings of all sorts, 31,467 thousand livestock and 27,974.47 hectre of irrigated area are liable to be affected and more than half of the net sown area liable to be fully or partially destroyed by flood.
- ix. Of the thirteen districts in the Southern Bihar , 5 are highly vulnerable, 3 prone and 5 likely to be affected by drought. In all a population of 2,76,60,966 out of which 1,32,18,343 are women, 47,60,427 children of 0-6yrs. age group, BPL families 26,36,018 and livestock totaling 12,224 thousand remain vulnerable to drought. Around 11,720.14 hectre of irrigated areas remain liable of suffer due to paucity of water.
- x. Since the High Speed wind sweeps, more or less the whole of the state causing death, destruction and devastations, the vulnerability is total but highly vulnerable are the districts nearer to the Bay of Bengal &

Bangladesh like Kishanganj, Katihar, Purnia and other districts in the Kosi-Mahananda region. The total population affected is 2,42,36,957 out of which 1,15,90,935 are women, 46,13,392 children of 0-6yrs., 27,79,812 BPL families and 15473 thousand live stock. In the whole of state out of a total of 1,36,16,527 building, 63,76,428 building having light-weight sloping roof are highly vulnerable to High Speed Winds.

- xi. All the 38 districts of the state are fire hazard prone; specifically 1,13,40,990 BPL families living in 37,58,206 houses of mud and unburnt bricks and having straw thatched, lightweight sloping roofs.
- xii. The prevention, mitigation and preparedness measures have been planned hazard-wise and zone-wise. For Earthquake it is primarily construction centric and awareness and preparedness of the people, based.
- xiii. Retrofitting in old buildings, earthquake resistant construction of the new-ones, formulation of building codes and training of architects, engineers and mason to implement that and introduction of construction certification measures in order to ascertain that the prescribed rules and regulations have been observed.
- xiv. Out of 38,28 districts are vulnerable to flood 15 of which highly vulnerable and 13 partially affected. In percentage terms around 74% of the geographical area of North Bihar get affected by inundating rivers & 36% of the total area of South Bihar gets affected by inundating tals. Thus, 56% of the total geographical area of Bihar get affected by inundating rives and tals.
- xv. The causes of flood in North Bihar Consist of three factors: first the rivers have a large catchment area having higher precipitation, second, the rivers have steeper gradients adding velocity to the flow of water and third, the meandering nature of rivers through the soft soil of the plains.
- xvi. The flooding in South Bihar caused by inundating tals has also three causes: first, height of the southern embankment of the Ganges; second, slope of the surface from South to North and third, accumulation of rain water.
- xvii. The end- results of the three factors are also three: inundation, erosion, and siltation. Basically all our flood mitigation and preparedness measures have been inundation and erosion centric. There has hardly been any measures taken to deal with siltation, which, in so many ways, is one of the key factors causing inundation as well as erosion.

- xviii. Flood mitigation and preparedness measures have been treated in view of drought conditions in the South Bihar. The revival of ponds and reservoirs in the North Bihar and Ahur and Pynes in the South supplement as water conservation measures and provide a perfect foil to the flood in the North and drought in South Bihar if strategically supported by interlinking of rivers for the smooth flow of flood water on the one hand and holding of water in the tributaries on the other.
- xix. Apart from these, rain water harvesting by the people in the South Bihar and creation of small hydroelectricity generating facilities shall be of great help in water preservation in the North Bihar. Providing boats at Gram Panchayat level, training locals in search and rescue, evacuation and settlements, relief distribution etc add on to the risk mitigation measures.
- xx. The roles of the government departments, specialized institutions, multilateral organisations, international NGOs, district administration and local bodies assume special significance for, be it the pre-disaster phase or during or post disaster phase the orchestration of the roles of these stakeholders becomes essential for effective disaster management.
- xxi. The role of the state government is partly that of a doer, partly that of a provider and partly that of a facilitator and partly that of a monitor. The Government Department through its Disaster Management Cell shall through specialized institutions like NDMA, NIDM, NDRF, SDMA, SDRF and SIDM, DDMA prepare finalize and implement disaster prevention mitigation and preparedness as well as response measures.
- xxii. The measures shall be implemented, monitored and evaluated through the Emergency Operation Centre at the State, District and Gram Panchayat level. The EOC shall also process data, disseminate information and provide early warning of impending disaster. During the disaster period the EOCs get converted into Command Centres for the incident commander to operate with the help of Incident Management Team.
- xxiii. The Early Warning System has been designed to have two-way communication system upto Panchayat Apada Prabandhan Kendra (PAPK) and PAPK connected with communities with Public Address System. The system is so telescopic that if so desired, Hon'ble chief Minister may address the people of the whole State from SEOC.
- xxiv. For community based disaster management system, a new concept in the name of "Sankalp Kendra" has been evolved. The Kendra Shall be

activity centre during Pre-disaster period and a well equipped shelter for people during disaster days.

- xxv. The State Emergency Operation Centre has been named as “The Glass House” denoting transparency and eye to eye contact between the people and the system. The SEOC shall also house Disaster Management Department (DM) during Pre as well as During and Post Disaster periods. DMD itself shall have to restructure organizationally to perform its designated roles. For, at present it is structured to draw not to disburse disaster management inputs among the stakeholders.
- xxvi. The Response mechanism has been based on worst case scenario and orchestrated hazard wise lead or support roles of the government department with DMD's presence in all the cases. The Response has been coupled with the Relief distribution and 14 support services to be rendered through NDRF, SDRF, and other stakeholders and local bodies
- xxvii. Rehabilitation, with a view to Build Back Better, has been presented in the form of a policy framework to be followed on case to case basis. The policy framework includes the hazards vulnerability of the area and locally available resource / market based livelihood promotional activities as well.
- xxviii. The implementation of the plan requires some pre-requisites-such as framing and implementation of policies and rules, creation of new organizational setups, restructuring of some existing ones and strategizing monitoring and evaluation mechanism.
- xxix. For all theses the financial commitments shall be required which could be a certain percentage of the Annual Budget. Funds allocated by the Central, State Government Departments, Multilateral, International NGOs, Corporate houses shall also be available to meet Disaster Management related expenses, right from pre-disaster to Post-Disaster period.
- xxx. Among the cross-cutting issues, co-ordination, implementation, monitoring, review and updating are of the paramount importance. For the Plan is not a one-time exercise but shall require adjustments, additions and alterations from year to year, may be from disaster to disaster. Because disaster management is, in a way, endurance management and endurance, that way, is all.

The State Disaster Management Plan

Section -I

PERSPECTIVE

**“It is not enough to be a man, one must be a system.
It is not enough to think and feel, one must think and
feel from a definite point of view”**

— Aldous Huxley

1. The Basis

- 1.1 The Vision
- 1.2 The Objectives
- 1.3 The Approach
- 1.4 The Strategy
- 1.5 The Methodology
- 1.6 The State Disaster Management Plan
- 1.7 The Implementation of the Plan
- 1.8 The Role of the State Govt. etc.

2. The State of Bihar

- 2.1 The Geographical Complexion
- 2.2 The Historical Perspective
- 2.3 The People
- 2.4 The Natural Resources
- 2.5 The Environment for Growth & Development

3. Multi-Hazard Profile of the State

- 3.1 Earthquake
- 3.2 Floods
- 3.3 Drought
- 3.4 High Speed Wind/Gale /Hail Storm
- 3.5 Fire
- 3.6 Other Hazards

4. Vulnerability Profile of the State

- 4.1 Earthquake
 - 4.2 Floods
 - 4.3 Drought
 - 4.4 High Speed Wind/Gale /Hail Storm
 - 4.5 Fire
-

1. The Basis

The fundamentals of existence lie in the struggle one has fought, the instruments one has used and the lessons one has learnt to survive. In this respect, Bihar's struggle for existence is far more grim than most of the states. It has undergone mitosis for as many as four times and has suffered through disasters of the worst kind many a time.

1.1 The Vision :

Right from the days following the battle of Buxar in 1764 after which Bihar was passed on to East India Company as a part of the Bengal Presidency, to 1912 when Bihar and Orissa were separated as one State, to 1936 when both Bihar and Orissa were made independent States, to 1956 when some key areas of Bihar was included in West Bengal, to 2000 when Bihar was divided to form the state of Jharkhand, the State has went on losing its natural resource base and got pushed to confine within an area prone to all sort of hazard: earthquake, flood, cyclonic storm/**Gale /Hail Storm**, drought, fire, extreme cold and heat waves etc.

For such a state of hazards which Bihar is, the VISION of Disaster Management is :

"To attain a position where people are ready to help themselves, local bodies to extend mutual help, the administration to organize public help and the government to facilitate the helping of helpers."

For the attainment of the vision the MISSION of the Plan is :

"To minimize the loss of life and property by having an appropriate prevention, mitigation & preparedness measures meticulously implemented and a well-rehearsed response, by both government and non-government stakeholders in undertaking search, rescue, relief and rehabilitation operations."

1.2 The Objectives:

In order to achieve the Mission, the objectives of the plan have been set as :

- i. Treating community as the primary stakeholder and first respondent in the Disaster Management Plan, focusing on disaster risk reduction, prevention, mitigation and preparedness measures.
- ii. Emphasizing preparedness at the community level and readiness at the local bodies level.

- iii. Facilitating the role play by the administration and government departments and other stakeholders through institutional mechanism.
- iv. Creation of specialized institutions to make disaster management an inclusive exercise and to wed it to development initiatives.
- v. To create a dependable early warning system to warn the people and activate other stakeholders.
- vi. Ensuring quick response and providing relief with care and attention to those belonging to the marginalized section.
- vii. To undertake rehabilitation with "Build Back Better" motif.

1.3 The Approach :

The process adopted for the formulation of the Plan has been

- i. Holistic : Covering all the hazards the state is vulnerable to.
- ii. Integrative : Covering prevention, mitigation, preparedness & response measures.
- iii. Participative : Including the affected people, the Panchayati Raj Institutions, the local bodies, the district administration, the government departments & expert institutions.
- iv. Associative : Creating space for the support and help from the corporate bodies, civil societies, NGOs, CBOs and others and solicit their participation in disaster management.

1.3.1 Holistic : Area wise the whole of the State of Bihar is in V, IV and III seismic zone. Being the courtyard of as many as twelve major rivers flowing down the Himalayas and over half a dozen rivers from Chhotanagpur Plateau meandering through its backyard, the state suffers from flood in varying proportions every year. As it depends heavily on rainfall for its agricultural activities, the state suffers from drought as well. Cyclonic Storm/High wind visits the three fourth of the state approximately every year many a time. And, having a large part of its population living below poverty line and in hutments, fire occurrences at the slightest pretence of a spark is a usual phenomenon.

In the above perspective, the Plan has to be compulsorily holistic covering all major hazards, natural as well as man-made.

1.3.2 Integrative : The prevention, mitigation, preparedness and response measures have been included in the Plan in order to make it comprehensive and effective in reducing loss of life and property. The Plan had to be

inclusive also because first, the Act and the Guidelines have given directions in this regard and second, it is a dire necessity to make people of Bihar aware of hazards, the mitigation measures being taken and to make them participate in preparedness so that they may copingly live with the incidence of unpredictable & unavoidable disasters. In order to substantiate the point the occurrence of incidence like earthquake provides an apt example. The incident of earthquake is so spaced that the grim memory of havoc created by it gets completely diluted with the passing of generations. As such, there is a pressing need to keep each generation reminding of the kind of disaster an earthquake brings about and enliven their awareness about such a disaster and induce them to keep preparing for responding to such an event with best of readiness..

1.3.3 Participative: The edifice of the State Disaster Management Plan has been built with rich inputs that participation of major stakeholders provided during events organized for the same.

Right from the stage of methodology to be adopted for the preparation of the Plan in which senior officers from the govt. departments, the central govt. organizations, the corporate sector, the civil societies and the multilateral agencies participated, to the finalization of the draft plan in which 21 professionals from as many areas of expertise contributed the exercise is the result of the coming together of many minds.

Besides, a team of research associates visited as many as nine districts, one in each division, to have Gram Panchayat level interaction with community leaders, Panchayat representatives, social workers and local NGOs on incidents of disaster, the responses etc. Another team of senior level programme officers went to another nine districts, one from each division to have district level interaction on disaster related issues with the members of District Disaster Management Authority, Nodal Officers from the district level line departments and local NGOs.

Apart from these, representatives from all the 44 government departments, industry associations and professional bodies were invited for interaction on the proposed State Disaster Management Plan. As a result of the interaction, the plan has virtually become an outcome of the joint efforts of the officers from NDMA, NIDM, SDMA, & DMD. The officers also, from time to time, helped with valuable suggestions in the proper shaping of the plan. The representatives of Corporate & professional bodies also provided valuable suggestions in system engineering.

1.3.4 Associative: In the Plan the association of government as well as non-government organizations has been ascertained in an appropriate manner. The non-government organizations have been given key roles to play at the Preparedness, the Response and the Rehabilitation stages.

Besides, enough options have been left for the government to associate NGOs & CBOs in capacity building activity as well.

1.4 The Strategy :

The strategy adopted to draw the State Disaster Management Plan began with the study of the National Disaster Management Act, 2005, the State Disaster Management Policy, the Guideline for making of the State Plan and the Report of the High Powered Committee. It was followed by chalking out of the methodology to be adopted for the preparation of the plan which subsequently got finalized in a workshop in which major stockholders participated.

The exercise to know the basics of the existing Disaster Management System in the state, to gather the available data and details of action taken from various damage assessment reports, and to collect experience and observations of the related government functionaries provided a clear picture of the perspective for working out the plan.

Based on the findings from the study of the Act, Guidelines, Reports and Publications the framework of the State Disaster Management Plan has been prepared and shared with competent authorities and after having incorporated their valuable suggestions and observations the plan framework has been finally drafted.

1.5 The Methodology :

The methodology adopted for detailing the finalized framework of the plan consisted of three constituents – steps, instruments and sources. In all, 12 steps, 6 instruments and 12 major sources were used to prepare the plan.

The twelve steps were:

- i) study of documents,
- ii) interaction with stakeholders
- iii) study of the hazards happening in the state
- iv) the existing disaster management system and traditional practices
- v) analyzing the gaps in the practices
- vi) identifying the preparedness needs

- vii) working out disaster wise mitigation measures
- viii) formulating institutional framework
- ix) chapterisation and drafting of the plan
- x) sharing the same with authorities
- xi) sharing the same with stakeholders and
- xii) finalization of the plan.

The six instruments used were survey & study, workshops, structured interviews, small group discussions, personal interviews and district and community level interactive meetings.

The twelve major sources used were

- i) documents
- ii) publications
- iii) nodal officers of the government departments
- iv) professional bodies
- v) corporate
- vi) academicians
- vii) non-government organizations
- viii) district administration
- ix) local bodies
- x) Panchayati Raj Institutions
- xi) community leaders
- xii) technical institutions etc.

1.6 The State Disaster Management Plan :

The edifice of the State Disaster Management Plan built with bricks of experience, available data and suggestions drawn from all segment of expertise and stakeholders has been placed on four pillars:

- i. The Disaster Management Act, 2005 and NDMA Guidelines
- ii. The State and the Govt. Departments
- iii. Disaster Management related specialized institutions and other organizations/UN agencies/NGOs and
- iv. The Primary Stakeholders and the Panchayati Raj.

1.6.1 The Disaster Management Act, 2005 and NDMA Guidelines :

The DM Act, 2005 and NDMA Guidelines provided the framework for disaster management exercise as a whole and in part including the making of State Disaster Management Plan.

The DM Act, 2005

The Disaster Management Act 2005 has defined “disaster” and “disaster management” in detail as well as in design. It has also specified the disaster management institutions that are required to be setup. The Act also describes in details the roles and responsibilities of Key Government Officials/Stakeholders.

- i) *“ disaster” means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to and destruction of, property or damage to or degradation of environment and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected areas.*
- ii) *“ disaster management” a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for:*
 - *prevention of danger or threat of any disaster*
 - *mitigation or reduction of risk of any disaster or its severity or consequences*
 - *Capacity building*
 - *Preparedness to deal with any disaster.*
 - *prompt response to any threatening disaster situation or disaster*
 - *assessing the severity or magnitude of effects of any disaster*
 - *evacuation rescue and relief*
 - *rehabilitation and reconstruction*

Apart from well defined roles and responsibilities, the Act provides some overriding powers for disaster management in a desired manner. Some of the important ones are:

63. Powers to be made available for rescue operations.- *Any officer or authority of the Union or a State, when requested by the National Executive Committee, any State Executive Committee or District Authority or any person authorised by such Committee or Authority in this behalf, shall make available to that Committee or authority or*

person, such officers and employees as requested for, to perform any of the functions in connection with the prevention of disaster or mitigation or rescue or relief work.

64. Making or amending rules, etc., in certain circumstances.-

Subject to the provisions of this Act, if it appears to the National Executive Committee, State Executive Committee or the District Authority, as the case may be, that provisions of any rule, regulation, notification, guideline, instruction, order, scheme or bye-laws, as the case may be, are required to be made or amended for the purposes of prevention of disasters or the mitigation thereof,..... the appropriate department or authority shall take necessary action to comply with the requirements.

65. Power of requisition of resources, provisions, vehicles, etc., for rescue operations, etc.- (1) If it appears to the National Executive Committee, State Executive Committee or District Authority or any officer as may be authorised by it in this behalf that-

- (a) any resources with any authority or person are needed for the purpose of prompt response;
- (b) any premises are needed or likely to be needed for the purpose of rescue operations; or
- (c) any vehicle is needed or is likely to be needed for the purposes of transport of resources from disaster affected areas or transport of resources to the affected area or transport in connection with rescue, rehabilitation or reconstruction, such authority may, by order in writing, requisition such resources or premises or such vehicle, as the case may be, and may make such further orders as may appear to it to be necessary or expedient in connection with the requisitioning.

71. Bar of jurisdiction of court.- No court (except the Supreme Court or a High Court) shall have jurisdiction to entertain any suit or proceeding in respect of anything done, action taken, orders made, direction, instruction or guidelines issued by the Central Government, National Authority, State Government, State Authority or District Authority in pursuance of any power conferred by, or in relation to its functions, by this Act.

72. Act to have overriding effect.- The provisions of this Act, shall have effect, notwithstanding anything inconsistent therewith contained in any other law for the time being in force or in any instrument having effect by virtue of any law other than this Act.

NDMA Guidelines:

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 L₀, L₁, L₂, & L₃ based on the ability of various authorities to deal with them.

L₀ : denotes normal times which are expected to be utilised for close monitoring, documentation, prevention, mitigation and preparatory activities. This is the planning stage where plans at all levels from community to the State shall be put in place. Training on search and rescue, rehearsals, evaluation and inventory updation for response activities will be carried out during this time.

L₁ : specifies disasters that can be managed at the district level, however, the state and centre will remain in readiness to provide assistance if needed.

L₂ : specifies disaster situations that may require assistance and active participation of the state, and the mobilisation of resources at the state level.

L₃ : disaster situations arise from large scale disasters where districts and the state may not have the capacity to respond adequately and require assistance from the central government for reinstating the state and district machinery.

The objectives of the DM Plan have been put as :

- Promoting a culture of prevention and preparedness by ensuring that DM receives the highest priority at all levels.
- Ensuring that community is the most important stakeholder in the DM process.
- Encouraging mitigation measures based on state-of-the-art technology and environmental sustainability.
- Mainstreaming DM concerns into the developmental planning process.
- Putting in place a streamlined and institutional techno-legal framework for the creation of an enabling regulatory environment and a compliance regime.
- Developing contemporary forecasting and early warning systems backed by responsive and fail-safe communications and Information Technology (IT) support.

- *Promoting a productive partnership with the media to create awareness and contributing towards capacity development.*
- *Ensuring efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society.*
- *undertaking reconstruction as an opportunity to build disaster resilient structures and habitat.*
- *Undertaking recovery to bring back the community to a better and safer level than the pre-disaster stage.*

The guiding principles for the preparation of State DM Plan have been stated as:

i) Participatory Approach

ii) Community Based DM

iii) Themes Underpinning the Plan

- *The vulnerability of different parts of the state to different kinds of disasters.*
- *The measures to be adopted for prevention and mitigation of disasters.*
- *The manner in which mitigation measures shall be integrated with development plans and projects.*
- *The capacity building and preparedness measures to be taken.*
- *The roles and responsibilities of each department of the government of the state in relation to the measures specified above.*
- *The roles and responsibilities of different departments of the government of the state in responding to any threatening disaster situation or disaster.*
- *The state plan will be reviewed and updated annually.*

The framework will comprise sections that deal with :

- *Operational.*
- *Administrative.*
- *Financial.*
- *Legal Aspects.*
- *Process*

The suggested outline consists of three part

Part I.

- *General*
- *Vulnerability Assessment & Risk Analysis*
- *Preventive measures*
- *Mainstreaming DM concerns into Development Plan/Programmes/Projects*
- *Preparedness measures*
- *Response*
- *Partnership with other stakeholders*
- *Financial Arrangements*

Part II. Disaster specific Action Plan

Part III. Cross cutting issues

1.6.2. The State and the Government Departments.

The State and the government departments have been presented as two entities—the State where disasters happen and the government departments as the ultimate stakeholders.

The State

The State has been depicted in terms of five factors:

- *Its geography*
- *Its history*
- *Its people*
- *Its material resources and*
- *Its environment*

The Govt. Depts.

Out of 44 Govt. Depts. in the State, 26 depts play major role in the disaster management have been included in the Plan. These departments are:

1. *Dept. of Disaster Management*
2. *Dept. of Home*

3. *Dept. of Water Resource*
4. *Dept. of Minor Water Resources*
5. *Dept. of Agriculture*
6. *Dept. of Food & Consumer Protection*
7. *Dept. of Panchayati Raj*
8. *Dept. of Health*
9. *Dept. of Education*
10. *Dept. of Labour Resources*
11. *Dept. of Public Health Engineering*
12. *Dept. of Transport*
13. *Dept. of Social Welfare/Backward Classes Welfare/SC & ST Welfare*
14. *Dept. of Building Construction*
15. *Dept. of Energy*
16. *Dept. of Environment & Forest*
17. *Dept. of Industries*
18. *Dept. of Animal Husbandry*
19. *Dept. of Finance*
20. *Dept. of Road Construction*
21. *Dept. of Rural Development*
22. *Dept. of Urban Development*
23. *Dept. of Cabinet Coordination (Civil Aviation)*
24. *Dept. of Rural Works*
25. *Dept. of Information and Public Relations*
26. *Dept. of Planning & Development*

1.6.3 Disaster Management Related Specialized Institutions/Authoritie & other Organizations:

In the framework of disaster management the specialized institutions created by the DM Act, 2005 at the State level and major stakeholders in the form of National level institutions, expert bodies and multi later / bilateral agencies and corporate bodies play key roles.

The Specialized Institutions/Authorities

The following specialized institutions created by the DM Act 2005 are:

- *National Disaster Management Authority(NDMA)*
- *National Executive Committee (NEC)*
- *State Disaster Management Authority (SDMA)*
- *State Executive Committee (SEC)*
- *District Disaster Management Authority (DDMA)*
- *National Institute of Disaster Management(NIDM)*
- *National Disaster Response Force(NDRF)*
- *State Disaster Response Force(SDRF)*

The State Government of Bihar has established a battalion of Bihar State Disaster Response Force (SDRF) on the pattern of NDRF. The State Government is also considering establishing an institution on the pattern of NIDM. The government has also planned to establish SEOC, DEOC etc with the state of the art facilities in a phased manner.

Other Organizations:

Some organizations/UN bodies that play major roles in managing disaster specifically during Response period are:

- i) *UNDP*
- ii) *UNICEF*
- iii) *WHO*
- iv) *ACTION Aid*
- v) *Oxfam*
- vi) *Save the Children*
- vii) *Bihar Inter Agency Group (BIAG) etc.*

1.6.4 The Primary Stakeholders & Panchayati Raj:

In the DM Act as well as in NDMA Guidelines due emphasis has been laid on community based DM Plan. The communities are the main stakeholders as they are the victims as well as the first respondent to any disaster. The focus on community participation has been maintained in the Plan.

Panchayati Raj being the prime local body in the rural areas having its linkages ranging from the district administration to the communities, is by its very

placement the first public respondent and main player in the implementation of all disaster management related initiatives

1.7 The Implementation of the Plan :

The authority for implementation of the State Disaster Management Plan vests with the respective line departments of the State Government with Department of Disaster Management being a nodal and coordinating department for this purpose. The SDMA would monitor the implementation.

The State Disaster Management Plan also includes an exercise in system engineering aimed not only at disaster risk reduction but also motivating people, the functionaries and the system with confidence in themselves and trust in one another. It is not only aimed at disaster risk reduction but also at developing in people a culture of preparedness and disaster resilience and building institutions so that developmental initiatives are freighted and not fettered with disaster risk reduction measures.

1.8 The Role of the State Govt. Depts. & the Prime disaster management agencies:

The formulation of the State Disaster Management Plan has been based on the following postulates:

- i) The perspective in which the Disaster Management Act, 2005 was formulated
- ii) The mould in which the State may have to cast itself to implement the plan, and
- iii) The designated and desirable role SDMA may have to play in bringing about the pre-requisites for the realization of the goal, the disaster resilient system and society.

As such, in the implementation of the plan the roles of the State government and the prime agencies for the disaster management, the State Disaster Management Authority and Disaster Management Department become crucial and require some elaborations which are as follows:

1.8.1. The Perspective of the Act:

In May 1994 at the World Conference of Natural Disaster Reduction convened by the UN at Yokohama, Japan, a tectonic shift took place which shook the very foundation of thinking about Disaster. It brought about a paradigm shift from disaster as a calamity calling for relief and rehabilitation to a catastrophe which not only destroyed lives and property *en masse* but also undid years of *socio economic* developmental gains and momentum. The Conference also brought home to the participating countries the economic rationale behind going beyond relief and

rehabilitation to disaster mitigation and preparedness and stressed that it made economic sense to work for prevention and mitigation of disaster and prepare people to live copingly with vulnerability. In fine, the shift in emphasis from post -disaster relief to pre-disaster risk reduction was a life and property saving as well as cost saving exercise.

Keeping the spirit of the Act intact, the eight forms of disaster specified in the State Policy in focus and the directions given in the Guidelines in view, this State Disaster Management Plan has been made inclusive of L₀, L₁, L₂ & L₃ level of disaster and has been based on the worst case scenario for each form of disaster.

1.8.2. The Role of the State:

The State Disaster Management Plan has been formulated by visualising the State in a particular mould (role) which normally varies from stage to stage in the socio-economic development process.

There are four stages in the socio-economic development of a society: formative, normative, developing and developed. Corresponding to each of

*In a Different Mould:
Doer; Provider;
Facilitator & Monitor*

the four stages the State has to cast itself in four different moulds. The mould corresponding to the formative stage is that of a *Doer*, to the normative stage, is that of a *Provider*; to the developing stage, is that of a *Facilitator* and to the developed stage, is that of a *Monitor*.

In formulating the State Disaster Management Plan, the State has been taken in all the four moulds: although, presently, it is perceived more in the mould of a Doer and a Provider, even when the state economy has moved from normative to the developing stage in the socio-economic development process.

In this regard, the 15th report of the Second Administrative Reforms Commission (SARC) on state and district administration in 2009 has made certain important recommendations which need to be looked into. It says that:-

- i. Disaster/Crisis management should continue to be the primary responsibility of the State Governments and the Union Government should play a supportive role.
- ii. The law should create a uniform structure at the apex level to handle all crises. Such a structure may be headed by the Prime Minister at the National level and the Chief Minister at the State level. At the administrative level, the structure is appropriately headed by the Cabinet Secretary and the Chief Secretary respectively.

- iii. The role of the local governments should be brought to the forefront for crisis/ disaster management.
- iv. The National Executive Committee as stipulated under the Disaster Management Act need not be constituted, and the National Crisis Management Committee (NCMC) should continue to be the apex coordination body. At the State level, the existing coordination mechanism under the Chief Secretary should continue.
- v. In larger cities (say, with population exceeding 2.5 million), the Mayor, assisted by the Commissioner of the Municipal Corporation and the Police Commissioner should be directly responsible for Crisis Management.
- vi. Empowering the Relief Commissioners/Disaster Management Departments to effectively discharge disaster related responsibilities.
- vii. The district emergency response plan should be prepared in consultation with all concerned. The plan should be known and accepted by all the role players. (This should be a part of the District Disaster Management Plan).
- viii. Effective coordination is essential at the district and sub-district levels for rescue/ relief operations and to ensure proper receipt and provision of relief. During rescue and relief operations, unity of command should be ensured with the Collector in total command.

1.8.3. The Role of SDMA:

The State Disaster Management Authority is the apex state level body for disaster management having power and functions ranging from formulation of State Policy to approval and monitoring the implementation of Plan, to review the measures being taken for mitigation, capacity building and preparedness.

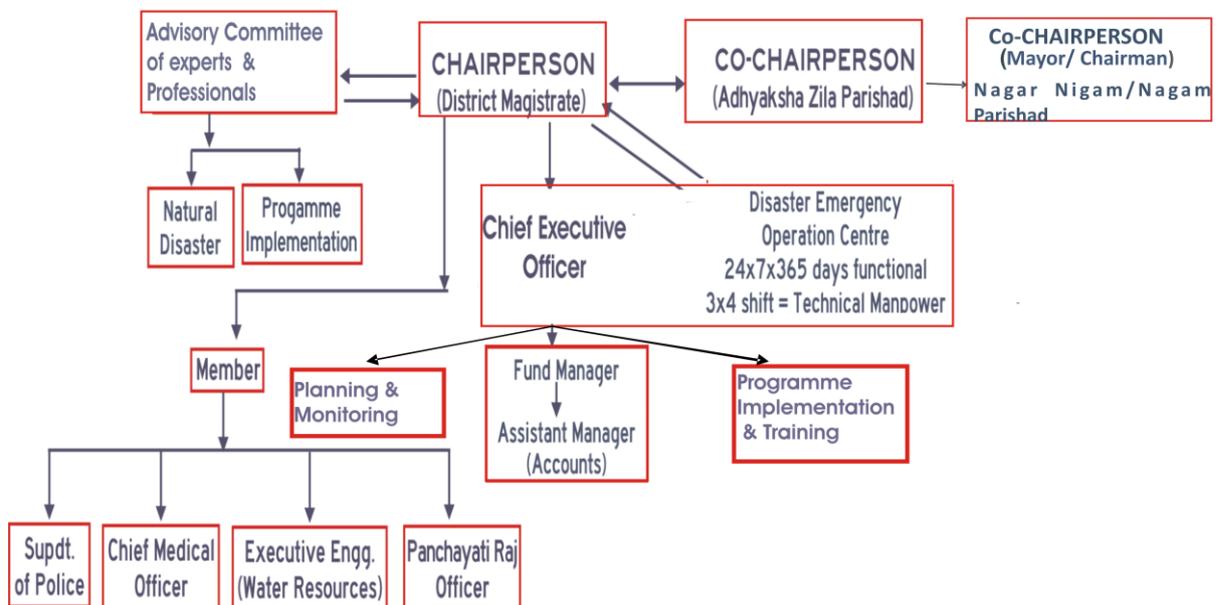
1.8.4. The Role of State Government (DMD):

The Disaster Management Department (DMD) is face of the State Government: it is responsible for all aspects of disaster management including prevention, mitigation, preparedness, capacity building, response and relief, and has been positioned as a *coordinating centre* for the implementation of the all programs of disaster management at the State and district level, for coordinating the efforts of all stakeholders during pre, during and post disaster days and for interacting with govt. departments and organizations, on the one hand, and with Corporate, Non Government Organizations (NGOs) and Media, on the other.

1.8.5. The Role of DDMA:

The District Disaster Management Authority shall be the implementing agency for all disaster management related programme and activities be it prevention, mitigation and preparedness related or disaster response, relief or post-disaster rehabilitation and reconstruction measures. During disaster response period the District Magistrate shall be the Incident Commander and shall have adequate power and authority to provide required support and services. Since, the DDMA is the authority which has been envisaged to be integrated; it has been suggested under the state plan that both planning & monitoring and programme implementation & training have to be manned by professionals & experts. The organizational structure of DDMA has been drawn as:

Organisational Structure of



District Disaster Management Authority (DDMA) *

- ❖ In order to make the DDMA structure more inclusive, it has been suggested that in addition to Adhyaksha Zila Parishad, Head of Urban Local Bodies also be made co-chairperson of the Authority.

2. The State of Bihar

The geography of a state, its history, its people, its natural resources and environment for growth & development pervading are the five elements that constitute the profile of a state, create its socio-economic complexion & condition its development.

The **geography** of a State provides it with its boundaries, its area consisting of land, water bodies, mountains and its climatic conditions to nurture and develop lives, living and livelihood. Its **history** consolidates the perspective and the inclinations for a state to perceive, act and behave. Its **people** provide a state with strength to converge and create. Its **natural resources** contain the potentialities and permutations to promote and produce. And the **environment for growth & development** gives a state the sensitivity and sustainability to grow, garner & generate.

2.1 The Geographical Complexion:

The state of Bihar is located in the eastern part of the country between 24°–20'–10" to 27°–31'–15" North latitude and 82°–19'–50" to 88°–17'–40" East longitude. It is an entirely land locked state and lies mid-way between the humid West Bengal in the east and sub-humid Uttar Pradesh in the West. It is bounded by Nepal in the North and Jharkhand in the South. It is divided into two unequal halves by the river Ganga which flows through the state from West to East.

Map: - Physical Map of Bihar



2.1.1 The Land:

The total area of the state is 94,163.00 Sq.km. out of which 92,251.49 Sq.km.(97.97%) are rural areas and 01,911.51 Sq.km. (2.03%) are urban areas.

The state is divided into three agro-ecological zones: first, North West Alluvial plains (Zone-I) consisting of 12 districts—West and East Champarans, Gopalganj, Sheohar, Sitamarhi, Madhubani, Darbhanga, Muzaffarpur, Siwan, Saran, Vaishali, Samastipur; second, the North-East Alluvial Plains (Zone-II) consisting of 9 districts—Begusaria, Khagaria, Saharsa, Madhepura, Supaul, Araria, Kishanganj, Purnia, Katihar, and third, the South Bihar Alluvial (Zone-III) consisting of 17 districts—Buxar, Bhojpur, Bhabhua, Rohtas, Aurangabad, Gaya, Jehanabad, Patna, Nalanda, Sheikpura, Nawada, Jamui, Banka, Lakhisarai, Munger, Bhagalpur and Banka

Out of the total geographical area of 94.163 lakh ha the land use is as given below:

Table: 2.1–Land Use:

Sl. No.	Category	Area (ha)
1.	Forest Land	6,76,400
2.	Land under misc trees, groves	2,11,709
3.	Current fallow	2,56,783
	other fallow	6,87,570
	cultivable waste	79,319
4.	Net area under cultivation	56,05,798
5.	Barren Land & permanent pasture	5,03,381
6.	Area under non-agriculture use	13,95,340
	Total	94,16,300

Source : Directorate of Statistics & Evaluation, GoB.

2.1.2 The Water bodies:

Bihar is a land-locked state demarcated by the river Ganges into north and south and further divided into regional blocks by rivers flowing down from the Himalayas and the Chhotanagpur Plateau to find repose in the Ganges. The Northern Gangetic plain of Bihar is the courtyard of rivers flowing from the Himalyas, like the Ghaghara, the Gandak the Burhi Gandak, the Bagmati, the Kamla, the Kosi and the Mahananda. And the Southern Gangetic plain is the backyard to the rivers that descend down the Chotangapur Plateau like the Karmansa, the Sone, the Punpun, the Phalgu, the Kiul and the Sakri. Altogether more than a dosen major rivers flow through the state dividing it in **seven "geo-cultural zones"**.

These seven geo-cultural zones correspond to what Ms. Manosi Lahiri in her book, "The Bihar Geographic Information System" called "Special Purpose Area" (SPA).

Map: - Seven River Zones:



- i) **Ghaghara-Gandak Zone** consisting of East and West Champarans, Gopalganj, Siwan and Saran District.
- ii) **Gandak-Bagmati zone** consisting of Sheohar, Sitamarhi, Muzaffarpur, Vaishali, Samastipur & Begusarai districts.
- iii) **Bagmati-Kosi Zone** consisting of Darbhanga, Madhubani Supaul, Saharsa & Khagaria districts
- iv) **Kosi-Mahananda Zone** consisting of Madhepura, Araria, Purnia, Kishanganj and Katihar districts.
- v) **Karmnasa—Sone Zone** consisting of Buxar, Kaimur, Bhojpur and Rohtas districts.
- vi) **Sone—Punpun Zone** consisting of Patna, Jehanabad, Arwal, Gaya, Nalanda, Aurangabad and Nawada districts and
- vii) **Punpun-Sakri zone** consisting of Sheikpura, Lakhisarai, Jamui, Banka, Munger and Bhagalpur districts.

These broadly divided river zones also roughly correspond to some specific cultural zones such as Bhojpur, Tirhut, Mithila, Magadh, Anga etc.

In the past, North Bihar were also known as a zone of ponds and South Bihar as a zone of tals and *ahar & pynes*. These ponds, ahar and pynes were used to store water during rainy season and during scheduled overflowing of rivers and subsequently used for irrigation purpose during non-rainy days. It also helped, to a very large extent, in maintaining the water table in the area.

2.1.3 The Mountains:

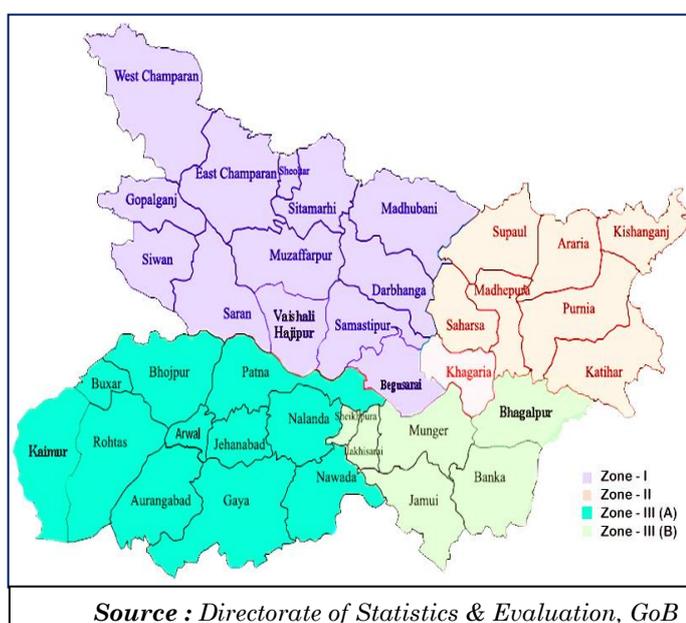
Although the area of the state consists largely of the Gangetic plains, it is dotted with historically/mythological famous hills : Rajgir hills in Nalanda known for the excurmises of Jarasandh of Mahabharat days; the Barabar & Kawakola hills of Gaya known for caves where Buddhist monks resided; Mandar hills of Bhagalpur known for its mythological use in the famous churning of ocean by Gods and demons and Makar hills of Rohtas known for ancient temples of Gods & Goddesses.

The Himalaya and the Chhotangapur hills are beyond the boundaries of the state but the rivers that descend down theses hills very much make or mar the socio-economic fortune of Bihar.

2.1.4. The Climate & Rainfall:

Bihar is situated at 173 feet 52.73 meter above sea level. It has a tropical climate with hot summers and cold winters. The summer temperature shoots upto 45°C and in winter drops even below 5°C. The hot summer months are from April to mid June and the cold winter months are between mid- November to mid- February. And in between lies the period of flood, fire and cyclonic winds.

Map:- Climate



Rainfall is largely due to South-West Monsoon in the State. It accounts for about 85 percent of the total rainfall. The average rainfall is around 1120 mm. Remaining 15 percent rainfall is from winter rain, hot weather rain and north-west monsoon.

The average rainfall of 1120 mm would have been sufficient for carrying out normal agricultural activities in the state. But the year to year variations cause problems and bring about floods/droughts resulting in grim variations in income of farmers from agriculture. This is more so because more than 50% of the cultivated land are still dependent on rain or some conventional modes of irrigation which also somehow fail during low rainfall years.

Table: 2.2– Annual Rainfall for Different Seasons

Year	Winter Rain	Summer Rain	South-west Monsoon	North-west Monsoon	Total (Rainfall in mm)
2000	0.40	101.70	994.10	10.00	1106.20
2001	20.90	86.70	908.20	192.20	1208.00
2002	48.90	66.80	896.90	33.20	1045.80
2003	19.20	93.00	767.60	128.90	1008.70
2004	23.70	41.40	906.10	60.10	1031.30
2005	0.10	89.50	777.60	30.20	897.40
2006	0.10	88.97	925.86	27.77	1042.69
2007	28.34	76.40	1360.85	40.49	1506.08
2008	30.61	61.78	1084.27	19.31	1195.97
2009	0.09	98.22	699.17	71.13	868.61
Average	17.23	80.45	932.06	61.33	1091.08

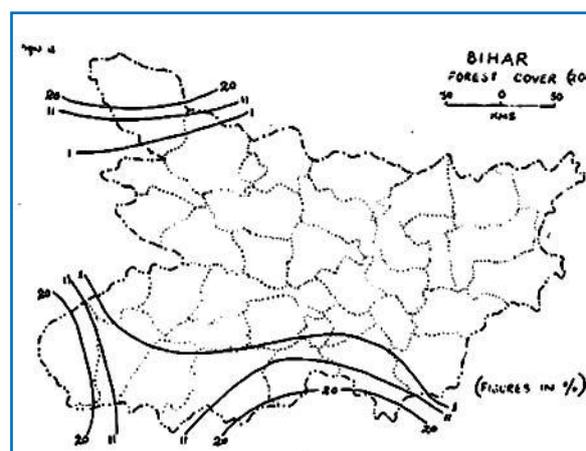
Source: Directorate of Statistics & Evaluation, GoB.

During the period beginning with 2000 to 2009 the annual rainfall has varied between 897 mms in 2005 (82.2 percent of the average rainfall) to 1506 mm in 2007 (138 percent of the average rainfall). In 2005, the rainfall from the south west monsoon, the major source of rainfall in the state, was 16.5 percent less than the average. On the contrary, in 2007 the rainfall from south western monsoon was 45.9 percent more than the average.

2.1.5. The Forest:

Bihar has 6.87 percent of its area clothed with forest and woodlands. It is the last remnants of the dense extensive Sal forests occupying the Supaul, Purnia, Araria, Kishanganj and West Champaran and Jamui, Nalanda, Gaya, Aurangabad

Map: - Forest Cover in the State



Source : Environment & Forest Dept , GoB.

and Rohtas in the Southern part. This natural vegetation of Bihar plains, outside the cultivated areas is of a savannah or parkland type. It is characterized mostly by extensive meadows and grasslands punctuated by trees.

Table : 2.3 Bihar Forests - At a Glance:

SL	Description	Area (in km ²)	%age
1	Geographical Area	94,163	100
2	Forest Area	6,473	6.87
3	Very Dense Forest	76	0.08
4	Dense Forest	2,951	3.13
5	Open Forest	2,531	2.69

Source : Environment & Forest Dept , GoB.

Out of 6.87%, 0.08% is very dense forest, 3.13% dense forest and 2.69% open forest. Vigorous efforts are being put in to increase the forest area to 15% of the total area of the State.

2.2 The Historical Perspective:

Historically, Bihar dates back to the days of Mahabharat and shown as directly instrumental in the building of Dwarka: if Jarasandh the mighty king of Magadh, would not have scorched with repeated attacks the people of Mathura, they would not have built Dwarka to resettle themselves away from the reach of Jarasandh. And if Karna, the King of Ang would not have stood by Duryodhana there would have been no Mahabharata.

Because of the historically proven roles that the state has played in the growth & development of the sub-continent — from the crucial battle fought between a monarchy and a republic when Ajatshatru waged war on Licchivies to the

battle of Buxar in the year 1764 between Mir Kasim and the British—Bihar holds the distinction of being the cradle of both the people-centred power (Republic) and power centred people (monarchy). It has been the seat of conquerors of battle where blood flowed like water (Kalinga War), the builders of great empire and mighty armies (Chandragupta Maurya), of grand infrastructure and superb system (Shershah Suri), of movers of faith beyond the material boundaries and shakers of mind within the territories of faith (Lord Buddha, Lord Mahavir and Guru Govind Singh).

In the midst of these 'firsts' and the greatest in the world the contributions of the only system-engineer king of the world, the one and only Shershah Suri of Bihar stand apart. He founded not only the modern city of Patna with hope that it "would become one of the greatest towns of the country", but also, during his five years of rule (1540-1545), gave systems on which the edifice of modern governance :

- i) Infrastructure as an instrument of development as well as control: the Grand Trunk Road.
- ii) Revenue based administrative system which later on Raja Todar Mal, also from Bihar, improved for Akbar and Lord Cornwallis further improved for the British.
- iii) The system of Annual Budget based expenditure and taxation noted by Shri P. Chidambaram as the Union Finance Minister in his Budget Speech.

These events, world renowned figures and path breaking initiatives *clearly indicate that the future of the State of Bihar lies in innovating, improvising and leading by setting examples.*

2.3 The People :

The people of Bihar have witnessed more extension or narrowing of boundaries, more aggression and internal dissensions than people of any other state in the country. But all these happened at the circumference. Even after the battle of Buxar in 1764 when the Diwani of Bengal, Bihar and Orissa went in the hands of East India Company, till the year when Lord Cornwallis proclaimed the permanent settlement, the centres of life of common people in Bihar remained similar: traditional, caste based, agri-oriented, community linked and vocation bound. But after 1793, when the whole presidency got divided into settlement and non-settlement areas, the very centre of life got shaken. Consequently, from 1850 till 1947, people of the region remained merged and mired in movements, repressions,

exploitations, protests and rallies, sometimes in the interest of the nation and sometimes for their own individual identity. **They did not and could not find time to get socially settled in order** to work for their own economic betterment. And, after 1947 till date, how people of Bihar have suffered at the hands of the policy makers at the Centre is so well known that to restate them would be an unpleasant repetition.

With the dwindling of vocation based and community-linked life on the one hand and continued neglect by the policy makers at the Centre, on the other, people of Bihar menacingly clung to caste base as they found in it a ready-made, easy instrument to do permutations and combinations to be in a position to socially and politically dictate. As a result, the social capital and moral economy, that are woof and warp of all economic structure, whether of an ant or elephant size, got eroded and compromised. The very edifice on which growth and development could be built was made an altar to offer scarifices for personal or caste gains. As a result the people of Bihar, in spite of having physical and mental attributes that more than match the best of people of the most advanced regions, remained sulking in the dwarfing environment within the state and imposing environment outside.

Living through these trying conditions, people of Bihar, over the years, on the one hand, have developed a double edged personality- native and migrant. As a native, they look upon hard work as a painful necessity. And as migrant, they work harder than others to justify themselves which either opens them up to all sorts of exploitations or blossoms their dormant virtues to achieve in the face of all odds.

On the other hand, around two and a half decade of their living and being yoked together by feudalism, has made the people of Bihar excessively dependent on the system. They have developed a fascination for getting cattered even for petty needs. In the process, they as individuals have become lethargic, passive and isolated as social beings, highly compromising and tolerant to the extent of being unresponsive and as economic being unenterprising, unambitions and idle. They remain merged and mired in caste and creed and refuge to grow as citizens.

2.3.1 Demography :

Another dimension which, after independence has started having a bearing on the people of the state is its demography. Over the years after independence its geographical area has shrunk from 1,74,083 sq.kms to

94,163.00 Sq.kms in 2000. And population has increased from 829.99 lakh in 2001 to 1038.05 lakh in 2011.

Table : 2.4– Decadal Growth of Population in Bihar

Sl. No.		2001	2011	Percentage decadal group
1.	Population	8,29,98,509	10,38,04,637	25.07
2.	Male		5,41,85,347	Sex-ratio 933
3.	Female		4,96,19,290	
4.	Child Population (0-6yrs.)	1,68,06,063	1,85,82,229	
	- Male Child	86,52,705	96,15,280	
	- Female Child	81,53,358	89,66,949	
5.	Population aged (7yrs & above)	8,52,22,408		
	- Male Child	4,45,70,067		
	- Female Child	4,06,52,34		
6.	Literacy		5,43,90,254	36.82%
	- Male		3,27,11,975	73.39%
	- Female		2,16,78,279	53.33%
7.	Density	880 per Sq. Km.	1102 per Sq. Km.	

Source: Census 2011

2.3.2 Health :

The health scenario in the State of Bihar remained dismal till the other day. It suffered from the classical health problems related to underdevelopment and social deprivation, namely, nutritional deficiencies and communicable diseases. It required, therefore, social development approach addressing the needs for maternal care, child health, contraceptive services, education of girls, ensuring a minimum age of marriage of girls, reducing infant mortality and MMR through better health care and immunization, nutrition support to women and children.

Bihar has shown signs of improvement in vaccination coverage, institutional deliveries and infant mortality and child health indicators. According to SRS 2011, the Infant Mortality Rate (IMR) has dropped from 56 in 2008 to 52 in 2009. The corresponding all India figure for the same period is 53 & 50 respectively. Similarly, the crude birth rate fell from 28.9 in 2008 to 28.5 in 2009. All India figure is 22.8 & 22.5 respectively. The crude death rate fell from 7.3 in 2008 to 7.0 in 2009. The corresponding all India figure is 7.4 & 7.3 respectively.

Table: 2.5– Health Indicators in Bihar:

Indicators	DLHS III (2007-08)		
	Total	Rural	Urban
Antenatal Care			
Mother who received any antenatal check-up (%)	59.3	58.5	70.8
Mother who had antenatal check-up in first trimester (%)	24.2	22.9	40.7
Mothers who has three or more ANC (%)	26.4	25.4	39.8
Mothers who has full antenatal check-up (%)	4.6	4	11.7
Reproductive Health			
Institutional delivery (%)	27.7	25.6	54.3
Delivery at home (%)	71.5	73.5	45.3
Safe Delivery (%)	31.9	29.7	59.9
Mothers who received post-natal care within two weeks of delivery (%)	26.2	24.9	42.6
Mothers who received financial assistance for delivery under JSY (%)	9.7	9.4	14.1
Child Immunization			
Children 12-13 months fully immunized (%)	41.4	41.4	41.2
Children 12-23 months not received any vaccination (%)	1.6	1.5	2.7
Children 12-23 months who have received BCG vaccine (%)	81.5	81.6	80.4
Children 12-23 months who have received 3 doses of DPT vaccine (%)	54.4	54.5	53.8
Children 12-23 months who have received 3 doses of polio vaccine (%)	53.1	53	54
Children 12-23 months who have received measles vaccine (%)	54.2	54.1	55.8

Source : Economic Survey 2010-11

2.3.2.1 Burden of Diseases:

The burden of fatal diseases that the people in Bihar specifically marginalized section, have to suffer are largely five : Kalazar, Malaria, Japanese encephalitis, TB & HIV. The first three ones are largely due to unhygienic conditions in which they live and the later two because of malnutrition and migration. Out of 38 large parts of 30 districts suffer from Kalazar, 7fromMalaria, 5 from Japanese encephalitis, 13 from TB & 28 from HIV.

Table : 2.6–Major Diseases in Bihar

Sl. No	District	Kalazar	Malaria	Japanese encephalitis	TB	HIV prevalence in the district
1	Araria					
2	Arwal	Y			Y	
3	Aurangabad		Y	Y		Y
4	Banka	Y				Y
5	Begusarai	Y			Y	Y
6	Bhagalpur	Y			Y	Y
7	Bhojpur	Y				Y
8	Buxar	Y				Y
9	Darbhangha	Y				Y
10	East Champaran	Y				Y
11	Gaya		Y	Y		Y
12	Gopalganj	Y			Y	Y
13	Jamui		Y		Y	Y
14	Jehanabad	Y			Y	Y
15	Kaimur (Bhabua)		Y			
16	Katihar	Y				Y

17	Khagaria	Y				
18	Kishanganj	Y				
19	Lakhisarai	Y				Y
20	Madhepura	Y				Y
21	Madhubani	Y			Y	
22	Munger		Y		Y	
23	Muzaffarpur	Y		Y		Y
24	Nalanda					Y
25	Nawada	Y	Y			Y
26	Patna	Y				Y
27	Purnia	Y			Y	Y
28	Rohtas		Y			Y
29	Samastipur	Y			Y	Y
30	Saran	Y				
31	Sheikhpura	Y				
32	Saharsa	Y				Y
33	Sheohar	Y				
34	Sitamarhi	Y			Y	Y
35	Siwan	Y		Y	Y	Y
36	Supaul	Y				Y
37	Vaishali	Y				Y
38	West Champaran	Y		Y	Y	Y

Source: NICD, Delhi, State of Health in Bihar & DMD, GoB.

Human Development Index (HDI) is a composite index representing three dimensions of human development namely, economic, health and education. The combined HDI of Bihar is 0.367 as compared to 0.472 for India. It ranks 15th in the country. In marginalized groups it is around 0.201 ranking lowest. The above sums up the stature of the people of Bihar as one of the constituents of the profile of the state.

2.4 The Natural Resources :

There are two categories of natural resources: the natural resources of the surface and the natural resources of the deep. The natural resource of the surface consists of human, land, livestock, forest, some minerals and water. The natural resources of the deep consists of minerals, metals, petroleum, gas etc. Each category of natural resources impose its own kind of preconditions upon any attempt at harvesting growth and development out of it.

The natural resources of Bihar consists of highly fertile land, abundant water resources-both surface and ground , limestone, silica sand and livestock. These are all natural resources of the surface.

These resources of the surface get adversely affected by disasters, specifically flood, which ravage the fertile land and neutralize the precious efforts put in by farmers. The extent of this damage can be envisaged by the

fact that out of 94.16 lakh ha of geographical area 68.80 lakh ha is flood prone.

2.4.1 The Land Resource:

Bihar falls in the riverine plain of the Ganga basin area. Because of this topographic nature, land put to agriculture use here is high as compared to other states.

The area under non-agricultural use has remained at 17.6 percent of the total geographical area. The net sown area is at 60.5 percent. Cropping intensity has been 1.37 which implies an additional 368 thousand hectares under cultivation.

However, the land use pattern is not uniform all over the State. Due to different agro-climatic conditions there is substantial district wise variation in the land use pattern. From the point of net sown area, in 9 out of 38 districts more than 70 percent of the land area is under cultivation. The district where irrigation facilities are minimal, the cropping intensity remains low.

2.4.1.1 Production & Productivity:

Fertility of soil, along with endowment of abundant ground water resources enable the farmers in the state to produce a variety of crops. Apart from cereals and pulses, Bihar also produces oilseeds, fibers, fruits and vegetables. Of late, the farmers have also taken to floriculture in view of the growing market both within and outside the State.

Presently, Bihar produces 50.6 lakh tones of rice, 45.1 lakh tones of wheat, 17.8 lakh tones of maize and 1.43 lakh tones of oilseeds and 47.8 lakh tones of sugarcane. Despite one of the worst drought in 2009, the total food grains production was around 105.00 lakh tones which underlines the high degree of resilience of agriculture in the State.

Apart from major cereal and pluses, the state also produces a number of vegetable crops important once of them are : potato 50.34 lakh tones, cauliflower 10.44 lakh, tomato and brinjal 11.86 lakh tones. The total area under vegetable cultivation in Bihar is 8.27 lakh hectares (2007-2008) which is approximately 10.6 percent of the gross sown area of the state.

Beside the major food-grains and vegetables, the third important component of agriculture productions in Bihar is the cultivation of fruits. The total area under fruits production was 2.9 lakh hectares (2008-09) which is approximately 5% of the net cultivated area. The production level of major fruit crops are 13.30 lakh tones of mango, 2.29 lakh tones of guava, 2.17 lakh tones of litchi 13.74 lakh tones of banana. The total area & production of fruit in Bihar in the year 2009-2010 was 290.71 thousand hectare area and production 3727.82 thousand tones.

Apart from these, sericulture and Jute are the products base on which a host of labour intensive value addition enterprises did well in the past and with the help of technologies can do in future.

2.4.1.2 The Land Holding Pattern:

The land holding pattern in Bihar is highly fragmented and its derivations having complex social overtones. 43.08% of area has 84.14% of land holdings which is less than a hectare. 19.21% of area is held by 9.23% which means up to 2 hectare, 22.88% of area by 5.12% which means up to 4 hectare 12.76% of area by 1.42% which means up to 10 hectare & 2.07% of area by 0.08% which means above 10 hectare.

The derivations of this pattern –lager the chunk lesser the no. of holding is disastrous of a state where 90% of the population live in rural area and depend, directly or indirectly, upon agriculture . This has created social imbalances and given rise to caste dominance on the one hand, and created a huge marginalized section and the grievous instance of poverty, on the other.

Table: 2.7–Land Holding Pattern :

Sl. No.	Size Class (ha)	Percentage of No. of holdings	Percent area of operational holding	Average area per holding
1.	Marginal (<1 ha)	84.14	43.08	0.31
2.	Small (1-2 ha)	9.23	19.21	1.24
3.	Semi-medium (2.4 ha)	5.12	22.88	2.67
4.	Medium (4-10 ha)	1.42	12.76	5.36
5.	Large (> 10 ha)	0.08	2.07	15.67

Source : Economic Survey: (2011-12)¹

2.4.2. The Water Resources:

The Water Resources of Bihar consist of over a dozen of large & medium rivers, sufficient average annual rainfall and ample ground water.

¹ Production figures taken from Economic Survey Report 2010-11

Availability wise these water resources are more than sufficient to harvest 'gold' from the rich fertile land of Bihar. But due to traditional harvesting practices and management of water resource the picture of agriculture in Bihar has not brightened to its full potential .

2.4.2.1 Irrigation potential and facilities in Bihar:

Optimum use of water resources is the key to enhancement of irrigation efficiency in an agrarian economy like Bihar. To maximize agriculture production and to free agriculture from the vagaries of monsoon, irrigation facilities are required to be created. Presently the irrigation facilities available in Bihar in the year 2009-10 was :

Table : 2.8–Different Irrigation Sources:

Sl. No.	Sources of Irrigation	Gross Irrigated Area (Lakh ha)	Net Irrigated Area (Lakh ha)
1.	Canal	10.63	7.98
2.	Tank	1.17	0.89
3.	Tubewell	28.87	20.53
4.	Wells	0.07	0.06
5.	Other Sources	1.23	0.87
	Total	41.97	30.33

Source : Economic Survey (2010-11)

2.4.2.2 Surface Water Scenario :

There are broadly four canal commands in Bihar (i) Sone Command (ii) Gandak Command (iii) Kosi Command (iv) Kiul-Badua-Chandan Command and ten Chief Engineer Zones (CEZ) to supply surface water to 16,42,779 ha area in various districts of Bihar

- i) The canal system under Sone command irrigates about 7,78,040 ha area spread over 12 districts.
- ii) The canal system under Gandak command irrigates about 4,01,966 ha area spread over 7 districts.
- iii) The canal system under Kosi command irrigates about 2,15,060 ha area spread over 6 districts, and
- iv) The canal system under Kiul-Badua-Chandan command irrigates about 2,04,779 ha area spread over 7 districts.

2.4.2.3 The Ground Water Scenario :

In entire Bihar the percentage of ground water development is 39.27% only. The net ground water availability in entire Bihar is 11,770,6196 ha/m. And the net groundwater availability for future irrigation for entire Bihar is 15,88,696 ha/m.

The above mentioned information put together tend to reveal that rainfall deficit and less and late release of water from canals result in drought like situations. However, it is possible and comparatively less strenuous to mitigate drought like situations with sufficient ground water resource to meet crop water demand and with appropriate land and water management strategies as well as judicious, efficient and equitable use of land water resources.

Thus, the two major natural resources—land and water—instead of strengthening, prey upon each other leaving the farmers waiting for relief and rehabilitation. From 2000 to 2009 a total of 4.34 lakh hectares cropped area and on an average 4.34 lakh hectare of cropped area per year got affected by flood bringing about a total value loss of 7835902.82 lakh of rupee, that is on an average, of Rs. 783590.25 lakh per year.

Apart from flood, drought, arising out of scanty rainfall, hits the resource base of the state. It may seem strange but in the heartland of rivers flowing down from the Himalayas and the Chhotanagpur Plateau, drought has affected all the 38 districts of the state due to 20% to 42% deficit in rainfall in consecutive year 2009 & 2010 leading to the shortfall in crop coverage more than 60 percent over the entire state.

Thus, the major natural resource base of the state, inspite of being the best of its kind is more a source of loss of life and property than a resource for socio-economic growth and development.

2.5 The Environment for Growth & Development :

The environment in a state consists of all those factors that have a bearing on the socio-economic development of the state. It has two aspects, internal & external.

The internal aspects consist of factor such as socio-economic complexion, infrastructure, administrative setup, govt. policies and local bodies etc.

The external aspects consist of factors such as central govt. policies, state in relation to the centre, corporate sector, geographical location etc.

2.5.1 Internal Aspect : *Socio-Economic Complexion*

After Independence—during 1952-'53 to 1964-'63—Bihar had a moderate rate of agriculture production of 2.97% per annum. But this rate was better than many other states like Andhra Pradesh, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Uttar Pradesh and West Bengal most of which are now taken as developing states. During the same period, the rate of food-grains production in Bihar was 3.05 percent which was higher than

the national average which was 2.05%. But due to exploitative agrarian structure, poor irrigation and water management, inadequate credit and extension service and lack of growth oriented culture in people and development oriented leadership in politics, the state of Bihar could not sustain the growth. During the period 1969-'70 to 1983-'84, the agriculture production tumbled down to 0.42% and food-grain production to (-) 0.3%.

Of late, however, the wheel has taken full circle. With the emergence of forward looking and enlightened political leadership, the growth and development in the primary sector giving impetus to the growth in the secondary sector, has taken the centre-stage. The firm indicator of these development is the creation of infrastructure and building of conducive environment through policies and promotional initiatives in the state.

2.5.2 Infrastructure:

Infrastructure is one of the key movers of socio-economic development. Physical infrastructure drives the economic growth and social infrastructure impacts human resource development. Physical infrastructure consists of power, irrigation, telecommunication, aviation and road connectivity. Social infrastructure consists of schools, hospitals, sports and recreation facilities.

2.5.2.1 Physical Infrastructure: *Power*

The power position in Bihar is depicted by the hard fact that no new generation unit has come up in the state in the last 25 years. Power being a key component in the industrial development of any region, the economic backwardness of Bihar can safely be laid at the doorstep of power shortage.

With the bifurcation of Bihar in the year 2000 major power generating units went to Jharkhand, leaving only dilapidated thermal power generating units to Bihar. As a result, the state is lagging far behind other states in terms of power availability and is forced to purchase 90 percent of its power requirements from central utilities. In the beginning of 2010, Bihar State Electricity Board had around 3 million consumers consuming 5325 gigawatt hours (GWH) of which 33 percent were to domestic, 27 percent to industrial and 15 percent to irrigation consumers.

The per capita power consumption in the state is around 122.11 KWH units as against all India average of 778.71 KWH. The total installed capacity including hydel is about 600 mw against the peak demand of 3000 mw. The deficit which was around 15 percent in 2006-2007 has increased to around 45% in 2010-11 not because the availability has gone down but because the peak demand has increased two and a half time.

Table : 2.9– Power Availability & Supply Position (MW):

Year	Peak Demand	Peak Availability	Deficit	Percentage
2006-07	1399	1162	198	15.1
2007-08	1800	1244	556	30.88
2008-09	1900	1348	552	29.05
2009-10	2500	1508	99.2	39.68
2010-11	3000	1664	1336	44.53

Source: Bihar State Electricity Board

Given this trend of increasing deficit in power supply, the Central Electricity Authority has anticipated nearly 65% deficit in peak demand on 2012 in the state.

2.5.2:2 Physical Infrastructures: *Irrigation*

Around 90% percent of Bihar population lives in rural areas which is much higher than the national average of 72 percent. Obviously, that much percent of Bihar population depends mainly on agriculture which in turn depends on rain and irrigation facilities for its productivity.

The annual rainfall of around 1120 mm in Bihar is more than sufficient for Kharif crops like paddy and maize. But it being erratic and seasonal in character, the availability of irrigation facility becomes a dire necessity for the economic development of Bihar.

Out of 53.53 lakh hectares of the ultimate irrigation potential of the state, an irrigation potential of 28.80 lakh hectares have been created through major & medium irrigation schemes. The remaining 24.73 lakh ha slated to be developed by 2015.

The minor irrigation, which includes surface and ground water facilities such as minor canal, Tanks, Ponds, Ahars & Pynes, Tubewells lift irrigation etc. covers around 32.50 lakh hectares.

The State has planned to renovate and modernize 21,000 Ahars and Pynes in 17 district of South Bihar and is also going to initiate a new scheme viz. Mukhymantri Ahar Pyne Irrigation Scheme to renovate the old Ahar and Pyne system of irrigation in the State.²

Apart from these, in the light of the National Water Policy 2002, the state government proposes to work for interlinking of state rivers and tapping of ground water resources, on the one hand, and promote the participatory

² — Based on Economic Survey Report 2010-11

irrigation management programme to have the participation and ownership of the beneficiary farmers both in maintenance of the system and distribution of water.

2.5.2.3 Physical Infrastructure: *Communication*

Communication facilities characterize the socio-economic growth and development of a State. Their convergence denotes freedom and their coverage indicates development. Half of the battle for socio-economic growth and development is fought and won through communication. In this regard Bihar has taken giant step forward in the last five years beginning with 2005-2006 during which it registered around 10 fold increase (from 42 lakh in 2005-06 to 415 lakh in 2010-11) in respect of verbal connectivity. This has been achieved mainly due to phenomenal increases in mobile connections, which registered a growth of more than 17 times during the period.

Table: 2.10– Number of Tele Connections (in Lakh)

S.N.	Connection	05-06	06-07	07-08	08-09	09-10	10-11 up to Oct.10
1.	Landline Connection	17.38	9.86	9.73	9.63	9.61	9.62
2.	Mobile Connection	23.55	46.92	81.94	151.78	283.41	402.60
3.	WLL Connection	1.3	1.53	1.88	2.38	2.82	2.81
4.	Gross Total	42.23	58.31	93.55	163.79	295.84	415.03
5.	Annual Growth %		38.08%	60.44%	75.08%	80.62%	40.29%

Source : Economic Survey 2010-11

In spite of the tremendous growth in telecommunication in the state, the tele density, (Number of telephone per 100 persons) which is an important indicator of telecom penetration in a region, Bihar is still far behind other states in the country. Besides, there exists a yawning gap between the rural and urban tele density which is around 139 as compared to paltry 16 in rural areas out of which 8% of the connections have been provided by private players in the rural areas.

Table: 2.11– Tele Density in Bihar:

S.N	Category	Rural	Urban	Total
1	Service Area wise	16.16	139.44	32.94
2	Wireless Tele density	15.17	134.37	31.86
3	Wire line Tele density	0.44	50.7	1.07

Source : Economic Survey 2010-11

In furtherance of Information Technology in rural areas, however, public sector organization, BSNL has played a pivotal role. The contributions of BSNL helped the State in creating most of the communication based facilities in rural areas.

2.5.2.4 Postal Services:

Communication can be verbal or written. In the area of written communication Post Offices have been playing a key role for the last 150 years and have become an integral part of community life. Indian Post has a network of 1.55 lakh post officers of which 1.39 lakh is in rural areas and constitutes the largest network in the world.

Table: 2.12– Postal Facilities in Bihar

S. N.	Postal Facilities	March 2010		
		Urban	Rural	Total
1.	Post Office	433	8623	9056
2.	Departments Post Offices	398	645	1043
3.	Extra Dept. Post Offices	35	7978	8013
4.	Permanent PO	411	8528	8939
5.	Temporary PO	22	95	117
6.	Night PO	6	0	6
7.	Letter Boxes	2831	22129	24960
8.	Post Boxes	904	0	904

Source : Economic Survey 2010-11

In order to utilize this vast network, 91.2% of which is located in rural areas, convergence of a host of service driven by information technology is required and is being worked out.

2.5.2.5 Roads & Bridges :

Good quality roads and bridges are not only denotive of socio-economic development but also of the aspirations of the people. In this respect Bihar has been at the lowest rung of development. It has, for every one lakh populations, road density of only 126.13 kms. as against 322.77 kms. at all India level. Similarly, for every 100 sq kms. of area there were 129 kms. of roads for the country, whereas it was only 111.17 kms. for Bihar.

Table: 2.13– Length of Roads in Bihar

SN.	Category	Pucca Roads	Kutchra Roads	Total (Road Length in km)
1.	National Highway (NH)	3734.38	–	3734.38
2.	State Highway (SH)	3989.00	–	3989.00
3.	Major District Roads (MDR)	8966.04	–	8966.04
4.	Other District Roads	20190.00	–	20190.00
5.	Rural Roads	21348.00	46461.00	67810.00
	Total	58227.00	46461.00	104689.00

Source : Dept. of Road Construction, GoB(2010-11)

About half of the villages in Bihar lack all weather road connectivity. However, as a result of the speedy implementation of road construction works in the state, out of the total road length of 104689.00 kms. around 74 percent were “link routes” which were largely (86%) unpaved. The National Highways (NH) and State Highways (SH) constituted around 5

percent each of the total road length in the state. The state government has assigned the task of construction of rural roads to department of Rural works and this will certainly improve the road connectivity.

Table: 2.14– Average Length of Roads

	Average length km per lakh population		Average km per 100 sq.km	
	Bihar	India	Bihar	India
Total Road	126.13	322.77	111.17	129.00

Source : Economic Survey 2010-11

The adequacy and quality of road having increased in a very short period of five years has resulted in four fold increase in vehicles from 80,000 in 2005-06 to 3.19 Lakh in 2009-10.

2.5.2.6 Airways:

Civil aviation is indicative of, on the one hand, economic affluence and, on the other, the level of industrial and commercial activities taking place in the state. With 16 number of domestic flights per day, the position of Bihar airways connectivity is not at all impressive. However, another airport at Gaya, about 110 km. from Patna, is also operational and proving boon for pilgrims from Buddhist countries.

2.5.3. Social Infrastructure:

In human resource development social infrastructure holds the key. The advancement of literacy and education, the proximity of health services, the creation of water and sanitation facilities, the availability of employment/self-employment opportunities and the support of social welfare measures together provide a bedrock on which the edifice of human resource is built. In Bihar that bedrock is still in its formative stage.

It has been so because of the inappropriate linkages between the regional and social development. Economically better off regions have better social infrastructure and low-income areas have poor social infrastructure.

Somehow, this lopsidedness has to be corrected in order to achieve social betterment with economic improvements. The Per Capita Development Expenditure (PCDE) is not only required to be increased but is also required to be proportionately given larger allocations in socially less developed regions.

2.5.3.1 Literacy & Education:

Literacy- As per Census 2011 , with the overall literacy rate of 63.82% (Male 73.89%—Female 53.33%) Bihar still lags behind all India average of 74.04 % (Male 82.14%- Female 65.46%) by over 10 percent and has larger literacy disparity between gender; 20.06% against all India average gap of only 16.68%. *It is significant to observe that the highest level of gender gaps in literacy are concentrated in low-income districts.*

In 2001, the difference between the highest (Patna 62.9%) and the lowest (Kishanganj 31.1%) was as high as 31.8%. But in 2011, this difference got reduced to 23.1% with Rohtas (75.6%) recording the highest and Purnia (52.5%) recording the lowest literacy rate.

- ❖ Districts with overall high literacy rates are also generally the district with high rates of literacy among marginalized groups.
- ❖ Average gender gap in literacy is significantly lower among minorities across all districts compared to other social groups.

Education- The total coverage of primary and upper primary schools together for every ten thousand of population in Bihar has increased from 6.05 to 6.98. The number of senior secondary schools has also increased. But overall coverage of secondary education remained unchanged at 0.41 for every ten thousand of population between 2002 and 2009. The national average for each of these categories in 2002 were 6.33 (Primary), 2.38 (Upper Primary), 0.88 (secondary) and 0.42 (Senior secondary)³

The coverage of secondary and senior secondary level education through schools and colleges is far less and show longer inter district variations.

Table : 2.15– Availability of schools in relations to population:

Indicator	2002	2009
1) No. of Primary & Upper Primary Schools /10,000 population	6.05	6.98
a) No. of Primary Schools/10,000 population	4.88	4.68
b) No. of Upper Primary Schools/ 10,000 population	1.17	2.29
2) No. of Secondary & Senior Secondary Schools/ 10,000 population	0.41	.41
a) No. of Secondary Schools/10,000 population	0.37	0.28
b) No. of Senior Secondary Schools/ 10,000 population	0.04	0.13

Note : Calculation Based on data from 7th and 8th All India School Education Survey, NCERT; Department of Human Resource Development, GoB; Census of India 2001; Deptt. of Planning and Development, GoB.

³ Based on Economic Survey Report 2010-11

The number of students enrolled in primary and upper primary schools in Bihar has annually grown very significantly—all students (19.63%), SC (23.24%) and ST (27.87).

The overall enrolment in the period at the primary level of all boys has increased at an annual growth rate of 7.67%, for SC boys, the growth rate is 5.7%, and for ST boys, it is 12.76%. For girls enrolment has grown for all girls at 6.92%, SC girls (8.4%) and ST girls (15.37% at the primary level.

The overall enrolment at the upper primary level for all boys increased at an annual growth rate of 20.47% SC at 24.05% and ST at 27.20%. For girls enrolment in Upper Primary has grown at 26.64%, for SC girls at 31.73% and ST girls at 33.46%.

Higher Education – In the realm of higher education Bihar did not have sufficient institutional and sufficient human resource base to hold the aspiring and intellectually brighter students within its fold. However, during last five years, the state initiatives in setting-up new institutions and in 'retrofitting' the old ones, have started showing some positive results.

In the past few years the scope for quality higher education has increased with institutions like NIT, BIT centre, Medical, Law, Management, Hospitality and Fashion opening in the state capital and nearby districts. All the technical colleges have already been placed under Aryabhata Knowledge University for better management. Similarly the upcoming Nalanda International University is bound to create educational environment in the state. A central university and three government medical colleges are in process of being setup.

As against 11 universities in 2001, Bihar now has 13 universities. The enrolment of students has increased by 35% in technical institutions. In case of female students, the enrolment in Science/Computers and Arts segments have increased by 42.55.

Table: 2.16 – Facilities for Higher Education

Sl.No	Institutions	Nos.
1	Universities	13
2	Open University	01
3	Medical Colleges	13
4	Engineering Centres/ Technical Colleges	15
5	Colleges/Institute	815
6	Research Institutes	15
7	Education Teachers Training	23

Source: Aryabhata Knowledge University website:

The increasing share of women's enrolment in higher education is the highest in teachers training and education, followed by Arts. The share is much lower in science and still lower in commerce. In professional courses, female enrolment is higher in medicine but low in engineering and polytechnic institutes. Thus, the pattern of higher education enrolment points to a continued gender bias. A well-strategized initiative to achieve a gender balance in higher education is essential for overall social development.

2.5.3.2 Health & Family Welfare:

Beside education, the status of health is also an important factor in the human resource development of a state. Although the status of health service in Bihar is still inadequate, the substantial improvements in recent years have led to the betterment of position.

One of the key indicators of health in a state is infant mortality Rate (IMR) which was 48 per thousand live birth in 2010, nearly equal to national average of 47 per thousand live birth.

The improved health situation in Bihar is also indicated through the data on Coude Death Rate (CDR). In 2010, the CDR in Bihar was 6.8 compared to a higher national average of 7.2. Along with IMR & CDR, Bihar has also recorded a sharp drop in Maternal Mortality Rate (MMR) from 312 in 2004-06 to 261 in 2007-09.

The Health infrastructure and Human Response position in the state, as per the Directorate of Health Services is as follows:

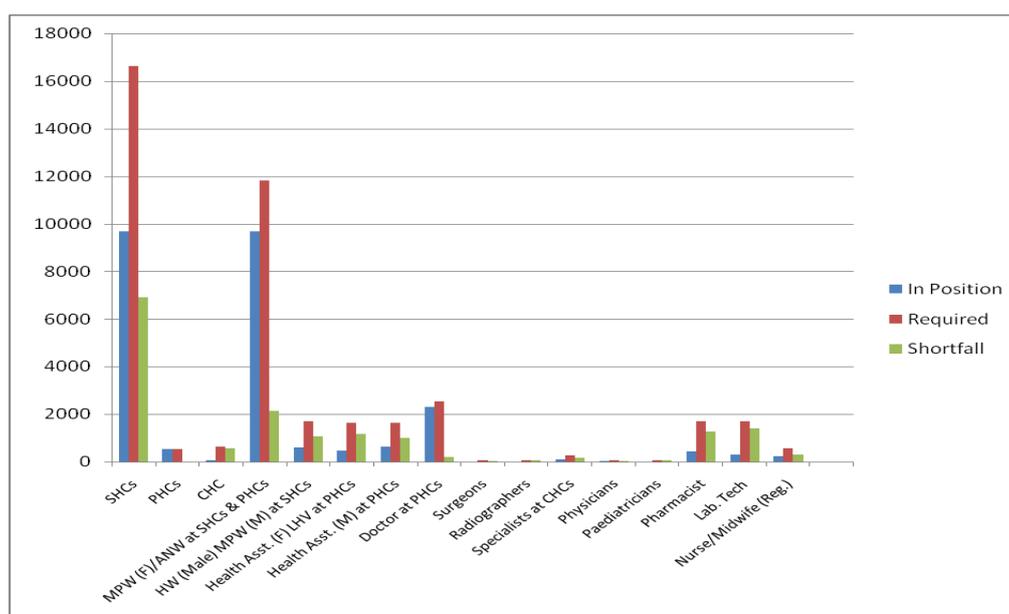
Table: 2.17 Health Service: Required & Available

Sl.No.	Item	In Position	Required	Shortfall
1	SHCs	9696	16623	6927
2	PHCs	533	534	1
3	CHC	70	622	552
4	MPW (F) ANW at SHCs & PHCs	9684	11808	2124
5	HW (Male) MPW (M) at SHCs	620	1700	1080
6	Health Asst. (F) LHV at PHCs	479	1641	1162
7	Health Asst. (M) at PHCs	634	1641	1007
8	Doctor at PHCs	2323	2528	205
9	Surgeons	28	70	42
10	Radiographers	15	70	55

11	Specialists at CHCs	104	280	176
12	Physicians	38	70	32
13	Pediatricians	17	70	53
14	Pharmacist	439	1711	1272
15	Lab. Tech	300	1711	1411
16	Nurse/Midwife (Reg.)	256	566	310

Source : Directorate, Health Services, GoB

Graphic presentation of required, present and shortfall in health infrastructure & Human Resource.



Source : Directorate, Health Services, GoB

The improvements in the functioning of health care system in Bihar has led to the large number of patients visiting government hospitals from 1819 patients in 2006 to 7950 in 2011.

As regards family welfare the position of Integrated Child Development Scheme in the state tell us all about it. The most important and corrective intervention for young children and expectant and nursing mothers. It aims at long term improvement in childcare, health and nutrition, water and environmental sanitation. It, therefore, is a sure indicator of family welfare activities in a state. In Bihar the ICDS scheme encompasses a total of 86,237 Anganwadi Centre (AWC) and 5440 mini-AWCs, as 2009-'10.

Being a human capital based programme, ICDS is extremely crucial for achieving desired level of human development as a resource for the future.

In that respect, not only the number of centres but also the quality and percentage of staffing and management of the centres become crucial. In all these regards Bihar has miles to go before they rest.

2.5.3.3 Public Health Engineering & Sanitation:

Similarly, water supply and sanitation are key factors in Public Health Services that have of late considerably improved.

Table: 2.18– Financial Progress in utilization of fund for Water Supply & Sanitation:

Sl.No	Year	2007-08	2008-09	2009-10	2010-11
1	Outlay (Rs. lakh)	16027.85	42527.85	22700.00	22340.74
2	Expenditure (Rs. lakh)	14812.84	13801.8	16258.51	20785.68
3	Percentage of Expenditure	92.42	32.45	71.62	93.04

Source : Economic Survey Report 2011-12

The coverage of Rural Piped Water Supply Scheme has increased from 25% of target in 2006-2007 to 36 percent in 2009-10. The target for replacement of old hand pumps could be achieved from 25 percent in 2008-09 to 60% in 2009-10. However, the achievement against target for extension of coverage of sanitation for uncovered tolas has fallen from 80% in 2008-09 to 65% in 2009-10. Utilization of allocated fund too has shown year to year fluctuation varying from 92.4% in 2007-08 to 32.5% in 2008-09 to 71.6% in 2009 –10.

Table: 2.19 – Physical Achievements

Schemes	2007-08		2008-09		2009-10		2010-11	
	Target	Achievement (% of Achievement)	Target	Achievement (% of Achievement)	Target	Achievement (% of Achievement)	Target	Achievement (% of Achievement)
Rural Pipe Water Supply Scheme	80	20(25%)	70	17 (24%)	56	20(36%)	39	3 (8%)
Establishment of New instead of Old hand Pumps	NA	NA	2723 8	6887 (25%)	2035 1	12298 (60%)	8053	1589 (20%)
Uncovered Tolas to be covered	2000	7761	2457 9	19705 (80%)	4050 8	26285 (65%)	1874 9	4822 (26%)

Source : Economic Survey Report 2011-12

2.5.3.4 Labour Employment & Poverty:

Poverty- The evidence of poverty, as reflected in Planning Commission estimates, continues to be very high in Bihar, compared to the national average. Rural poverty in Bihar was estimated to be 55.7% 2004-05 compared to the national average of 41.8 percent. Urban poverty was estimated at 43.7 percent as compared to all-India average of 25.7%. The poverty ratio for the entire population of Bihar was at 54.4% compared to the national average of 37.2%.

Labour- The Work Participation Rate (WPR) is 32.9% in Bihar, with 14 districts having a WPR of more than 30 percent. The SC population has a higher WPR 38.2 percent with 17 districts having levels higher than 45%. Among ST WPR is even higher at 45.2%.

The gender gap in WPR is high with female WPR at 18.4% and male WPR at 46.3%. The gender gap is less in SC population, WPR female being 28.2% and for male 47.%. For ST the gap is even less at 36.9% and 52.9% respectively for female and male.

Employment/Self-Employment — Employment/self-employment opportunity locally available keep the people home state bound. Non availability of these, forces people to migrate leading to de-establishment of population.

Bihar has been suffering from de-establishment of population on this and other counts. First, the employment opportunities, for around 90% of population living in rural areas, are agriculture bound. The traditional, skill based self-employment opportunities no-more provide sustainable livelihood. The agriculture although preyed upon each year by flood or drought, remain the only source of employment. In the face of the above facts, the population in Bihar get disestablished due to migration. Most of the families left behind consist of women, children and old persons.

The two schemes, Swarnajayanti Grameen Swarozgar Yojana (SGSY) and Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGA), however, have provided some base for employment generation.

In Bihar Swarnajayanti Grameen Swarozgar Yojana (SGSY) 158061 persons were assisted through SHGs in 2009-10. About 40% beneficiaries were women. 2,38,359 SHG member trained in 2009-10 which 38% were women and 66 percent persons belonging to SC community.

Under MNREGS 124.1 lakh households were issued job-cards in 2009-10, 41.9% SC households, 33.3 demanded jobs and 33.26% were given employments.

The programme has generated about 1173.53 lakh work days of employments for 41.27 lakh households in 2009-10 of this 30% work days were for women.

Table: 2.20 – Performance of the MNREGS (2007-08 to 2010-11)

Year	Total Job Cards Issued (in lakh)	Households provided employment (in lakh)	Person days generated(in lakh)		Households completed 100 days	% of Fund utilized	Number of Completed works	Average employment per household (days)	Total accounts opened (in lakh)
			Total	% share of women					
2007-2008	81.24	39.26 (48.3)	840.58	27.3	9945 (1.3)	71.5	46436	21.4	–
2008-2009	102.99	38.42 (37.3)	991.22	29.8	100891 (2.6)	60.0	53939	25.8	48.78
2009-2010	124.06	41.27 (33.3)	1137.53	30.0	287019 (7.0)	75.8	70491	27.6	84.91
2010-2011	130.44	46.84 (35.9)	1597.49	29.6	260919 (5.6)	82.7	83593	34.1	102.57

Note : (1) Total accounts include both individual and joint account in both Bank and Post-Office
(2) Figures in parentheses denote percentages with respect to total job-cards issued.

Source : Annual Reports, Department of Rural Development, GOB

Women's Empowerment– In view of the poor sex-ratio of 916 as well as women led families of the migrant labour, women employment, specifically those belonging to marginalized section, assumes greater significance for a state like Bihar. Besides, the gender gap in the state encompasses various dimensions of discrimination, marginalization and oppression. The gender gap is inbuilt into gender relations and valuations which need to be addressed for balanced social development, economic, social and cultural empowerment.

Labour and Social Welfare – Bihar's labour force is concentrated in Agriculture, unorganized sector and engagement of Child Labour remain challenges in Bihar

- 59 general including 12 women govt. ITIs
- Atleast one ITI has been established in every district of the State. In the 12th five year plan effort will be to open ITI's in unserved subdivision/blocks.
- 455 private ITIs sanctioned sofar.

Social Welfare – Social welfare outlay in the state amounted to 1775.57 crore in 2010. 52% for social security, 34.4% child development & 12.7% women empowerment.

2.5.4 Governance & Administrative Setup:

The economy of Bihar is basically agrarian. About 90% people still live in the villages. The governance in Bihar has been an issue since 60's but of late, it is regarded as the nation's fastest growing state, with GDP logging an annual growth rate of around 12%. The socio-economic level is of a developing kind and the form of government is democratic.

Of late, the complexion of governance has started brightening. The economy has been moving from development deficit to development. The law and order position has improved. The 'speedy trial' mechanism has expedited convictions. Right to education has urged people to get educated. 'Right to employment under MNREGA' has assured poor of certain amount of livelihood. 'The Bicycle' scheme of the Chief Minister has facilitated the drastic reduction in disparity between gender literacy and the percentage of school dropouts.

The people participation in local self-governance has been wedded with gender balance by the path-breaking initiative of 50% reservation for women. The introduction of Gram Katchahri at the Gram Panchayat level has brought the justice at the doorstep for the poor and the marginalized.

The improved law and order position has charged the environment with confidence in people in general and in investor in particular. The land and water resources of the state are attracting investors. The bi-lateral and multi-lateral agencies are extending generous support to further improve its conditions.

On the whole, Bihar has taken a giant leap from poor to good governance, from excessive economic dependence to economic self dependence, from natural resource based livelihood to value-addition and tertiary sector based livelihood.

The administrative set-up which is the same in all the states in the country but not similar has better permutation and combination with the political setup, on the one hand and local bodies, on the other. It has brought about a pronounced improvement in the environment as a whole in the state.

The administrative set up of Bihar

★ Divisions	9
★ Districts	38
★ Sub Division	101
★ Blocks	534
★ Civil Thana	810
★ Panchayats	8463
▪ Panchayat Samiti	531
▪ Zila Parishad	38
▪ Nagar Nigam	05
▪ Nagar Parishad	32
▪ Nagar Panchayat	85
▪ Towns	130
★ Revenue Villages	44103
★ Urban Agglomerations	14
★ Towns	199
★ Police Stations	813
★ Police District	40

2.5.4.1 The Local Bodies:

The local bodies provide linkages between administration and the people. They constitute the delivery system for the administration and become the barometer of people's satisfaction or dissatisfaction with the governance.

The local bodies in Bihar consist of Urban and Rural local bodies.

The Urban local bodies in Bihar are :

1. Nagar Nigam (500 wards)	10
2. Nagar Parishad (1321 wards)	43
3. Nagar Panchayat (1351 wards)	86

Total 139

The Rural Local Bodies in Bihar consisting of Panchyati Raj Institutions are:

Table 2.21: Panchayati Raj: An Overview 2011

Details	No.	Details	No.
Zilla Parishad	38	Gram Kachhari Members	115542
Panchayat Samiti	531	Gram Panchayat Sarpanch	8442
Gram Panchayat	8442	Gram Panchayat Secretary	5816
Gram Kachhari	8442	Naya Mitra	6947
Gram Panchayat Members	115542	Gram Kachhari Secretary	7474
Gram Panchayat Mukhia	8442	Zilla Panchayat Raj Officers	22
Panchayat Samiti Members	11534	Panchayat Raj Officers	299
Zilla Parishad Members	1162		

Source : Department of Panchayati Raj, GOB,

The importance of local bodies lies in the fact that all the developmental programmes and schemes including disaster management related

programme and activities, have to be implemented through them. As such their proper functioning is crucial for socio-economic development of the people.

The two initiatives about Panchyati Raj Institutions taken in Bihar changed the very thinking about local self-governance in the country. First the inclusion of Gram Katchahri at the Gram Panchayat level and Second, the 50% reservation for women. One has released the pressure on police and the other has brought about gender equality. Women have gained confidence and weaned away from excessive dependence on men. Their participation in the decision taking process has also increased.

The devolution of roles and responsibilities to Panchayats has provided the rural populace with opportunities to partake of development measures. In fine, the widening gap between the rural and urban area seems to have slowed down.

With around 12% growth rate, the GSDP has shown impressive increase. The decline in pressure on agriculture sector, the increase in tertiary sector contribution in GSDP, and the sunshine in the secondary sector has brightened the growth and development prospects in Bihar. In order to make that sustainable, the disaster management plan requires be well formulating and better implementing, because Bihar is vulnerable to all major hazards Earthquake, Flood, Cyclonic Storm, Drought and Fire.

Madhepura & Saharsa, above 45% and the rest four—Kishanganj, Muzaffarpur, Purnia and Sheohar, less than 10%. In all 15.2% of the total area of Bihar is covered in Zone V.

Out of 30 districts in Zone IV, 13 districts are 100% in zone IV; 8 districts are above and around 90%; and the rest of the 16 districts are below 80% in Zone IV. In all, 63.7% of the total area of Bihar fall in Zone IV.

Out of 13 districts in Zone III, 5 districts are 100% , 2 districts around 80% and the rest below 70%. In all 21.1% of the total area of Bihar falls in Zone III

Table: 3.1 – The major earthquakes in Bihar :

S. No.	Date	Place	Scale	Casualty	Districts affected
1.	4 th June 1764	Bihar-Bengal Border	6.0	–	
2.	23 rd August 1833	Nepal Border	7.7	–	
3.	23 rd May 1866	Nepal Border	7.0	–	
4.	23 rd May 1866	Jharkhand- Bihar Border	5.5	–	
5.	30 th Sept. 1868	Hazaribagh	5.7	–	
6.	07 th Oct. 1920	Bihar-UP-Bihar	5.5	–	
7.	15 th Jan. 1934	Indo-Nepal Border	8.3	10,500	Patna, Gaya, Shahabad, Saran, Muzaffarpur, Darbhanga, Bhagalpur, Munger, Purnia
8.	11 th Jan 1962	Indo-Nepal Border	6.0	–	
9.	21 st August 1988	Indo-Nepal Border	6.8	1000	Madhubani, Darghanga
10	18 th Sept. 2011	Sikkim-Nepal Border	6.8		

Source: BSDMA Calendar(2011)

Thus, Bihar has suffered ten earthquakes in a span of 247 years. Earthquakes ranging from 5.5 to 8.3 on the Richter scale has rocked and wrecked Bihar. The latest earthquake was reported on 18th Sept. 2011 at 6.12 pm on 6.8 Richter scale with epicenter being in Sikkim – Nepal region. Only 10 deaths were reported in the state.

The worst of these was in 1934, one in which more than 25,000 persons lost their lives. Bhatgaon in Nepal and Munger in Bihar were completely ruined. Large part of Patna and Kathmandu in Nepal and Motihari, Muzaffarpur and Darbhanga in Bihar were also destroyed along with innumerable villages in between. Many of the houses got sunk in the ground. The isoseismic covered an area of about 36000 sq. km with a length of about 300 km.

The earthquake happened on Monday, January 15, 1934. Its worst manifestation was in North East Bihar. Calcutta, which itself received a severe shaking, was the news centre, and news came slowly, because the area which suffered most was very isolated and normal communication were interrupted. Railway lines were twisted, bridges were broken, great fissures had append across the roads, telegraph and telephone lines were down. Patna, the capital of Bihar and then Orissa, had been badly damaged, Jamalpur where the railway stations had collapsed, an incoming

train had suffered more terribly and that there had been many deaths in Bihar. In Bengal there was bad news from Darjeeling.

The Statesman

15 Jan. 1934

Next day the Statesman's representative Captain Dalton (of India Air, Pageants Limited) flew over the stricken area and telephoned us from Patna the long message which first made the world realize the terrible nature of the tragedy which had occurred. In this message our correspondent said:—

The whole country from Muzaffarpur towards Bettiah is stricken. Muzaffarpur is in ruins and its streets are strewn with corpses. Floods accompanied the earthquake, water spouting from large fissures which appeared in the ground and inundated the countryside, which is one vast sea dotted by little islands of high ground.

From the aeroplane not a house could be seen standing. Railway lines have been swept away and no roads are visible. Everywhere is stark desertion.

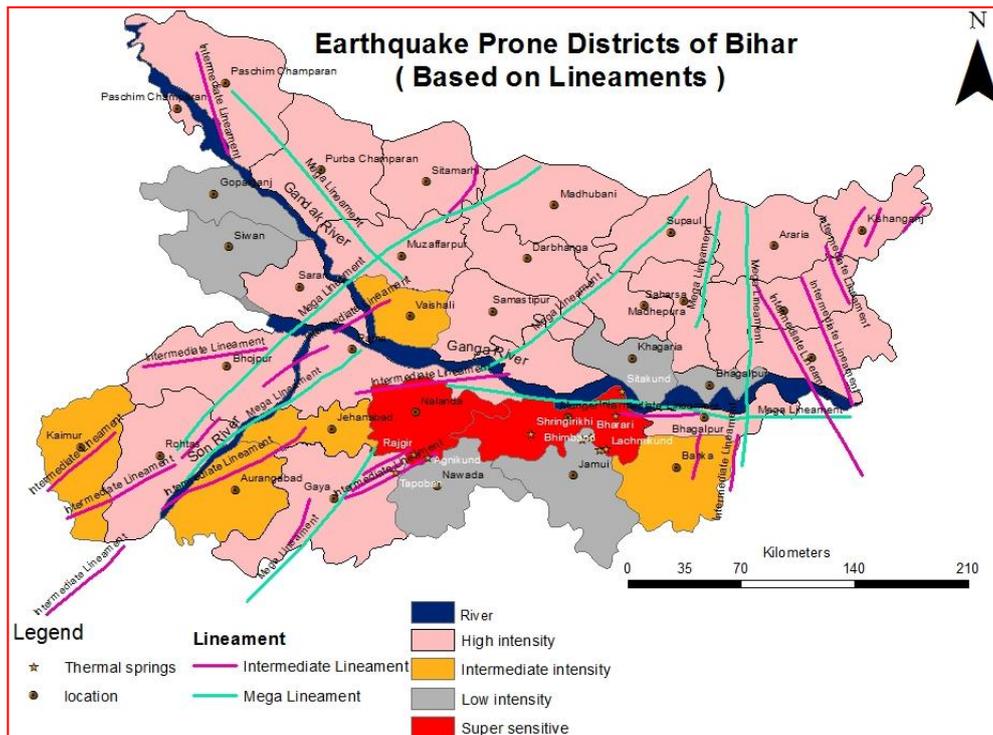
Later news, when our correspondents and photographers penetrated the area unfortunately only made the tragedy grow in size, as Monghyr, Darbhanga, and Sitamarhi came into the picture. And as the weeks have gone by and realization has grown the sense of calamity has steadily deepened.

Bihar is helping itself. The other Provinces and the Government of India are doing what they can. But many millions of pounds are needed and there is room for all the world to show sympathy. The practical way to do this is to contribute to the Viceroy's Earth-quake Relief Fund, Imperial Bank of India, Patna.

Modern India is intensely political, and Bihar is no exception. But the earthquake has produced there a marvelous truce. Politics indeed are forgotten. Officials and non-official, elected Ministers and their former opponents the leaders of the "civil disobedience" movement are working together and for years to come they will all be put to the neck of their collar to pull the province out of the abyss. May this good which has come out of evil extend itself throughout the British Empire and the rest of the world, so that stricken Bihar will become the focus for a union of hearts concerning India.

On the morning of January 15 a cynic might have said that it would take an earthquake to bring all the communities in India together. We have had the earthquake, and we are together as never before.

Map: 9 - Earthquake Vulnerability Zone wise :



Source- BSDMA

3.2. The Floods :

Bihar is endowed with rich water bodies consisting of glacial rivers, rain-fed rivulets and tals and ground water. The whole of North Bihar is a courtyard of Himalayan Rivers and the whole of South Bihar the backyard of rivers flowing from south. Together they divide the State in seven river zones as if, bracketed between two major rivers, the rich land falling in-between is held in ransom by them.

Most of these rivers namely Ghaghra, Gandak, Burhi Gandak, Bagmati, Kamla, Adhwara group of rivers, Kosi and Mahanada have Himalayan origin and have considerable portion of their catchment in the glacial region falling in Nepal and Tibet. They are, therefore, positioned to receive very copious rainfall during monsoon when discharge of these rivers is 50 to 90 times larger than fair weather flow. This causes frequent and large scale flooding of North Bihar. As such, 73.63 percent of the geographical area of North Bihar is considered to be prone to floods.

Southern part of Bihar, on the other hand, is drained by rivers that are largely rainfed, having their origins either in the Vindhyaachal Hills or in the Hills of Chotanagpur and Rajmahal. These rivers are either dry or have scanty discharges in non-monsoon months. Karmanasa, Sone, Punpun, Kiul, Badua, Chandan are the important rivers of this region.

Falling between the Ganga and Indo-Nepal border, North Bihar having a geographical area of around 50,000 sq.km. has a general slope from north-west to south-east. The geographical area of South Bihar is around 44000 sq.km and has a general slope of south to north.

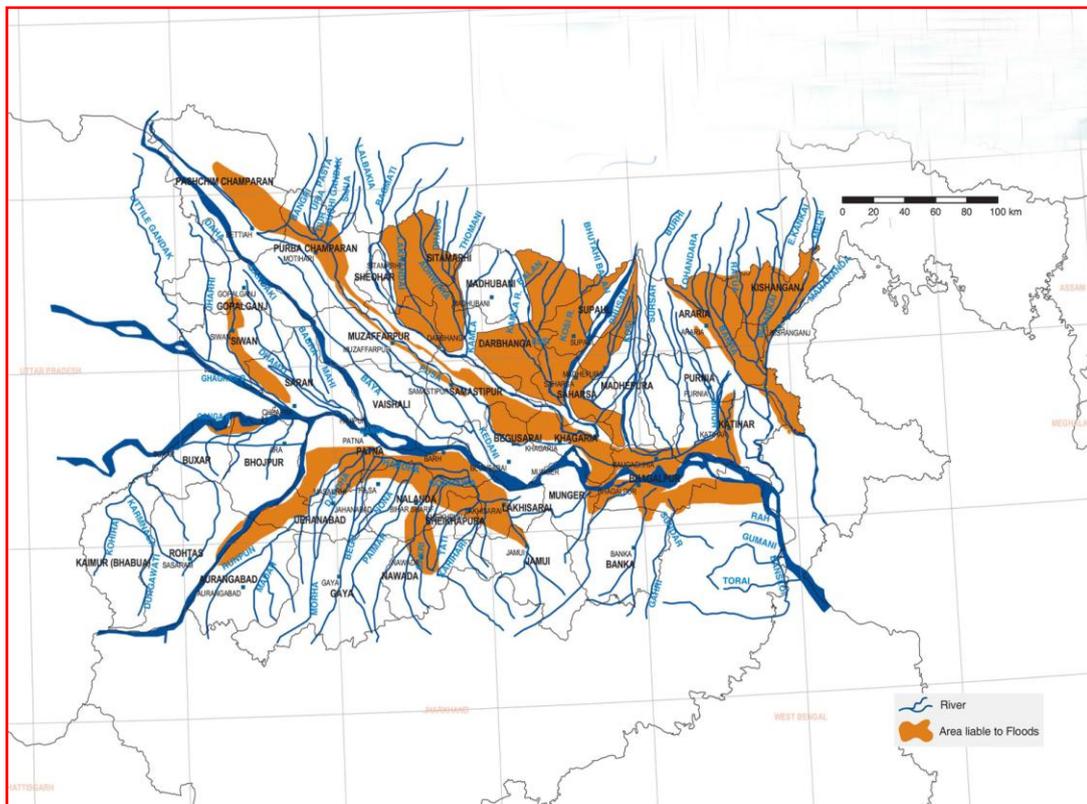
If the rivers of North Bihar, due to their large catchment area in the Himalayas, cause floods in around 74% of its geographical area, then the rivers of South Bihar drain their water of the tract and accumulate them behind the high southern Bank of the Ganges which has resulted in the formation of a number of tals viz, Fatuha Tal, Bhaktiyarpur Tal, Barh Tal, More Tal, Mokamah Tal, Barahiya Tal and Singhual Tal. These tals also receive backwater of the Ganges when it is in high spate. These tals, therefore, get submerged during monsoon and affect the kharif cultivation in most of the area. The area, thus, affected by tals is around 36% of the total South Bihar area.

Thus, the total geographical area affected by flood, water logging in tals etc. amount to 56% of the total geographical area of Bihar. (*Water Resources Dept., GoB*)

Floods in large parts of the plains of Bihar, specially North Bihar, are recurring features and cause havoc destroying crops and the quality of land and threatening the conditions of life and livestock due to large-scale displacement.

Every year, almost 28 districts get flooded causing huge loss of property, lives, farmlands and infrastructure. Out of these the area of Sitamarhi, Supaul and Kishanganj are 90% affected by flood, five districts- Bhagalpur, Darbhanga, Khagaria, Madhepura, Saharsa get around 70% affected and in the rest of the districts, the flood affected areas vary from 55% to 25%. In all, 56% of the total area of Bihar is affected by flood.

Map : 11 - Flood Vulnerability Zone wise



(Source: Vulnerability Atlas of India)

A study of the flood stages in various river systems revealed that early flood takes place during the month of May-June in River Bagmati, Kosi and Kamla. Thereafter, flood generally comes in River Burhi Gandak in the month of mid July. During these months River Ganga generally remains low but by September, the master drain, the Ganges, also rise making the flood-problem very acute.

Thus, from the month of May to September, for five neat months, Bihar has to suffer through the ravages of floods of one kind or another, the impact of which was perhaps not felt to the same extent in the past as is felt now. It is so because of the ever increasing encroachments on the flood plains by the growing population to meet its requirements of food and fiber. The destruction of forests for reclaiming areas for occupation and for obtaining fuel for domestic requirements have also contributed in intensifying floods.

Table : 3.2 – Year wise district, life & area affected In Last 10 Years

Year	Number of Affected											
	District	Blocks	Panchayats			Village	(in Lac)		Area (in Lac ha.)			
			Fully	Partly	Total		Human	Animal	Agric	Non-Agric	Total	Cropped
2010	9	44	40	237	277	679	7.18	3.57	1.602	0.39	1.992	0.101
2009	16	91	150	452	602	1546	22.03	1.346	1.71	9.339	11.05	0.475
2008	18	116	341	583	924	2585	49.952	12.166	6.40495	2.11922	8.8242	3.67211
2007	22	269	2235	1581	3816	18832	244.42	27.13	13.323	5.51	18.833	10.603
2006	14	63	10	365	375	959	10.89	0.1	1.52	0.297	1.81	0.87
2005	12	81	130	432	562	1,464	21.04	5.35	3.343	1.261	4.6	1.35
2004	20	211	2,015	773	2,788	9,346	212.99	86.86	20.99	6.010	27.00	13.99
2003	24	172	646	850	1,496	5,077	76.02	11.96	9.943	5.140	15.08	6.10
2002	25	6	1,587	917	2,504	8,318	160.18	52.51	14.446	5.244	19.69	9.4
2001	22	194	838	1,154	1,992	6,405	90.91	11.7	9.042	2.91	11.95	6.5

From 2001 to 2010, the number of districts affected ranged from 9 to 25, number of blocks affected, from 6 to 269, number of panchayat fully affected, from 10 to 2235, number of panchayats partially affected from 237 to 1581 and the number of villages affected ranged from 679 to 18,832.

The number of human life affected ranged from 7.18 lac to 244.42 lac., livestock affected ranged from 0.1 lac to 86.86 lac. The total area affected ranged from 1.81 lac ha to 19.69 lac. hac out of which agriculture land ranged from 1.6 lac hac. to 14.4 lac ha, and non- agri land ranged from 0.39 lac hac to 9.3 lac hac. The total crop loss ranged from those sown in 0.1 lac hac to 10.6 lac. hac.

Table : 3.3 – Year wise Crop, Houses and Property cost in last 10 Years

Year	Crop Damaged (Rs. Lac)	House Damaged						Public Property Damaged (in Rs. Lac)	Deaths	
		Pucca		Kuccha		Total	Value (in Rs. Lac)		Human	Animal
		Fully	Partly	Fully	Partly					
2010	311.92	564	19	5623	2096	6868	704.87	169.2	32	0
2009	2182.57	250	233	6317	2517	7674	528.15	530.1	97	2
2008	3420.25	6643	39749	65825	36725	297916	8451.4	9771.96	258	878

8										
2007	7683782	6689	18889	362671	364483	784328	83144.52	64241.52	1287	2423
2006	706.63	17	228	9,201	9,191	18,637	1,225.03	8,456.17	36	31
2005	1,164.50	49	38	982	4,469	5,538	382.79	305	58	4
2004	52,205.64	17,444	37,064	3,43,573	5,31,692	9,29,773	75,809.51	1,03,049.60	885	3272
2003	6,266.13	222	136	10,748	34,156	45,262	2,032.10	1,035.16	251	108
2002	51,149.61	9,452	19,952	79,569	3,10,041	4,19,014	52,621.51	40,892.19	489	1450
2001	26,721.79	11,329	11,015	1,17,090	82,574	2,22,074	17,358.44	18,353.78	231	565

Source: Disaster Management Department, GoB

Thus, the recorded impact of flood reveals that it is not the number of districts or blocks or panchayats affected by flood that matter. It is the area covered that determines the loss of life and property. And, therefore, flood as a hazard has to be given area bound treatments.

In the year 2004, this ravage was repeated with a death toll of 885 human lives and 3272 animals. Crop damage was worth Rs. 522.06 crore and loss of public property to the tune of Rs. 1030.49 crore. 9.3 lakh houses were damaged.

In the year 2007, 650 people and 615 animals were reported to be dead. 59610 houses were damaged. 11.9 lakh hectare areas covering 10215 villages were adversely affected. Damages of crop and public property was estimated as Rs 781 and Rs 643 crore respectively.

In the year 2008 in the Eastern Afflux Embankment near Kusaha Village in Nepal at nearly 12 km upstream of Kosi Barrage a breach happened which increased to nearly two km. Through this long breach Kosi took a new course nearest to where the river flowed in 1926 and caused destruction which never happened before. Around 806 villages were washed away and about 23.13 lakh people lost their property. Around 7 lakh person had to be evacuated. In all, 16 districts, 86 blocks, 1678 village, 18.36 lakh of population, 1.139 lakh of animals were affected by flood in 2008. Crop worth ; 1704.09 lakh, houses worth ; 379 lakh and public property worth; 321.9 lakh were either lost or damaged.

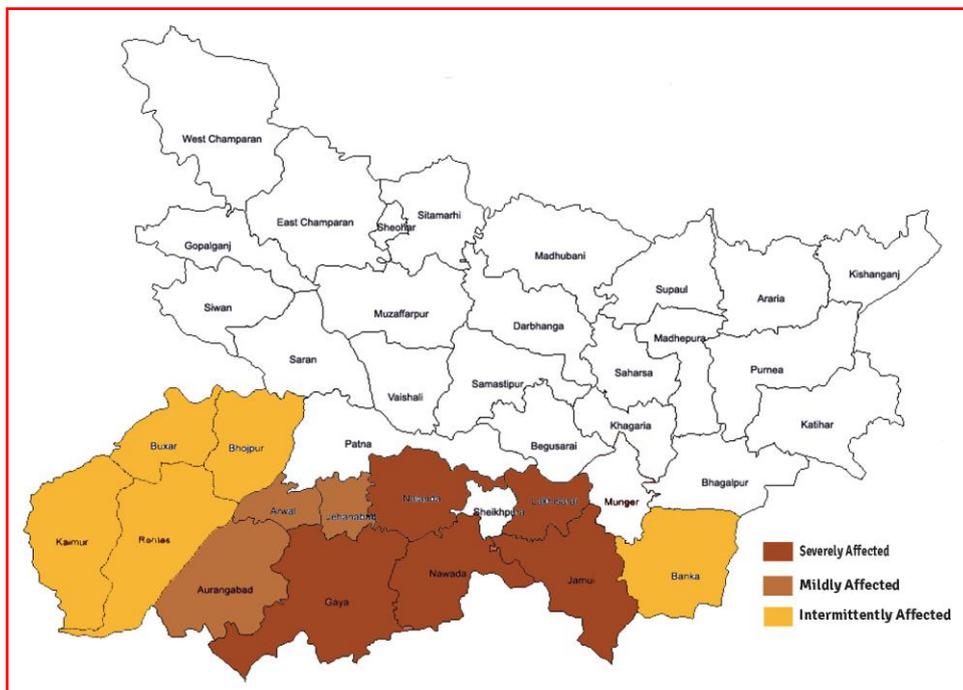
3.3 Drought :

It is an irony of situation that a state so rich in water bodies, also suffers from severe droughts. Bihar often faces drought situation of different scales/levels that intrinsically lead to famine situations. This situation

necessarily occurs when the summer monsoon gets weak and which causes percentage departure of seasonal rainfall from the normal.

Climatically, the state of Bihar lies on the cross-roads of the wet eastern coastal regions and the relatively dry continental region of the western plains. Being on the threshold of transition zone there happens regional variations in rainfall distribution as well as rainfall variability. Although, the average rainfall in Bihar is 1120 mm, but considerable variations occur with 2000 mm in the extreme eastern and northern part and less than 1000mm in the western and south-western part of the state. As a result 33% of the State receives less than 750 mm rainfall, making the southern part of Bihar vulnerable to drought. Even the 35% of north-eastern part of Bihar that receives around 1120 mm rainfall suffers drought once in four to five years due to scanty rains.

Map : 12- Drought Prone Areas



Source: Developed on Inputs from DMD, GoB

Although the North Bihar plain receives plenty of rainfall, but when the annual rainfall is even 25 percent less than the normal, drought situations prevail. Quite often the problem of drought and floods prevails simultaneously.

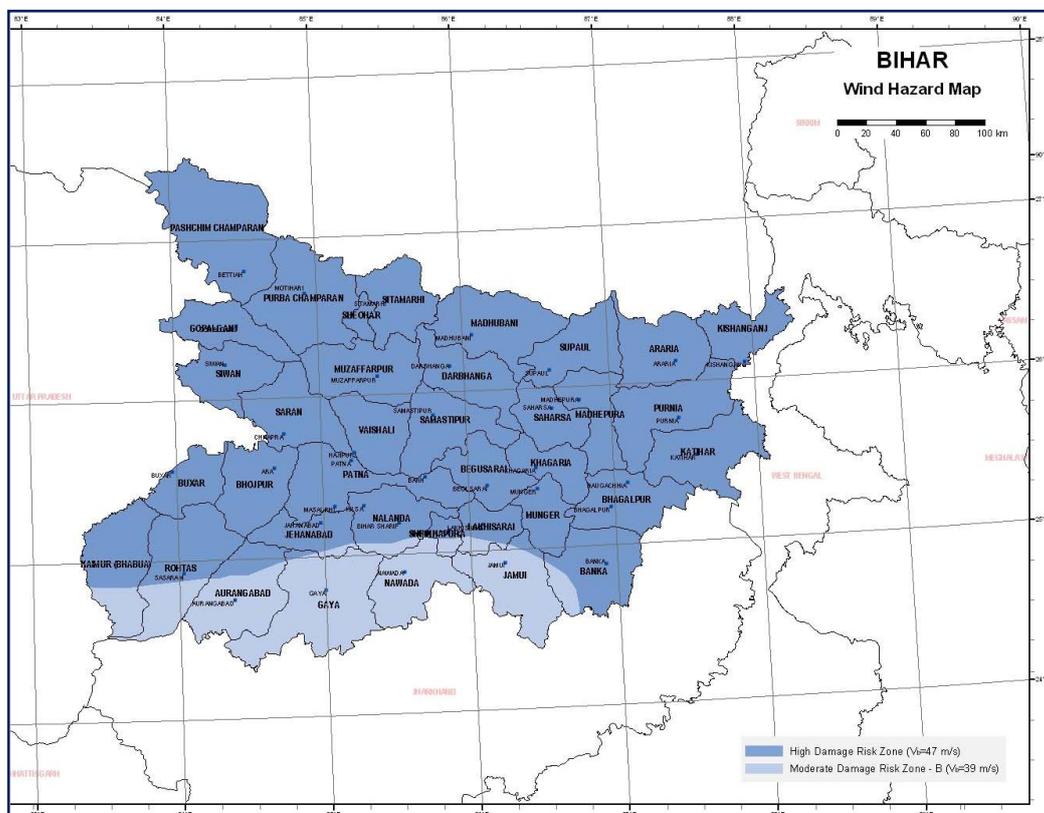
Apart from deficiency in rainfall prime reasons of recurring drought in Bihar is the nature of soil with low mineral and humus-contents besides extremely poor water holding capacity. Recurrent rainfall variability and sustained departure from the normal rainfall vis-a-vis low reliability,

fluctuating both surface and underground water resources and extremely poor water holding capacity of the major soil group appear to have clubbed together to cause frequent droughts in Bihar. Beside, there is a positive relationship between reducing forest land and the increasing rainfall variability and the phenomenon is well manifested in Bihar scenario of recurrent droughts.

3.4 High Speed Winds/Cyclonic Storm:

Among the natural hazards of the surface cyclones (High Speed Winds) are by far the most devastating both by causing loss of life as well as loss in terms of socio-economic development. Severe tropical high speed winds are responsible for large casualties and damage to life, property and agriculture. Its three constituents: wind speed, whirlings, and water, leave behind three dimensional impacts in the area. The only saving grace is that its formation can be watched right from the depression development to landfall stage.

Map:13 – Cyclonic Storm Vulnerability Zone wise



Source: Vulnerability Atlas of India

As detailed in the Vulnerability Atlas of India out of 38 districts, 27 districts are fully affected by high speed winds of 47 m/s intensity. The area of districts—Banka, Jehanabad, Arwal and Nalanda is nearly 90% affected. Other districts of South Bihar except Nawada are partly affected by high

speed winds of 44 m/s. Nawada is, however, 100% affected by high speed winds of this intensity.

Table: 3.4 Cyclonic Storm Vulnerability Zone wise

Sl. No.	District	Cyclonic Storm (wind speed mtr./sec.)			Sl. No.	District	Cyclonic Storm (wind speed mtr./sec.)		
		55 & 50	47	44 & 39			55 & 50	47	44 & 39
1	Araria	0.0	100	0.0	20	Madhubani	0.0	100	0.0
2	Aurangabad	0.0	30.0	70.0	21	Munger	0.0	100	0.0
3	Banka	0.0	87.6	12.4	22	Muzaffarpur	0.0	100	0.0
4	Begusarai	0.0	100	0.0	23	Nalanda	0.0	85.0	15.0
5	Bhagalpur	0.0	100	0.0	24	Nawada	0.0	0.0	100
6	Bhojpur	0.0	100	0.0	25	Patna	0.0	100	0.0
7	Buxar	0.0	100	0.0	26	Purnia	0.0	100	0.0
8	Darbhanga	0.0	100	0.0	27	Rohtas	0.0	58.1	41.9
9	East Champaran	0.0	100	0.0	28	Samastipur	0.0	100	0.0
10	Gaya	0.0	2.0	98.0	29	Saran	0.0	100	0.0
11	Gopalganj	0.0	100	0.0	30	Sheikhpura	0.0	52.5	47.5
12	Jamui	0.0	3.0	97.0	31	Saharsa	0.0	100	0
13	Jehanabad + Arwal	0.0	95.7	4.3	32	Sheohar	0.0	100	0.0
14	Kaimur (Bhabua)	0.0	66.9	33.1	33	Sitamarhi	0.0	100	0.0
15	Katihar	0.0	100	0.0	34	Siwan	0.0	100	0.0
16	Khagaria	0.0	100	0.0	35	Supaul	0.0	100	0.0
17	Kishanganj	0.0	100	0.0	36	Vaishali	0	100	0
18	Lakhisarai	0.0	100	0.0	37	W Champaran	0.0	100	0.0
19	Madhepura	0.0	100	0.0		State - Bihar	0.0	86.0	14.0

Source : Vulnerability Atlas of India

In all 86% of the total area of Bihar is prone to high speed winds of 47 m/s intensity and only 14% of the area prone to high speed winds of lesser intensity.

3.5 Fire:

Like earthquake & high speed winds fire hazard of varying intensity covers all the 38 districts of Bihar. In the year 2000-2001, 37 incidents of fire in 35 districts devastated 17228 houses in 2368 villages affecting 67400 population and destroying property worth Rs. 2398.729 lakh, 111 human lives and 291 animal lives were lost. In the year 2010-'11, 96 adults, 27 children, 129 animals lost their lives and 21,434 houses were destroyed. Due to changes in the roofing of the majority of hutments the evident of fire has considerably decreased in Bihar.

However, largely the concentration of fire hazard is mainly in the residential areas of the BPL families, of SC/ST, to low income group since they live in clusters of houses of Kutch wall, and straw thatched roofs etc.

In urban areas, the old government building and skyline changing apartments are causing concern as they have not provided for fire escape of water storage facilities the two essential steps to mitigate disaster from fire hazards.

3.6 Other Hazards

Among other hazards epidemics, industrial accidents and road/boat accidents are growing menacingly. The large proportion of population living below poverty line in unhygienic conditions, the growth of food-processing industry in areas not having appropriate safety measures and many-fold increase in vehicular traffic without having sufficiently wide roads and sufficient number of trained human resource to manage the traffic have increased the incidence of disaster.

Bihar has so far witnessed one air-crash in Patna and another Rajdhani Express accident near Gaya in recent times. Train burning incident also took place near Gulzarbagh Junction on main line. Roads being narrow, driving being open to all who can, sans age barrier sans license, sans checking, road accidents in Bihar kill more people than all the hazards put together.

And density of population and paucity of resources put together causes hundreds of boats capsizing midstream and resulting in the drowning of women, children and men in thousands every year.

BBB

4. Vulnerability Profile of the State

Hazard is an impending danger—natural or manmade. Loss of life and property from hazard is disaster. And the correlation between the loss of life and property on the one hand, and impending danger, on the other is vulnerability. Vulnerability, thus, requires to be seen from the hazard point of view, that is, its degree, its intensity, its frequency etc. and from the life, property and structure etc. point of view that is, lives liable to be lost, property damaged etc.. The assessment from the hazard point of view helps in formulating the mitigation measures. And, the estimation of loss of life, property etc. point of view helps in deciding about the kind of preparedness required to reduce risk.

The correlation between the loss of life and property and impending danger depends on some given factors—location, poverty, density of and threshold population and attitude and awareness of people about vulnerability.

By location is meant the nature of area from hazards point of view. By poverty is meant the percentage of poor and marginalized people living in the area. By density is meant the density of population per sq.km. By threshold population is meant women, children, elderly and differently challenged persons. By attitude and awareness is meant the knowledge and preparedness of the people to reduce risk and act accordingly.

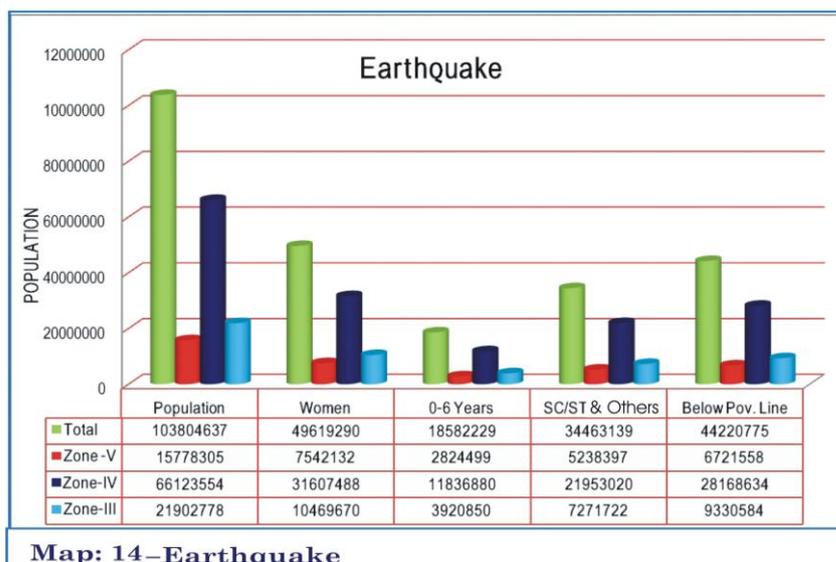
Table: 4.1 – Form of hazard wise factors most prone to vulnerability :

Sl. No.	Hazard	Area worst hit	Sector worst affected	Population	Property
1	Earthquake	All	Structure + Infrastructure	All	Livestock + structure + wealth
2	Flood	Largely	Agriculture + Infrastructure	Largely threshold & marginalized section	„
3	Cyclonic Storm	Largely Rural	Structure	„	–
4	Drought	Rural	Agriculture	„	Livestock
5	Fire	Rural+Urban	Structure	Marginalized threshold	Livestock destruction + structure
6	Man-Made	Localised	Beneficiaries	causality varying with nature of hazard	–

Source : Encyclopedia of Disaster Management

Thus, hazard wise extent of vulnerability in Bihar works out as detailed below:

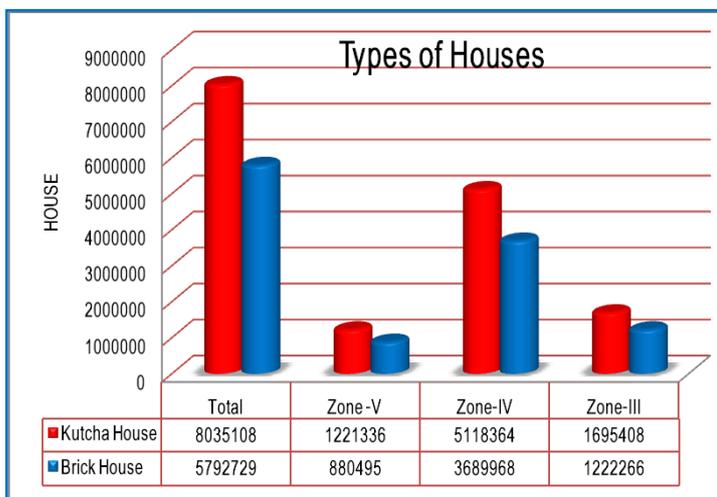
4.1 Earthquake:



Map: 14–Earthquake

As per the Vulnerability Atlas of India, 15.2% area of Bihar is in V Zone which, in terms of life, property structure etc. comes to mean that the life of a population of 1,57,78,305 (Census 2011) in which 75,42,132 are women and

28,24,499 are of 0–6yrs age group 52,38,397 are SC/ST and marginalized group and 67,21,558 living below poverty line in high risk zone. And since this population is living in either 7,65,591 kutcha houses or 13,95,927 brick walled houses, and 11,18,464 in houses of other materials, and suffer loss of property including livestock to the tune of 43,67,012 and poultry to the extent of 22,69,256 numbers.



Map: 15 –Types of Houses

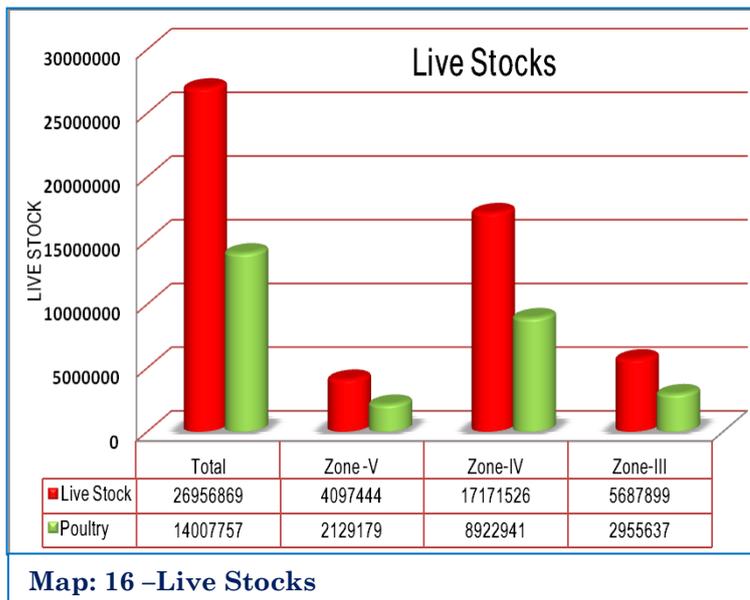
That, 63.7% of the total area of Bihar is in Zone IV which means that the life of 6,60,99,997 out of which 3,16,07,487 are women and 1,18,36,897 are of 0–6 yrs. age group and 2,19,53,019 are SC/ST and minorities and 2,81,68,633 is in danger. And since the population

is living either in 30,10,383 kutcha houses or in 54,88,923 brickwalled houses or in 43,97,911 houses of other materials they are in danger of losing their abode and also suffer the loss of property including livestock to the tune of 1,71,71,525 and poultry to the extent of 89,22,941 in numbers.

That, 21.1% of the total area of Bihar lies in Zone III which means the life of 2,18,94,969 people out of which 1,04,69,670 are women and 39,20,850 of 0–6 yrs. of age 72,71,722 SC/ST and minorities and 93,30,583 are living below poverty line, living either in 9,97,159 Kutchha houses in 18,18,151 brick walled houses or 14,56,765 houses of other materials are prone to losing their shelter *along with about 56,87,899 livestock's and poultry about 29,55,636 in number*

From population density point of view also the picture of vulnerability emerges as:

- i) Zone V (15.2%) = 15,254 sq.kms × 1102 persons /sq.kms
= 1,57,78,305 persons
- ii) Zone IV (63.7%) = 59,981 sq.kms × 1102 persons/ sq.kms
= 6,60,99,997 persons
- iii) Zone III (21.1%) = 19,868 sq.km × 1102 persons/ sq.kms
= 2,18,94,969 persons



Thus, keeping the sub-surface fault-line in view, the vulnerability of the districts falling in zone IV gets equally enhanced. For, the sub-surface fault lines in a way enchain the destiny of those living in Zone IV with those in

Zone V. The earthquake of 1934

amply demonstrated that the destiny of those in Zone IV is intrinsically linked with those in Zone V. The earthquake having its epicenter near Sitamarhi on Nepal border heaped worse devastations in Monger (in Zone IV) than in Madhubani & Sitamarhi.

The earthquake also indicated that it did not destroy life directly. Life and property got destroyed by the destruction of structures & infrastructure.

This indicates the fact that if structures and infrastructure are properly built, life and property to that extent shall be comparatively safer and fear of damage and destruction shall be less.

Keeping the above indications in view, the vulnerability from earthquake increases manifold on the following counts:

- i) The mushrooming growth of multi-storied buildings in urban areas— disregarding all norms.
- ii) Increase in infrastructure facilities like roads, flyovers, bridges etc.
- iii) density of population
- iv) Increase in the population of threshold and marginalized section.

4.2 Floods :

The state of Bihar, being a land of rivers descending down from the Himalayas and overflowing with water from a large catchment area beyond its boundaries having higher precipitation and steeper gradients and meandering through its plains, is destined to suffer the ravages of floods.

The area worst affected by floods in the state is 56% of its total geographical area covering 28 out of 38 districts. But the nature and causes of floods vary from one geo-cultural zone to another although the end result is the same: inundation, siltation and erosion.

From flood point of view the vulnerability of Bihar as a state is intense on all the five factors: location, poverty, density of and threshold population and awareness and preparedness of the people.

4.2.1 Population

Out of the total population 7,99,82,950 living in 28 districts out of which 3,97,23,905 are women and 1,50,14,935 children between 0–6yrs. and 93,75,555 families living below poverty line. The livestock vulnerable to flood number 31,467 thousand. The total number of habitation 1,26,32,94, of all sorts is liable to be affected. And around 27,974.47 hectare of irrigated land suffers the risk of losing crops cultivated.

In the 15 highly vulnerable to flood districts a population of 4,69,18,520 is at risk out of that 2,22,74,281 are women, 86,49,102 children of 0-6yrs. of age and 55,61,818 BPL families. Live stock wealth consisting of cows and buffalo, pig & sheep, goat and poultry to the tune of about 1,60,86,000 is liable to be lost. The population living in 70,64,729 dwellings of all sorts may mostly get washed away or partly damaged.

And the total irrigated area of 13,457.32 thousand hectares are likely to suffer loss of crop due to inundation, & cultivated land suffer from siltation and water logging.

Table: 4.2 – District-wise vulnerability Assessment:

Sl. No.	District	Population	Female	0-6yrs.	BPL Families	Livestock ('000)	Habitations	Irrigated '000 hect.
0	1	2	3	4	5	6	7	8
1	East Champaran	5082868	2408831	993569	594443	1508	739684	1793.13
2	Sitamarhi	3419622	1619181	643851	444998	1363	542581	729.99
3	Sheohar	656916	309302	124919	80569	212	101521	231.85
4	Muzaffarpur	4778610	2261110	817709	596244	1299	699025	1354.66
5	Vaishali	3495249	1648191	591634	470215	873	433964	1024.05
6	Samstipur	4254782	2026350	784203	459922	1022	665680	1210.87
7	Darbhanga	3921971	1868928	700992	371134	1102	656288	567.51
8	Madhubani	4476044	2151060	779360	662909	1265	721277	1081.54
9	Supaul	2228397	1070582	424411	305815	1026	367376	820.90
10	Saharsa	1897102	901600	377504	212465	833	284075	552.32
11	Madhepura	1994618	952245	397468	235255	967	293418	749.21
12	Khagaria	1657599	777534	347048	233715	692	249623	569.19
13	Begusarai	2954367	1394164	532382	319388	615	464310	893.27
14	Bhagalpur	3032226	1418212	532307	279170	1326	375357	621.17
15	Katihar	3068149	1466991	601745	295576	1983	470550	1257.66
	Total	46918520	22274281	8649102	5561818	16086	7064729	13457.32

In the 13 vulnerable districts a population of 3,62,20,589 is at risk. Out of these 1,74,49,624 women, 73,65,833 children of 0-6 yrs, 38,13,737 BPL families living in 55,68,185 habitations of mud wall to burnt bricks, are liable to suffer most. And, a total of 13,817,12 hectare of irrigated area and 15,381 thousand live stocks consisting of cows and buffalo are open to all costs of damages.

Table: 4.3 – District-wise vulnerability Assessment

Sl. No.	District	Population	Female	0-6yrs.	BPL Families	Habitations	Irrigated	Livestock ('000)
0	1	2	3	4	5	6	7	8
1	West Champaran	3922780	1865111	753429	480386	653725	1352.19	1629
2	Gopalganj	2558037	1288360	437031	265491	389003	1573	797
3	Siwan	3318176	1646055	532868	315461	462103	1743.87	787
4	Saran	3943098	1919622	657316	405443	558264	1372.51	1200
5	Buxar	1707643	819287	286969	170332	239339	1349.28	644
6	Bhojpur	2720155	1288433	440847	256221	380182	1740.46	728
7	Patna	5772804	2721687	905708	403781	876201	1352.19	1345
8	Nalanda	2872523	1376946	501046	330943	463005	280.72	992
9	Lakhisarai	1000171	474066	182234	76706	158749	582.62	399
10	Sheikhpura	634927	305334	118228	59492	105156	246	281
11	Purnia	3273127	1577298	1644083	482114	555415	1051.98	2389
12	Araria	2806200	1345322	564131	304793	411916	666.3	2111
13	Kishanganj	1690948	822103	341943	262574	315127	506	2079
	Total	36220589	17449624	7365833	3813737	5568185	13817.12	15381

Source : Census-2011-12 & Vulnerability Map of India & Rural Development Dept., GoB

4.2.2 Resource Base

The prime resource base of Bihar is agriculture. Since 60.5% of the total area is net sown area in the state out of which 33.79% area is in flood prone zones, and only 17.6% area is in non-agricultural use, it can safely be said that more than half of the net sown area is susceptible to flood.

4.3 Drought

It is an irony of situation that a state regularly ravaged by floods, is also prone to drought. It is so because first, around 59% of the net sown area is dependent on rain and second, the soil does not have water holding capacity and third, the water management practices in the state have not been planned properly. In the name of flood protection building embankments is the be-all and end-all of water management practices in the state

It is so because in our anxiety to have protection from flood, we tend to ignore the chances of aiding the factors that make a region vulnerable to drought. Those factors are:

- deficiency of monsoon which has been highly erratic in the state in the last five years.
- Insufficient irrigation facilities for the agricultural land. In Bihar only 41.97% of the agri. land is properly irrigated.
- Although rich in water resources but no proper effort for the conservation of water has been practiced.
- the alluvial soil of the state has a poor moisture retention capacity.

Table No 4.4: Districts Vulnerable to Drought

Sl. No.	District	Population	Women	0-6yrs.	BPL	Livestock ('000)	Habitation	Irrigated Area
1	Gaya	43,79,383	21,12,518	7,62,570	3,60,848	2,160	6,01,129	1,243.73
2	Nawada	22,16,653	10,71,530	3,67,231	1,93,116	1,258	3,22,513	526.25
3	Jamui	17,56,078	8,41,710	3,13,455	1,95,234	1,354	2,60,021	448.81
4	Nalanda	28,72,523	13,76,946	5,01,046	3,30,943	992	4,63,005	980.74
5	Lakhisarai	10,00,717	4,74,066	1,82,234	76,706	357	1,58,749	582.62
6	Jehanabad	11,24,176	5,37,974	1,93,946	96,258	427	2,79,050	545.15
7	Arwal	6,99,563	3,36,618	1,23,684	80,274	268	—	469.01
8	Aurangabad	25,11,243	12,00,376	4,38,065	2,26,526	1,178	3,50,284	1,624.42
9	Kaimur	16,26,900	7,79,116	2,91,785	1,87,599	612	2,42,317	1,260.81
10	Bhojpur	27,20,155	12,88,433	4,40,847	2,56,221	728	3,80,182	1,740.46
11	Buxar	17,07,643	8,19,287	2,86,969	1,70,332	644	2,39,339	1,349.28
12	Rohtas	29,62,593	14,14,737	4,93,047	2,82,017	911	4,58,736	3,660.28
13	Banka	20,29,339	9,65,032	3,62,548	2,06,944	1,335	3,09,839	1,051.73
	Total	2,76,06,966	1,32,18,343	47,57,427	26,63,018	12,224	40,65,164	15483.29

Source : Census-2011-12 & Vulnerability Map of India & Rural Development Dept., GoB

The state has all the ingredients to foster these drought nurturing factors. First, being located in the tropical zone and largely dependent on south-west monsoon, which account for 85% of the total rainfall in the state, it is susceptible to receiving less than the average rainfall. Second, of the major sources of irrigation—surface canals, ahar and pynes, tubewells, other sources of supply, surface water is not properly tapped to meet the irrigation requirements. Sinking water-table make it less cost effective to pump water for agriculture proposes. Non-availability of power make it all the more difficult to use underground water. On top of these, annual increase in deforestation owing to the pressure of population, add to the increasing threat of drought in the state.

4.4 High Speed Winds/Cyclonic Storm/Gale/Hail Storm:

High Speed Wind is one of the most disastrous hazards that civilization helplessly sees approaching and destroying everything around. It is a calamity that in the process of its visitation annihilates and uproots all that come in its way, and leaves behind rain and garbage for population to fend with.

86% of the total area of Bihar falls in high damage risk zone of cyclone of 47 m/s velocity which means that a population of 8,92,71,990 consisting of 4,26,72,589 women, 1,59,80,720 children of 0—6yrs. of age and 2,96,38,300 SC/ST and minorities living either in 40,64,253 mud houses or in 74,10,477 brick walled houses or in 59,37,526 houses of other materials out of which 68,60,143 are thatched with light weight materials; 59,72,988 with heavy weight materials and 47,21,166 have flat roofs.

Table No: 4.5 Districts Highly Vulnerable to High Velocity Wind

Sl. No.	District	Population	Women	0-6yrs.	BPL	Livestock ('000)
1	Araria	28,06,200	13,45,322	5,64,131	3,04,783	2,111
2	Kishanganj	16,90,948	8,22,103	3,41,943	2,62,574	2,077
3	Nawada	22,16,653	10,71,350	3,67,231	1,93,116	1,258
4	Katihar	30,68,149	14,66,991	6,01,746	2,95,576	1,984
5	Purnia	32,73,127	15,77,298	6,44,083	4,82,114	2,389
6	Saharsa	18,97,102	9,01,600	3,77,504	2,12,465	833
7	Supaul	22,28,397	10,70,582	4,24,411	3,05,815	1,326
8	Madhepura	19,94,618	9,52,245	3,97,468	2,35,255	967
9	Bhagalpur	30,32,226	14,18,212	5,32,307	2,79,170	1,325
10	Banka	20,29,339	9,65,032	3,62,548	2,08,944	1,203
	Total	2,42,36,759	1,15,90,735	46,13,372	27,79,812	15,473

Source : Census-2011-12 & Vulnerability Map of India & Rural Development Dept., GoB

Apart from 2,42,36,759 persons out of which 1,15,90,735 are women; 46,13,372 of 0-6 yrs. age 27,79,812 BPL families and 15,473 thousand livestock living in these 10 districts highly vulnerable to high speed wind. Out of 1,63,16,527 buildings in the state a total of 63,76,428 houses of mud and unburnt brick wall and having straw thatched lightweight roofs are highly vulnerable to High Speed Winds.

Those living in moderate damage zone consist of 1,45,32,647 persons out of which are 69,46,700 women, 26,01,519 children of 0–6yrs of age, 2,96,38,300 SC/ST and minorities and 37,75,168 BPL households living in 6,61, 622 mud houses of having light weight roofs.

4.5 Fire

Fire, as a hazard, is man-made as well as situational and incidental. It largely affects population by destroying household and property.

Habitation complexion wise all the 38 districts of the State are fire hazard prone. More so, endangered are 1,13,40,990 BPL families living in 37,58,206 houses made of mud and unburnt bricks and having straw thatched, lightweight sloping roofs. Apart from these a huge number of families living in high-rise building having no fire escape, are bound to be victims of fire hazards.

Table : 4.6 –Annual Fire Statistical Report

S.No.	Description	2011	2010	2009	2008	2007	Total
1	Total No. of Fire Stations	105	46	46	44	40	-
2	Total No. of Fire Calls	3,724	4,479	3,898	2,331	1,863	16,295
3	Total No. of Death (Persons)	94	129	82	60	21	386
4	Total No. of Injured (Persons)	109	136	108	106	49	508
5	Total No. of Death (Animals)	586	852	489	123	70	2,120
6	Total No. of Injured (Animals)	103	130	92	25	10	360
7	Total No. of Village Fire	1,693	2,078	1,925	816	446	6,958
8	Total Property Damaged (₹ in Crore)	4,109.16	109.87	62.65	74.79	17.31	4,373.78
9	Total Property Saved (₹ In Crore)	10,875.98	978.27	276.73	226.30	267.85	12,625.13

Source: Bihar Fire Service, GoB

In 2011 itself there were 3,724 fire calls, 94 deaths due to fire hazard , 109 persons were injured, 586 animal died, and Rs. 4,109.16 crore worth of property was destroyed or damaged.

Table : 4.7 – Disaster Prone Districts

Sl. No.	District	Earthquake		Flood	Drought	Fire	Cyclonic Storm
		High	Medium				
1	Araria	H		F			CY
2	Arwal				D		
3	Aurangabad				D		
4	Banka		M		D		CY
5	Begusarai		M	F	D		
6	Bhagalpur		M	F	D		CY
7	Bhojpur			F	D		CY
8	Buxar			F	D	Intensive	CY
9	Darbhanga	H		F	D	Intensive	CY
10	East Champaran		M	F	D		CY
11	Gaya		M		D		
12	Gopalganj		M	F			CY
13	Jamui				D		
14	Jehanabad				D		CY
15	Kaimur(Bhabua)				D		CY
16	Katihar		M	F		Intensive	CY
17	Khagaria			F			CY
18	Kishanganj		M	F			CY
19	Lakhisarai			F	D		CY
20	Madhepura	H		F			CY
21	Madhubani	H		F	D	Intensive	CY
22	Munger		M		D		CY
23	Muzaffarpur			F	D	Intensive	CY
24	Nalanda		M	F	D	Intensive	CY
25	Nawada				D		
26	Patna		M	F	D		CY
27	Purnia		M	F			CY
28	Rohtas				D		CY
29	Saharsa	H		F			CY
30	Samastipur		M	F	D		CY
31	Saran		M	F	D	Intensive	CY
32	Sheikhpura		M	F	D		CY
33	Sheohar			F	D		CY
34	Sitamarhi	H		F	D		CY
35	Siwan		M	F	D	Intensive	CY
36	Supaul	H	M	F			CY
37	Vaishali		M	F	D	Intensive	CY
38	West Champaran			F		Intensive	CY

Legends

EARTHQUAKE	H	DROUGHT	D
	M		FIRE
FLOOD	F	CYCLONIC STORM	CY

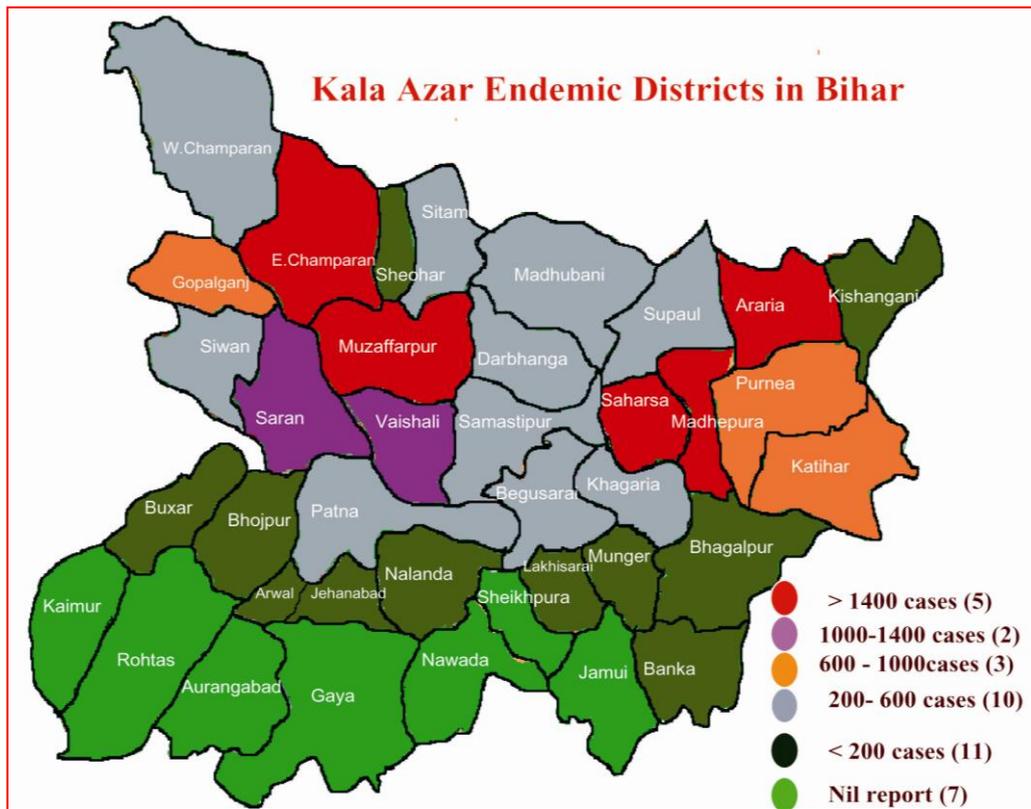
Table : 4.7 – Rainfall :

Districts Name	2008					2009					(2010 up to sep.)			
	Winter	Summer	SW Monsoon	NW Monsoon	Total	Winter	Summer	SW Monsoon	NW Monsoon	Total	Winter	Summer	SW Monsoon	NW Monsoon
Patna	60.8	47.7	1168.2	7.8	1284.5	0.0	61.4	615.6	56.8	733.8	0	58	410.6	468.6
Nalanda	60.5	7.8	1076.3	6.1	1150.7	0.0	89.9	445.3	57.7	592.9	0	15.6	537.2	552.8
Rohtas	55.9	47.0	1025.9	4.5	1133.3	0.0	28.5	710.8	71.7	811.0	5.1	36.6	374	415.7
Kaimur	11.2	1.2	890.2	0.0	902.6	0.0	1.3	451.1	38.1	490.5	6.3	32.8	518	557.1
Buxar	27.5	48.9	1266.1	13.1	1355.6	0.0	22.9	508.4	31.4	562.7	0	7.3	534.5	541.8
Bhojpur	59.9	66.4	1190.6	4.6	1321.5	0.0	58.8	577.6	46.8	683.2	0.8	4.8	561.3	566.9
Gaya	96.9	27.0	901.9	0.0	1025.8	0.2	64.9	605.4	32.3	702.8	0	0	155.8	155.8
Aurangabad	86.3	56.9	964.8	0.0	1108.0	0.0	36.7	691.0	24.3	752.0	0	4	469.3	473.3
Jehanabad	66.6	25.2	1171.2	0.0	1263.0	0.0	50.8	513.0	63.0	626.8	0	20.2	507	527.2
Arwal	50.0	61.7	1251.1	1.7	1364.5	0.0	122.8	679.0	26.8	828.6	0	21.2	336.2	357.4
Nawada	61.5	35.7	1104.1	0.0	1201.3	0.0	99.4	540.6	156.4	796.4	0	24.8	509.5	534.3
Saran	20.3	50.3	1375.5	1.9	1448.0	0.0	100.7	628.7	52.8	782.2	1.1	8	639.5	648.6
Siwan	0.0	0.0	1359.7	0.0	1359.7	0.0	79.0	343.3	56.3	478.6	0	0	189.8	189.8
Gopalgunj	0.0	50.4	1202.6	20.0	1273.0	0.0	87.6	711.5	83.5	882.6	0	59.8	734.8	794.6
Muzaffarpur	13.3	72.9	1236.7	36.8	1359.7	0.0	115.8	645.2	0.0	761.0	0	53.7	623.3	677
Sitamarhi	55.4	9.2	680.5	13.5	758.6	0.0	0.0	908.4	8.4	916.8	0	14.3	440.5	454.8
Sheohar	0.0	113.0	983.6	127.4	1224.0	0.0	170.6	491.0	0.0	661.6	0	0	267.4	267.4
W.Champanan	0.0	110.9	1408.2	15.7	1534.8	0.0	110.7	986.1	47.3	1144.1	0.8	106	1056.5	1163.3
E.Champanan	6.8	97.1	1195.3	30.8	1330.0	0.0	99.7	775.0	25.9	900.6	1.5	86.2	704.1	791.8
Vaishali	11.4	23.2	1417.0	27.7	1479.3	0.0	62.4	616.1	69.0	747.5	0	21	433.2	454.2
Darbhangha	1.3	44.8	686.1	27.2	759.4	0.0	153.0	841.9	45.1	1040.0	0	42.1	558.3	600.4
Samastipur	19.9	15.0	1041.9	46.6	1123.4	0.0	137.5	577.5	83.1	798.1	1	78	456.5	535.5
Madhubani	0.0	0.0	768.8	76.6	845.4	0.0	153.4	1049.9	36.0	1239.3	0	31.4	534.1	565.5
Saharsa	32.5	186.6	927.4	0.0	1146.5	0.0	70.3	766.6	59.7	896.6	0	53.6	468.6	522.2
Supaul	18.0	238.8	734.8	49.3	1040.9	0.0	92.8	598.6	0.0	691.4	0	332.2	182.2	514.4
Madhepura	16.	47.3	1030.	0.0	1094.	0.	213.	1054.6	88.0	1356.	0	250.	750.3	1000.5

	9		1		3	7	4			7		2		
Purnea	23.4	122.2	1251.5	16.4	1413.5	0.0	207.7	1109.7	178.2	1495.6	0	86.6	137.3	223.9
Araria	6.0	180.6	1434.3	36.8	1657.7	0.0	261.8	957.4	78.0	1297.2	0	107.3	1096.7	1204
Kishanganj	26.7	188.4	1965.6	12.6	2193.3	0.0	110.1	1135.0	212.4	1457.5	0	156.6	2310	2466.6
Katihar	19.3	106.4	995.2	12.9	1133.8	2.0	206.8	618.0	195.5	1022.3	0	56.7	593.9	650.6
Bhagalpur	29.8	46.1	807.8	31.7	915.4	0.5	138.6	753.3	124.8	1017.2	0.5	60.6	486.2	547.3
Banka	67.0	36.6	759.2	33.9	896.7	0.0	65.0	632.6	99.0	796.6	1.6	39.3	629.7	670.6
Munger	33.7	50.6	1194.7	18.2	1297.2	0.0	90.8	903.2	69.6	1063.6	0	31.3	595.3	626.6
Lakhisarai	27.9	62.8	1163.1	7.5	1261.3	0.0	103.4	683.5	73.0	859.9	0.6	47.3	687.5	735.4
Begusarai	2.4	0.0	1115.8	20.2	1138.4	0.0	0.0	314.8	149.0	463.8	0	96.3	374.2	470.5
Jamui	0.0	0.0	663.7	0.0	663.7	0.0	0.0	624.2	61.9	686.1	0	32	535	567
Khagaria	25.5	50.8	880.8	32.4	989.5	0.0	134.9	710.5	79.9	925.3	0	0	0	-
Sheikhpura	68.4	18.2	912.1	0.0	998.7	0.0	128.9	793.9	121.4	1044.2	3.9	85.1	620.8	709.8
Bihar	30.6	61.8	1084.3	19.3	1196.0	0.1	98.2	699.2	71.1	868.6	0.6	56.87	553.13	627.11

Source : Economic Survey Report- 2010-11

Map: 17- Kala Azar Endemic Districts in Bihar



Source: NVBDCP, Delhi

BBB

The State Disaster Management Plan

Section - II

DISASTER PREVENTION, MITIGATION PREPAREDNESS & CAPACITY BUILDING

**“In small proportion we just beauties see,
In short measures life may perfect be.”**

–Benjamin Johnson

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- 8.1 Awareness Generation
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-

The Concept

Disaster Prevention, Mitigation and Disaster Preparedness aim at the same goal—the risk/damage reduction, but approach from opposite directions. Prevention & Mitigation approach to minimize risk from the hazard side. Preparedness largely approaches to achieve risk reduction from “people” side. So, preparedness may be largely common to all hazards but prevention and mitigation have to be hazard specific. Preparedness may be a matter of inculcation and readiness but prevention & mitigation have to be concrete and specific.

Besides, prevention & mitigation, one the one hand and preparedness on the other, have to contend with two aspects simultaneously. Preparedness has to be people and area specific and prevention and mitigation has to be hazard and development specific. They may at the surface, appear independent of each other but, in the deep, they are like Siamese Twins.

And capacity building, Janus - like, looks both ways: towards preparedness through training related activities and towards prevention & mitigation through resources building initiatives. Together, all three aims at cushioning the impact of disasters sometimes thrust upon us and sometimes we inadvertently create.

5. Disaster Prevention & Mitigation

5.1 Basics

Disaster Prevention & Mitigation measures are guards of hazard impact. They stand against the intensity of the hazard impact and reduce the risk involved. Disaster Prevention & Mitigation, therefore, have to be hazard and area specific and have to follow processes varying from hazard to hazard. Since, the hazard proneness of an area is well known, the key constituents of prevention & mitigation measures would commonly be:

- i) The kind and form of hazard
- ii) The typical effects of a hazard
- iii) Prevention & Mitigation measures
- iv) Prevention & Mitigation Strategy and
- v) The Factors at Risk

Prevention & Mitigation measures intend to save life and reduce damages. They rest upon the risk assessment and vulnerability analysis and aim to hold the impact of hazards from robbing people of life, livelihood and their possessions to a possible extent. The factors at risk to be considered while strategizing prevention & mitigation, therefore, are:

- Population
- Cultivation
- Habitation
- Constructions &
- Possession

5.1.1 The Kind & Form of Hazards

Hazards can be natural and man-made. Natural hazards can be either of the surface or of the deep or above. Natural hazards of the surface are visible, its origin traceable, accessible and, therefore, its impact mitigable to a great extent. Such hazards include floods, drought, cyclonic storm, fire, traffic accidents, etc.

Natural hazards of the deep or above are hidden, sudden, its source inaccessible and, therefore, its impact immitigable. Such hazards include earthquake, volcanic eruptions, cloud-bursts etc.

Man-made hazards are accidental or incidental. Accidental man-made hazards consist of two or more factors involving momentum and, therefore, are unavoidable. Such hazards include major road, rail, air and waterways accidents.

Incidental man-made hazards are normally static and a result of system or human failure. Such hazards include fire, explosion, epidemics, industrial accidents etc.

In the case of natural hazards of the deep, the disaster prevention & mitigation measures and strategies, therefore, largely depend upon the typical effects their occurrences leave behind. In the case of natural hazards of the surface the prevention & mitigation measures and strategies have to be based on and include both the typical impact as well as the sources of hazards.

In the case of man-made hazards, both accidental and incidental, the prevention & mitigations measures largely depend upon training, discipline, technology and system in place.

5.1.2 The Typical Effects: EARTHQUAKE

An earthquake is a violent and sudden shaking of the earth's crust due to collusion or breaking or moving away of tectonic plates at the top of which the whole of human civilization is perched.

The joining of the tectonic plates is known as **fault-lines** and where the disturbances weaken the surface of the plate almost to the breaking point is known as **sub-surface fault lines**. The earthquake is caused by the release of energy through these fault lines and sub-surface fault lines. The intensity of this energy ranges from 0 to 10 and is measured on Richter scale.

The typical impact of the tremor known as earthquake varies from its intensity to intensity and the distance of the area from its epicenter. It ranges from shaking of structures to the changing of very landscape. Its typical impact is in the form of physical damage, destruction of infrastructure and loss of property. Physical damages may be in terms of damages or destruction of structures or damages or destruction by fire or floods due to dam failures caused by earthquake. Casualties will be due to damage or destruction of structures etc. It will be much higher in areas nearer to the epicenter and densely populated area with weak buildings traditionally constructed with earth, rubble, bricks etc; urban settlements in poorly constructed apartments and in proximity of high rise buildings.

5.1.3 Prevention & Mitigations Measures.

In case of Earthquake as a hazard no prevention measures are there to be taken. However, mitigation measures for Earthquake impact reduction are there to be taken. They consist of structural and non-structural measures. And both are intrinsically interdependent.

Structural Measures: The prime structural mitigation measures that are expected to considerably reduce the impact of earthquake are:

- (i) Properly designed, engineered and constructed structures — residential, service or infrastructure — built on well tested soil for adapting to suitable adjustments in design.
- (ii) Retrofitting in old structures so that short-comings in construction could be externally strengthened to a considerable extent to withstand the convulsions caused by Earthquake.

Non-Structural Measures: For getting the structural measures implemented with due earnestness, honesty of purpose and sense of compulsion host of non-structural measures in the form of policies guidelines and training have to be provided.

- (i) Policy decisions about construction of structures with due approval from specified authorities have to be taken. The building codes etc have to be suitably formulated/amended and appropriately detailed and legal implications properly stated.
- (ii) Guidelines both for earthquake-resistant constructions as well as for retrofitting have to be formulated with specifications about site selection, foundation, construction, materials and workmanship making involvement of specialist architects, trained engineer and masons mandatory.

The guidelines have to be formulated for the concerned authorities about land use planning, monitoring of construction work and controlling of settlements in hazard prone areas to avoid fatalities and loss of property.

5.1.4 Mitigation Strategy

The desired implementation of mitigation measures requires a well-thought strategy. Implementation of mitigation measures, therefore, has to be multi-pronged: adoption wise attractive and cost wise comfortable.

The Strategy for mitigation measures for the typical effects of earthquake involves.

- (i) Training of A, B, C, D, E, F, G, H and M; Architects, Builders, Contractors, Designers, Engineers, Financers, Government functionaries and masons.

- (ii) Awareness generation among the house owners about what details to look for or insist upon about the building, household fittings and equipment, in the houses they own or intend to purchase.
- (iii) Computer based information dissemination about the area-wise nature of soil, the kind of construction appropriate in the area, the certifications about the house/flat one is about to buy.
- (iv) The empanelment of specialist architects, trained engineers and masons by urban bodies and works departments for building earthquake resistant structures.
- (v) The Certification of commercial buildings by Fire Dept and urban regulatory bodies both at the planning and completion stages.

But, all these put together shall not be sufficient to make mitigation measures people-centred and motivating enough to observe norms. It can, however, be done through

- (i) Awareness among the stakeholders about the need to build/rebuild earth quake resistant houses/structures and keeping safe neighborhood.
- (ii) Capacity building of Architects/Engineers/Builders and even masons for construction of earth quake resistant houses/structures
- (iii) Formulation of suitable building bye laws in urban areas and enforcement thereof

5.1.5 The Factors at Risk

From the epicenter of an earthquake point of view Bihar has one high voltage epicenter right in the middle of its forehead at the Nepal border which also happens to be a fault line. From magnitude point of view, 15.2% of the total area of Bihar is in Zone V which denotes the most severely threatened area from earthquake point of view; 63.7% of the total area of Bihar is in Zone IV and 21.1% in Zone III.

But, as there are six **sub-surface fault lines** between Zone V and Zone IV areas where the possible cracking of the tectonic plate on those lines may happen, the total of 78.9% area of Bihar may be taken as threatened by a severe earthquake causing worse impact.

And since the typical effects of an earthquake are on structures, infrastructures and property the resultant factors at risk in 78.9% of the geographical area of the state are:

- (i) **Structures:** Around 1,39,65,111 habitations of all sorts are there in the severely earthquake prone area of 78.9%. Out of these 1,26,44,18 are in rural areas and only 13,20,929 are in urban areas. Out of the total habitations 80,25,064 are built of grass, bamboo, mud and unburnt bricks, and 57,85,488 are of burnt bricks & concrete etc.

Since, the typical effect of earthquake are on structures and infrastructures, the resulting casualties in the destruction of the burnt bricks and concrete roof houses are going to be more than those from the destruction of bamboo and mud houses.

In the urban areas, where multi-storeyed and high-rise buildings are there, the casualties are going to be much, much more.

The implementation priorities, thus, have to proceed from urban to rural, from high-rise buildings to multi-storeyed buildings, from govt. to private construction.

And, above all, the government has to set an example and create a demonstrative impact by initiating the construction of all govt. funded buildings as per the specifications and guidelines and initiate retrofitting of all govt. offices buildings and residential structures on immediate basis.

The next on the priority list should be the multi-storeyed and high rise buildings in the urban areas. It has to be done with a certain amount of pressure in the form of compulsion, penalties etc.

- (ii) The infrastructure in the 78.9% area of the state consists of 75,000 kms of National Highway to Link Roads with numerous large, infrastructures, like Gandhi Setu and Rajendra Bridge, and small bridges in numerous numbers. In the area, two thermal power plants and electric and telephone poles and fittings are there in lacs. The power generation and electric supply may be meager but they are required to be made earthquake resilient in order to protect the investments that have gone in them.
- (iii) The total area of 78.9% has 44,79,032 hectares of cultivated land wherein we produce roughly 40.4 lakh tone of rice, 36 lakh tone

of wheat, 14.2 lakh tone of maize, 1.14 lakh tone of oil seeds and 47.8 lakh tones of sugarcane¹.

All the embankments in the river basins are in this area. Their breaches or collapsing will wreak havoc and cause extensive damage. Besides, 90% of the population living in rural areas, those who happen to escape from fury of flooding caused due to rivers will suffer starvation.

- (iv) **The Industries:** In the severely earthquake prone area we have 29 sugar mills, one refinery, one fertilizer plant, three dairy plants, around 90% of the large, medium, small and micro enterprise located.

Table: 5.1 Hazardous Factories/Industrial Institutions in Bihar

1	Super Thermal Power Plant (NTPC), Barh	8	Kanti Bijli Utpadan Corpn., Muzaffarpur
2	NTPC, Kahalgaon, Bhagalpur	9	IOCL, Barauni Refinery, Barauni
3	BP-LPG Bottling Plant (Fatuha)	10	IOCL, Marketing Division, Barauni
4	IBP Corporation Ltd. Barauni Terminal (Oil refinery)	11	HP Corporation, bottling plant, Moranga Purnia
5	BP Corporation Ltd. Begusarai Terminal	12	BP Corporation Ltd., Pakri, Anisabad, Patna
6	HP Corporation Ltd. (LPG bottling), Giddha, Bhojpur	13	IOCL Marketing (Aviation fuel), Patna airport
7	IOI, LPG bottling, Giddha, Bhojpur	14	Kalyanpur Cement Company, Benjari, Rohtas

Source : O/o Chief Inspector of Factories, GoB.

Thus, in order to save a population of around 8,29,39,904 out of which 3,49,45,812 are women 1,48,47,200 children below 6yrs of age, 3,44,63,139 SC/ST and 4,38,05,556 living below poverty line, the mitigation measures are required to be urgently and strictly implemented through legal provisions, policy measures, creation of facilities, offering incentives and, above all by setting examples by the government, its administration and its functionaries.

5.1.6 Government Departments Involved

There may be three levels of involvement of government departments in disaster management prevention, mitigation & preparedness during pre-disaster period, response during disaster and resettlement and rehabilitation during post disaster period.

¹ Based on Economic Survey Report 2010-11

In case of Earthquake during pre-disaster period:

- Urban Development Department shall be the lead organization for the formulation of Building Code as well as monitoring, supervision & certification of construction in urban areas.
- Rural Development and Rural Works Departments shall be responsible for the implementation of earthquake related measures in rural areas.
- Fire Department shall be associated in both urban & rural areas for the fire safety measures – formulation, implementation and training of persons at all level in both urban & rural areas.
- Disaster Management Department in association with Urban Development Department, Building Construction Department and other works departments shall impart training to Architects/Engineers/Builders and masons in large number to build disaster resistant houses/structure

5.2 The Typical Effects: *Floods*

Floods are temporary inundations of land with water caused by rains, overflowing of rivers, discharges released from large reservoirs, cyclones, tsunami, melting of glaciers and sea tides. It may come gradually and take hours and days together to recede or may even happen suddenly due to heavy rains, breach in embankments, failure of dams, cloud bursts, storm surge etc. Except for flash floods, there is usually a reasonable warning period.

In a land-locked state like Bihar, floods are caused by either overflowing of rivers due to excessive rains in its catchment or excessive discharge released from reservoirs. The floods cause either breach in embankments or excessive erosions. As chance would have it, out of the four causes & consequences of floods—excessive rains, excessive discharge, excessive erosion, siltation and breach in embankments—only two of them the state can control and manage. The rest of the two are beyond the control of the state. Excessive rains the state cannot control nor can it control the excessive discharge, because rivers crisscrossing the State are flowing down beyond its borders, i.e., from Nepal or Uttara khand/UP or Jharkhand/ M.P. The State can however control excessive erosion, siltation and breach in embankments.

Normally, floods are quantified and analyzed on the basis of depth of water and duration for which floodwater stays. Velocity of water causes erosion of river banks and— or destroy and damage habitations and other structures. Rate of rising of water level and timing of floods vis-a-vis agricultural activities determine damages resulting from floods.

The damages caused by floods consist of the flooding of land leading to crop damage, collapsing of mud houses, buildings, endangering human lives, livestock and other public and private property. People, standing crop and livestock are liable to perish by drowning. Utilities such as sewerage, water supply, communication lines, road network and power supply get damaged, disrupted or destroyed; clean drinking water becomes scarce. Food shortage is caused due to loss of harvest & spoiling of stored grains. The agriculture gets affected due to deposition of coarse sand layers over the ground or onset of salinity or water logging for considerably long period.

On the whole, floods damage houses/ human settlements/crops/infrastructure, endanger human and cattle lives, fragment families, destroy wealth, jeopardize livelihood base and causes migration. It literally wipes out the socio-economic development achieved so far in the state and drives it to rewrite everything and begin from the beginning: response, relief, restoration, rehabilitation, reconstruction, and redevelopment are needed on a very large scale. All precious investment is reduced to almost naught. All precious efforts made before go largely waste.

5.2.1 Mitigation Measures:

Normally, the floods in North Bihar are caused by three factors: first, the rivers have a large catchment area with propensity of higher precipitation; second, most of the rivers originate from Nepal and whenever high precipitation takes place there, the rivers in Bihar side get flooded; third, the rivers have steeper gradients adding velocity to the flow of water and fourth, the meandering of rivers through the soft soil of the plains. As such, ideally the mitigation measures should be based on the principle of providing smooth passage to flood water by desilting its bed to avoid inundation and by harvesting the inundating waters in reservoirs, ponds and rivulets for productive utilization during scarcity of water resources for irrigation and other benefits on the one hand, and maintaining of water tables to the extent possible, on the other, to avoid erosion of banks and embankments. Unfortunately, our entire flood related mitigation and

preparedness have been inundation and erosion centric. Huge sum and technology is required for taking measures for de-siltation of rivers.

On these very lines, different committees and bodies of experts at the national & state level formed from time to time have observed and opined about mitigation measures for floods

The National Flood Policy, 1954 states three level mitigation measures: immediate, short term and long term. Immediate phase was devoted to investigation, collection of data, protection of selected towns and construction of embankments in the most vulnerable reaches. Short term phase envisaged flood control measures such as embankments, channel improvement, raising of villages. Long term phase was to cover selected long-term measures such as construction of storage, reservoirs on the tributaries of certain rivers etc.

—Flood Policy Statement, 1954

Another Committee made the following recommendations:

- i) Flood control schemes should fit in with other water-related plans to the extent feasible.*
- ii) Future multipurpose project should consider flood control aspects simultaneously.*
- iii) Effects of embankments on river regions be considered before approving such proposal.*
- iv) In general, embankments are satisfactory means of flood protection when properly designed, executed and maintained but a suitable combination of this method with other methods such as storage dams, detention basin etc. is usually more efficient and should be adopted as resource permit.'*

— Recommendations of High Level Committee on Flood, 1957

"The committee mainly recommended more attention to non-physical measures like studying possibility of multipurpose storage dams for flood prevention and sediment detention, administrative measures for restricting occupancy of flood zone....."

"Minister's Committee on Flood Control, 1964"

Rashtriya Barh Ayog, constituted in 1976, recommended in its report "... to achieve this (optimum production on a sustained and long term basis) the following points were considered important:

- i) planning should be basin/sub-basin wise*
- ii) master plans for flood management should be drawn up after a thorough study and evaluation of all alternative methods available—both physical and non-physical*
- iii) measures for conservation and utilization of water resources for multiple benefits should receive due emphasis in the comprehensive approach."*

—Report of Rashtirya Barh Ayog, 1980

“Basin-wise master plan for flood management in each flood-prone basin with sound watershed management and catchment area treatment”

— Recommendation of The National Water Policy, 1987

“Flood Management cannot be considered as an end in itself; rather it is the means to an end. It has to be viewed within the broad context of the economic and social development. Therefore, approach to flood problem must form part of the overall comprehensive planning of the basin for the optimal utilization of our land and water resource for production of food, fiber, fodder and fuel etc.”

“Report of Second Bihar State Irrigation commission 1994, Vol. V Part-1, page 71”

- i) Basin-wise master plan for flood control and management*
- ii) Provision of adequate flood cushion in reservoir projects*
- iii) More emphasis on non-structural measures*
- iv) Strict regulation of settlement and economic activities in the plains.*

—The National Water Policy, 2002

Geographically, Bihar is a land-locked state divided by the river Ganges into north and south and further divided into regional blocks by rivers flowing down from the Himalayas and the Chhotanagpur plateau and form seven river zones detailed earlier.

The first four zones of these are in the northern part and notoriously known for ravaging floods. The last three zones are sadly noted for low rainfall and menacing drought conditions. Individually these zones are also known for their cultural and agricultural specialties. Besides the language spoken being different, the behaviour pattern of the people also vary from zone to zone.

Redeeming this geographical compartmentalization of the state into Special Purpose Areas (SPA) the zone based mitigation measures shall be of great help in "regional and micro-level spatial planning" and in promoting area specific development programmes inclusive of flood mitigation. It is also logical because the floods in Gandak shall not, by any stretch of imagination, going to affect Saharsa or Supaul. Similarly floods in Kosi shall not be of any consequence to Gopalganj, Siwan or Chapra. Thus, river zone based strategy shall 'unbound' Bihar by making development river-centred and people-specific. The menacing rivers then would automatically become a part of the area plan through which they flow and be treated accordingly. In the context of the zonal area specific plan the rivers shall provide the disaster perspective for planning development and development plan shall provide the context in which rivers should be appropriately managed.

The flood mitigation measures may again be structural or none—structural. The structural mitigation measures will be basically river centric and will include

- i) The revival and maintenance of traditional practices of ahar, pynes and ponds system for diverting and storing flood water and making use of the same for multipurpose activities including irrigation, restoration of water tables etc. For this, larger involvement of senior citizens from the local areas will be required who have better understanding and knowledge about the system.
- ii) The conversion of rivulets and tributaries into reservoirs for storing flood water for a desired period and for later use. For this, major river-based GIS mapping would be required. Besides the bed of the rivulets and tributaries would have to be properly structured and meticulously maintained.
- iii) Horse shoe like curves created by meandering major rivers in the past centuries and abandoned now, locally known as "Mauns" may be converted into reservoirs by ways and means appropriate for the same. For this, highly proficient specialists will have to put their heads together and take decisions.
- iv) Using base flow and flood flows of the perennial rivers to generate hydroelectricity by putting generating units of 5 MW, 10 MW or even 20 MW may be planned. This will help both better river management as well as water conservation for productive utilization. As it is, we take care of and maintain anything which is productively utilized. Thus, if we start generating power, the rivers will in the process get maintained and managed.
- v) Develop and maintain Dhars, Bahiyars, Chauras and Mauns for conservation of flood water for irrigation purposes for which a contour survey at 25-50 cm contour interval should be done and long term data of timings, depth and duration of flood intensity in different flood prone village be used for planning and construction of suitable structures.
- vi) It is believed that the Ganges cause erosion on the side of its left bank only. And almost all its tributaries excepting Jamune, Karmnasa, Sone, Punpun and Kiul rivers merge in Ganges from its right bank side. In the process a lot of siltation gets deposited on the right side creating narrow streams within the bed. If in such suitably selected places large anti-flood sluices across the

rivers are built then a controlled release of water in the Ganges will take place, and a considerable level of water would be maintained in the tributaries as well. For this a lot of studies and technical feasibility study would be required.

In fine, all the structural mitigation measures have to be selected and applied with other developmental programmes in the four zones on the northern side of the Ganges and productive utilization of water in view. Only then a positive approach to solve the plethora of flood mitigation problem could be taken care of and be properly managed.

Recently the farmers of Jhunathi Panchyat in Arwal district collectively decided to check dam the flow of water in Punpun river near Motepur. Since, they were suffering from drought for the last two years and had to struggle to get drinking water as hand pumps had dried and water table had gone down by 70 to 80 feet. The farmers had no choice left.

So, the farmers decided to dam Punpun River. The check damming of Punpun brought the level of water up in the river and made it to flow in the canal/rivulet sort of passage which covered on area of 20 kms. As a result of this damming of Punpun and filling of the rivulet with water the farmers of the area get sufficient water to irrigate their land. It also brought the water table up and recharged the hand pumps. The drinking water problem of the people was also solved to a large extent.

Shri Sitaram Sharma, a farmer of the area, informed that such practices were there during Zamindari days. But due to fragmentation of land, now nobody was there to take a lead and organize this annual exercise because it involved devoting time, putting in money as well as labour

Thus, the flood mitigation measures should ideally be based on extensive survey and study based policy decisions, to have river zone based planning, initiate and regulate the developmental activities with flood risk reduction in view and for flood proofing by adopting the traditional practices and applying the modern technologies.

This may involve:

- Traditional survey, data collection and GIS mapping of river basins, networks of rivers, rivulets and reverines.
- The extent of damages flood water has been causing in the worst cases
- How the river in itself can be doctored to remain without overflowing full.

Based on the above flood proofing measures a long term planning for key structures, sewerage system & human settlements are required to be done. For the human settlements in low lying areas small ponds at the four corners and middle of the settlements where the water would flow down and accumulate will be helpful in avoiding water logging in the area. A lot of ecological activities can

be built around those ponds so that the water storage may become a prized possession for the habitants and help in maintaining water table as well.

So far as the moderation of flood by using structural means to divert and store the flood water is concerned, the use of a host of rivulets that remain dry for eight months or so every year, the interlinking of tals and chauras, converting the abandoned curve courses of the rivers into reservoirs—all these together will help in holding the run-off of flood waters at the peak stage of the flood and help in conserving water during 'rainy days'

All the constructive flood proofing measures suggested above require to be taken keeping the 'side effects' in view. For example

- i) **Storing Flood Water** in reservoirs may help in reducing flood intensity, but the sedimentation caused by the stored flood water may subsequently reduce the capacity of the reservoir. As such, smaller reservoirs are often better choice than larger ones. For, then desilting of small reservoir becomes possible and can be undertaken periodically by the beneficiaries themselves.
- ii) **Channel Alterations** help in reducing the gushing of flood water and these should again be done with provisions for regular maintenance of the slopes in the channel, removing of debris and other obstructions, using natural vegetation for strengthening the sides of the channels and for using it as a source of promoting fisheries etc.
- iii) **Watershed Management** measures reduce overland runoffs from agricultural lands to streams or other water bodies by improving infiltration of rainfall into the soil, minimizing run-off and reducing the sedimentation that can clog stream channel or storage reservoirs. The measures to avoid it include maintaining trees, shrubbery and vegetative cover, slope stabilization etc.
- iv) The great hindrances created by the continuous embankments of road and railways without providing sufficient opening for quick passage of the flowing flood water, specifically from Sahebpurkamal to Katihar, from Muzaffarpur to Jhanjharpur and from Muzaffarpur to Sitamarhi are required to have a series of openings in the embankments for smooth flow of excess floodwater as the railways have done between Mokama and Kiul. For flooding is sometimes a boon for agricultural fields if the water drains out fast and for that plenty of opening in all

the road & rail embankments would be required. This may reduce flood damage risk in the region.

5.2.2 Mitigation Strategy :

Unlike earthquake, flood as a hazard affects its vicinity only. In earthquake the epicenter at Nepal boundary may destroy and reduce Munger township to rubbles. In floods, however, it will never happen that the river Gandak in spate will be flooding Darbhanga or Madhubani area. It is because the impact of floods as a hazard is area-bound which allows mitigation measures to be exact and specific rather than general and generic.

The mitigation strategy for floods as a hazard, therefore, will have to be shuffled from river zone to river zone depending more upon the nature of river rather than the nature of factors at risk. Consequently, the mitigation strategy has to be zonalised rather than generalized and should be based on the general characteristic of rivers.

The prime common characteristics of the Bihar Rivers are:

- (i) Instability in water flow and the tendency to shift their courses.
- (ii) Unsteadiness in the incidence of flash flood due to sudden heavy discharge from 'abroad'
- (iii) Destruction of banks and embankments due to problem of erosion.
- (iv) Problem caused by uncontrolled silting, and
- (v) Flooding of crop land due to rising level of river.

But all the rivers in Bihar do not have all these characteristics. Each one is characterized by one or two. For example, Gandak is notoriously known for erosion of its own banks as well as man-made embankments, Kosi is known for carrying huge amount of siltation and changing its course etc. The mitigation measures therefore have to be strategized on the basis of these prime characteristic of rivers in a particular zone.

- 1) **Ghaghara—Gandak Zone:** The total area falling in the zone is 15,91,140 hectares out of which 2,53,800 hectares in Ghaghara basin and 3,35,000 hectares in the Gandak basin area that is, a total of 5,88,800 hectare is flood prone.

Since, the characteristics of the river inundating the Ghaghra-Gandak region are mainly overtopping of banks, breach in embankments and

the problem of bank erosion, the mitigation strategy has to be based on reducing these incidences.

The type and extent of vegetation in the catchment area and on the bank of river control the stream formation. As such, the mitigation strategy in the Ghaghara-Gandak zone has to be:

- i) **River bank plantation:** (a) large trees with deep root systems in the **upper reaches**, (b) a good mix of trees, shrubs and ground cover that may bind middle reaches and (c) trees, shrubs and ground cover with matted root systems and flexible branches at the lower reaches. The plantation can be undertaken under the social forestry scheme of the state
- ii) Deepening of chauris and mauns that are plenty in numbers in the Zone and inter connecting the same with river Ghaghara and Gandak for intake of inundating water through natural 'dhars' and 'bahiyars'.
- iii) Exploring the possibility of setting up of hydroelectric power generating units of 5 to 10 MWs.

2) Gandak—Bagmati Zone: The total area of the zone is 12,32,000 hectare out of which 10,65,000 hectare area is flood-prone.

Since the characteristics of Burhi Gandak and Bagmati are:

- i) They have extremely meandering nature all along their courses.
- ii) After entering Bihar from Nepal, the flow of the rivers slows down resulting in the dropping its bed loads of sand and silt as a consequence of which the streams meander through serpentine courses.

These rivers are also notoriously known for causing devastating floods which gets further aggravated by its tributaries Lalbakia and Lakhandei. Although along the main course of Bagmati, Lalbakia and Lakhandei flood protection embankments have been built, even then the menace of flood continues in this zone.

The mitigation strategy in the zone has to be based on the tributaries of Bagmati-Lalbakia and Lakhandei. Keeping in view that the zone is also drought prone when the monsoon fails, the conversion of the tributaries into reservoirs and connecting them with local chauris, ponds and mauns well spread over Panchayat Samiti and Gram Panchayats may be taken up.

- 3) **Bagmati—Kosi Zone:** The total area of districts falling in the Bagmati & Kosi Zone is 11,60,080 hectare out of which 8,14,000 hectare area is flood prone. Apart from Bagmati & Kosi, the area has Adhwara Group of rivers that flow from the east of the Bagmati to the river Kamla which are normally divided into three groups.
- a) Adhwara, Yamuna, Sikaw, Burhand and Khirohi subgroup
 - b) Sigha, Murka and Rato sub-group
 - c) Dhons, Dhomane and the Darbhanga-Bagmati sub-group

Altogether 12 rivers flow in the Bagmati—Kosi Zone. All the rivers descend from the steep slopes of the Himalayas and reach almost level plains. Consequently, as their flow slows down, silt accumulates along their courses, and then the rivers start changing their courses.

The mitigation strategy in the wake of the above facts may consist of:

- i) Converting the abandoned course of the river bed into reservoirs with proper intake and outlet channels so that, instead of allowing the flood water to flow down, the excess water gets accumulated in these reservoirs..
 - ii) Since the Adhwara groups of rivers have relatively close embankments, the desiltation work may be undertaken on a regular basis. Also because silts they carry are supposed to be rich in minerals.
 - iii) the traditional practices of interlinking dhars, bahiyars, chauras and mauns should be studied and revived properly.
- 4) **Kosi—Mahananda Zone:** The total area of districts falling in the Kosi-Mahananda zone is 16,48,770 hectare. Out of these, around 15, 30,000 hectare is flood prone.

The whole of Kosi—Mahananda zone has a network of streams emanating either from Kosi or getting merged into it. Having been formed due to the coming together of seven streams each one originating in the high region of the Himalayas where there is endless snow and plenty of precipitation the River Kosi is traditionally known as **Saptaushiki**. As all the seven streams coming together to form River Kosi originate in the high and hugely spread regions of the

Himalayas, each one has a huge volume of water carrying a very high percentage of silt and flowing down with tremendous velocity.

In the Baraha region of Nepal, three rivers, **Tanber, Arun and Sun Kosi** join together to form the river Kosi. The point of confluence of the three rivers is known as Triveni. The Baraha region is the area where according to mythology, Lord Vishnu had incarnated as the Boar to save the Earth.

That the struggle for existence is intense in the region dates back to mythology is obvious. The formation of the Kosi from seven streams to three rivers to one is known. The huge volume of water flowing with high velocity, carrying a very high quantity of silt, is seen. The mitigation measures in the zone have to be devised, planned and implemented keeping the obvious, the known and the seen in view. And they have to aim at first, controlling the velocity with which water flows down; second, holding the silt from choking its flow which forces the river to changes its course; and third, making use of the volume of water flowing with high velocity.

Firstly, the plantation of bamboo is the only solution. It is said that the whole of Barah region was once a dense bamboo forest and the whole of Kosi-Mahanada zone was known for bamboo forestry. It happened because bamboo is known for holding soil together as well as for controlling the velocity of a stream.

Secondly, digging of deep pits within the bed of the river for the excess of silt to settle is a possible measure. However, it would require a dedicated team of skilled persons on local basis. This can be developed at the Gram Panchayat level with the help of capacity building training.

And for the third, the high volume of water, we have two options, first create smooth passage to the Ganges or to make use of it to generate electricity and channelize the same for irrigation purposes.

5.2.3 Status of Implementation of Flood Mitigation Measures :

Some of the above mentioned structural and non-structural measures have already been implemented in various river systems which have been able to mitigate flood menace of severe intensity in substantial area of the state. But a dependable system for all intensity of floods is yet to be brought in place. Because the flood proofing here and there and emergent

measures wherever required so far undertaken is not sufficient. Flood forecasting and warning system based largely on the catchment data in India so far and not including Himalayan region in Nepal and beyond is being used which is also insufficient. This is so as probably flow of required data from Nepal is not adequate and regular and also Nepal does not have rainfall and runoff gauging stations of required density in their catchment area. The required density of meteorological and hydrological stations, however, may be stated as:

(a) Meteorological observation Sites:

- Indian Metrological Deptt should establish at least one rain gauge station for every 500 sq km. of the catchment area.
- 10% of the total no of rain gauge stations should be self recording which however has to be increased to 20% as per the recommendation of RBA.

(b) Hydrological observation Sites –

- Stations of World Meteorological Organization (WMO)
- Ganges discharge site for every 300 sq.km in hilly above and 1000 sq. km. in the plain catchment.

As already pointed out storages with flood cushion on all North Bihar Rivers have not been created so far to cater for even part of the flood volume although few sites on some rivers have already been identified in Nepal long ago.

**5.2.4 Measures so far adopted on various River System: River system wise structural measure under implementation are as below :
North Bihar**

- (i) Ghaghra-Sharda Barrage (a tributary in U.P.)
- (ii) Gandak – Gandak Barrage at Valmiki Nagar, second Barrage at Gobindganj (Planned)
- (iii) Burhi Gandak – No structure except embankment (Mason Dam on one of the tributary is finalized so far but yet to be implemented)
- (iv) Bagmati - Karmahiya barrage (Nepal) Ramnage barrage- India and Noonthore Dam in Nepal (both planned)
- (v) Kamla - Kamla, Tetaria Dam (Planned- Nepal)

- (vi) Kosi – Kosi Barrage at Hanuman Nagar, Darmara barrage (India) and Kosi High Dam (Nepal) both planned.
- (vii) Mahananda- Bagdogra barrage (Planned) and Phulbari barrage (Planned- West Bengal)

South Bihar

- (i) Punpun — Punpun barrage (under Implementation)
- (ii) Sone — Indrapuri barrage, Bansagar Dam (M.P.)
Indrapuri Dam at Kadwan (Planned)
- (iii) Kiul — Kiul Dam
- (iv) Badua — Badua Dam
- (v) Chandan — Chandan Dam
- (vi) Karmanasa — Durgawati Dam (Under Constrcution)

Apart from these structural measures, certain intrastate and inter-State river links have also been planned which when implemented would also mitigate flood problem in these river systems to the extent relevant provision of flood water is used.

- (i) Gandak — Ganga link
- (ii) Kosi- Ghaghra link
- (iii) Kosi – Meehi link
- (iv) Bagmati — Burhi Gandak link
- (v) Adhwara Multipurpose Project with Kosi- Adhwara Bagmati link
- (vi) Bagmati second barrage at Kataujah near Muzaffarpur with linking to Kosi Adhwara-Bagmati
- (vii) Burhi Gandak – Bagmati link
- (viii) Punpun – Kiul - Harohar Link Improvement of outfall of Kosi in the Ganga.

5.2.5 The Factors at Risk :

The four river zones in which North Bihar has been divided provide a fairly homogenous base—from soil, population and floods point of view—to

strategies for mitigations and to select measures to reduce the impact of floods.

The typical effects of floods are on agriculture, habitations, life, livestock and property.

In the four river zones of North Bihar which has a total area of around 52,29,000 hectares gross cultivated area is 22080.27 hectares . Since, the flood prone zone is around 73.63% and highly flood affected area is around 36%, the agriculture affected in Bihar every year by floods is to the extent of those grown in 16257.70 hectares.

In 36% of the highly affected area of the State apart from agriculture, stored agri-products, 70% of Kutchha dwellings, where around 42% of the poor people live, and a host of infrastructure are liable to be badly affected which works out as: the total number of persons affected would be around 3,26,98,461 out of which 1,56,30,076 would be women, 58,53,402 children of 0–6 yrs. of age group and 1,18,36,842 would be SC/ST & minorities.

The total number of livestock affected shall be around 1,04,44,438 and poultry around 54,27,305.

The total number of houses affected or damaged or destroyed would be 55,05,644 out of which 31,63,823 would be made of Grass/Bamboo etc, 13,43,291 of mud and unburnt bricks etc. and 22,83,406 of burnt bricks , concrete etc.

5.2.6 Involvement of Govt. Departments :

During **Pre-Disaster Period**, the Department of Water Resources Department shall be the nodal organization for taking the prevention & mitigation measures into programme and activities, intonating the same with the help of Minor Water Resources, Agriculture, PHED and Rural Development Department with water management inputs for drought mitigation in areas already identified by Agriculture Department.

In doing so they should take technical assistance, if any, from the relevant institutions and experts.

5.3 The Typical Effects: 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.

- i) Economic impacts denote loss of production in farm sector and also in non-farm 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.
- ii) Environmental 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.
- iii) 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.

5.3.1 Mitigation Measures

There are three kinds of drought: meteorological drought, hydrological and agricultural drought.

- i) **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.
- ii) **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.
- iii) **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 yoked 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.

Bihar has all along been suffering from **agricultural drought** primarily because it lies on the cross-road of the West-Eastern coastal regions and the relatively dry continental region of the western plain, and partly because its soils are poorly drained, deficient in minerals and humus-content and at the same time, their moisture-holding capacity is also very low. Therefore, these soils require constant watering before the monsoon and after the monsoon. In fact, during the period of sowing of kharif crops, rabi crops and garma crops, soils have to be kept sufficiently moist by watering, otherwise the yield is adversely affected.

Thus, drought mitigation measures in Bihar have to be taken on three counts: water, soil and cropping.

- i) **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:

- a. Construction of underground reservoirs to escape the impact of evaporation
- b. Conservation of floodwater in the branches of mainstreams and the network of rivulets
- c. Creation of Anicuts or check dams to hold water in the river beds and make it flow through the canals for irrigation purposes.
- d. revival of ahar, pynes and pond systems of the past and maintain the same
- e. 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.
- f. Spring water harvesting by diverting hill streams through small excavated channels, called KULS for irrigation and domestic use.

ii) Soil Management: The other factor responsible for drought conditions in Bihar is the nature of soil for which the first and foremost measures to be taken are:

- a. 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.
- b. 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.

iii) 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:

- a. **Strip cultivation:** Consist of cultivation of different crops in different strips simultaneously.

- b. 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.
- c. 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.
- d. Alternate cropping:** In deficit and/or irregular rainfall situations, alternate crops requiring less irrigation like maize, toria etc need to be sown.

In the three rivers-zones that fall in South Bihar - Karmanase-Sone Zone (Bhojpur), Sone-Punpun (Magadh) and Punpun-Sakri (Angika) —the Mitigation Measures have to be long term ones. One of such solutions is the making of long canal parallel to the railway line from Karmanasa to Sone (Bhojpur Canal), from Sone to Kiul (Magadh Canal) and from Kiul to Sakri (Angika Canal). It may sound fanciful but a mathematical model based feasibility study may help in taking appropriate decision in this regard.

5.3.2 The Factors at Risk:

Unlike other hazards, drought does not destroy structures. It destroys the very base of life—the source of remaining alive: food; the primary source of livelihood: agriculture and the foundation of growth and development hope.

The population and livestock affected would be approximately 4,77,50,133 persons out of which around 2,28,24,873 would be women and about 85,47,825 children of 0–6 yrs. age ground SC/ST and minorities affected would be around 1,58,53,044.

5.3.3 Involvement of Government Departments:

During the pre-disaster period Agriculture Department shall be the lead department and Water Resource, PHED, Minor Irrigation shall be the major support departments. Together, the departments shall work out programme and activities for the areas identified as likely to be affected by drought.

Rural Development Department with its Water Harvesting, Water Shed and Water Conservation related schemes shall draw the priorities from Agriculture & Minor Irrigation Departments and strategise the implementation of the schemes accordingly.

Agriculture Universities and other specialized institutions and experts shall provide technical and expert support in identifying the drought prone areas and orchestration of programme and activities for implementation during pre-disaster period.

5.3.4 The Typical Effects: *High Speed Wind*

High Speed Wind is an atmospheric condition developed by the heat from the sea and driven by the high planetary winds resulting in a fierce energy swirling with vast speed. It is an environmental hazard which takes time to build but strikes suddenly. It is closely related to the cycle of seasons. It leaves its impact on trees, houses, animals, humans and free standing loose structures like poles, hoardings, roof sheets etc.

High Speed Wind are characterized by destructive winds, storm, surges and exceptional levels of rainfall which may cause flooding.

The destructive winds that emanate in the Indian Ocean blow anticlockwise and are highly destructive in nature. The major factors in the form of cyclonic surges consist of a fall in atmospheric pressure over the sea surface, the increasing effect of the wind, the heat at the sea bed, the formation of funneling effect, the angle and speed by which the storm approaches the eastern coast and the formation of tides. The load of humidity that it carries from the sea condensed into exceptionally large raindrops and giant clouds. The resultant large raindrops rapidly falling saturates the catchment areas and brings about sudden gush of floods. The typical effect of cyclones is on:

- i) Essential Services:** Essential services like electricity, water, sewage and disposal are disrupted or destroyed in the high speed wind prone regions.
- ii) Transport and Communication:** The falling of trees on roads, the falling of electric poles and mobile towers, disrupt traffic and communication.
- iii) Crops and Plants:** Cyclone, accompanied by terrific winds and torrential rains, causes great damages to standing crops and fruit bearing trees.

5.4 Mitigation Measures:

Since the formation of cyclones has a process which is open to observation and recording of its development and movement, they normally provide sufficient time to take protective measures. The factors of cyclone that call for mitigation measures in a land-locked state like Bihar are only two—the high speed wind and the gushing of rain. Its swirling gets almost subsided by the time it reaches the border area of Kishanganj touching Bangladesh. As such the major mitigation measures consist of:

- i) **Cyclone Shelters:** Provision of cyclone shelters for poor and marginalized people to take refuge.
- ii) **Awareness:** Creating awareness among the people for having properly anchored roofs in the houses where roofs are made of corrugated steel sheets etc.
- iii) Fencing village with strong rooted trees that function like speed-breakers for the winds and protect the settlements.

5.4.1 The Factors at Risk

The factors at risk consist of over 60% dwellings, 42.6% of the poor, and the infrastructure support system in 86% of the total area of Bihar. The population affected would be about 8,92,71,987 out of which 4,26,72,589 would be women, 1,59,80,716 children of 0–6 yrs. age group. The livestock affected would be 2,85,14,975 and poultry 1,48,17,405 approximately.

The dwellings affected shall be 1,50,29,563 grass thatched houses, around 36,67,367 mud houses and 62,34,063 approximately burnt bricks and concrete houses.

5.4.2 Involvement of Government Departments:

The lead department for High Speed Wind shall be the Department of Disaster Management. The support departments shall be Rural Development Department and Indian Meteorology Department.

5.5 The Typical Effects: Fire

Fire in itself has been the first element to spark civilization. It still is the soul of our kitchen and source of controlled heat & light within the confines of our houses. It along with water is the only element which can be put to most productive uses when in control. But when it goes out of control or assumes control, it causes devastations and becomes a hazard.

Causes of fire can be many but the devastations depend upon what fuels fire into a hazard. In Bihar the causes of fire are basically two—negligence of the poor and negligence of the well-offs. And in both the cases the victims are those negligent and their neighbourhoods.

The negligence of the poor results in the burning of clusters of hutments. Its movement is largely horizontal and casualties are the children, the old, disabled, women and those belonging to marginalized section of society.

The negligence of the well-off fire becomes hazardous due to short-circuit in high-rise buildings, apartments and causes loss of life and property.

5.5.1 Mitigation Measures

The mitigation measures for fire-hazards are simple—keep the fire away from what fuels it into a hazard. Normally it is always done. But sometimes due to human lapses or taking observance of norms lightly we pay a price in the form of devastation and destruction of life and assets. Such measures are :

- i) developing low-cost houses with non-flammable walls like mud, bricks and roofing like tin sheets properly fitted.
- ii) wiring of houses and buildings properly insulated and fitted with cut-outs, fuses and fire alarms.
- iii) placing easily operatable fire extinguishers at proper places in high rise buildings.
- iv) providing cluster—based fire extinguishers
- v) Providing sufficient number of fire extinguishers at cluster of hutments Gram Panchayat and Thana buildings
- vi) making it mandatory to have emergency exit facility in high rise office buildings and apartments etc.

5.5.2 The Factors at Risk

All the districts of Bihar are fire prone, specifically those places where host of marginalized sections reside in hutments huddled in huge clusters in rural areas and in slums in urban areas,. Being crowded, the negligent act of one household becomes the destiny of all others.

Being slow in assuming disastrous proportion, fire provides ample time for people to escape and opportunity to save and salvage their moveable property and possessions. As there are over 4,42,20,775 (42.6%) of the total population in Bihar living in hutments clustered together, a large

segment of population is at constant risk of losing their abode, possessions and poor man's cow: goat and poultry.

In cities multi-storeyed buildings not having adequate number of fire extinguishers at accessible places, occupants are at great risk of suffering from casualties and property loss. Those in upper storeys become more vulnerable because oxygen in air at this level moves freely.

It is said that Lord Budha had predicted that flood, fire and fury (mutual dissensions) will always plague Bihar. That the state has been suffering due to these is a common knowledge. But what is not commonly known that even the great Chankakya was conscious of it and gave it due weightage by devoting a full chapter on disaster like fire management in his book Arthshastra. The concept of keeping two buckets filled with sand and the third one half filled with sand and fourth one empty after every set of five dwellings was prescribed by him for safe living. The measure was subsequently adopted by the British and made mandatory to have these at every railway station and government building.

Specialized buildings like store houses, distribution outlets & petrol pumps have to have fire fighting facilities of the best kind for there is every possibility of fire spreading to the neighborhood and take them by surprise.

5.5.3 Involvement of Govt. Departments :

During Pre-Disaster Period in case of fire hazard Dept. of Home through its Police and Fire Service Department shall be the lead organization. Departments of Health and Disaster Management shall be the major support departments.

5.6 Man-Made Disasters:

With the growth and development of civilization, some sources of disaster have been added to those of the natural ones. Such man-made hazards are: Traffic Accidents, Industrial, Epidemics, and Terrorism. Of these Fire & Traffic ones are accidents, while others are incidents.

5.6.1 The Typical Effects: *Chemical and Industrial Incidents*

The industrial revolution gave a paradigm shift to human hopes and aspirations in the pursuit of which man inadvertently disturbed the very environment of which it was the part. Man unwittingly got shifted his existence from eco-system based to control-system based which happens to

be susceptible to all sorts of human failures. The eco-system could be disturbed to a limited extent for which it has its own corrective measures. The man-made control system, on the other hand, does not have any self-correcting mechanism and hence any disturbance in the system leads to disastrous incidents.

Bhopal Gas Tragedy was the consequence of such a failure of control-system. And such failures in chemical and industrial sector do keep happening. The typical effects of such happenings are:

- i) **disabilities** like blindness, deafness, paralysis and nervous disorders. In cases like Bhopal Gas Tragedy, the generation after generation bears the brunt of such incidents.
- ii) **environmental degradation** by polluting air, water and soil may create disturbances for the whole biological world
- iii) **human and animal casualties** by causing death, inflicting incurable diseases and disabilities
- iv) **Skin diseases and disfunctioning** of the immune system of the body.

5.6.2 Mitigation Measures

The mitigation measures for man-made hazards have to begin with the hazard-assessment of the possible incidents before such hazardous units are permitted to get setup. Such hazard assessments can be done in the following manner:

- i) **Probability Effects:** Chiefly done in a laboratory to test its effect on human health, air, water, crops, vegetation etc.
- ii) **Simulation Exercise:** Can be done on computers using mathematical laws of probability and conducting diffusion studies.
- iii) **Real Life Examples:** based on such units located elsewhere

The hazard assessment through these methods has to be done before the setting up of such a hazardous unit. After that, a sort of mitigation measures either to avoid such incidents or to give compensations to the affected persons may have to be formulated which may consist of:

- i) **Legal liability Framework:** holding the management responsible for the payment of huge compensation to affected parties or persons.

- ii) **Inventory Mapping:** by taking stock of the hazardous materials and processes involved so that threats could be assessed and safety measures checked.
- iii) **Land use Planning:** locating the hazardous industries in isolated place so that agriculture, human settlement, social and health infrastructure remain at a distance.
- iv) **Community Preparedness:** people in the locality remain alert, advanced warning, and be advised by the government agencies.

5.6.3 The Factors at Risk

In the event of chemical and industrial hazards, the factors at risk range from elements of nature to human settlement. It could be because of explosion, gas leak, waste discharges etc. The major factors at risk are:

- i) women and children, old and differently challenged, pregnant and lactating mothers etc.
- ii) land, water and air get polluted and disturb the ecological balance in a way that human settlements are forced to move far away.
- iii) the impact is not confined to any limited area. Since the elements of nature are affected, the impact of hazard spreads its impact through a long distance as well.
- iv) some chemical hazards may have term reactions and pass on its impact through inheritance.

Among chemical & Industrial hazards in a growing economy like Bihar disaster caused by hazardous industries are the one which requires growing attention. Bihar being an agro- based economy is comparatively less prone to such disaster.

However, Begusarai, Bhagalpur, Bhojpur, Gaya, Munger, Muzaffarpur and Patna are the industrial centres that require special mitigation and preparedness measures. Apart from these, East & West Champaran where most of the sugar mills are located and Katihar where jute mills and related enterprises are situated, shall require mitigation and preparedness and response measures keeping in mind the nature of enterprises the major hazardous enterprises have to have site based disaster management facilities and trained manpower.

5.6.4 Involvement of Govt. Departments :

During Pre-Disaster period Dept. of Labour Resources shall be the lead Department and the major support departments shall be department of Home, Industries and Disaster Management Department.

5.7 The Typical Effects: *Epidemics*

Epidemic is widespread occurrence of an infectious disease at a particular time with a tendency to spread further. Such occurrences are generally caused by poor health hygiene and sanitation system, pollution, weak constitution of the people and ill health of animals and birds.

The epidemic may spread slowly or suddenly. The carriers of such diseases or infections are known as **Vector**. They travel through air, water and some diseases like plague and malaria are carried by mosquitoes, fleas or rodents. Besides, human beings themselves are the greatest carriers of infectious diseases.

Each type of infectious disease produces its own typical effect known as symptoms, for example, fever, vomiting, loose motion etc that indicate the onset of such diseases.

5.7.1 Mitigation Measures

Mitigation measures to put epidemics on hold has to begin with a fresh look at health, hygiene and sanitation system followed by hazard assessment of communicable and infection diseases. The measures may consist of:

- i)** hospitalization, confinement of the patients and other containment measures
- ii)** coordination with various departments for identifications of patients, vaccination of the vulnerable section of society.
- iii)** control-room based implementation of preventive measures coupled with proper monitoring
- iv)** Enforcing situations that only properly trained personnel shall implement the measures and apply treatments.

5.7.2 The Factors at Risk

Epidemics as hazards have typical socio-economic overtones and are wedded to living conditions and possible human contact. As such the victims of epidemics are generally

- i)** **Slum dwellers** living in jhuggi -jhopdis lacking in sanitation and health facilities.

- ii) **Disaster Prone Areas:** the victims of disasters like earthquake, flood and drought who are forced to live in relief camps are grievously exposed to the dangers of epidemics. For, in such a situation who is living with whom is not known, chance of communicable or infectious diseases following a disaster become greater and require extra care and attention on these counts.
- iii) **Poverty** in itself is a suffering and has direct correlation with communicable and infectious diseases. Poorly nourished children and women fall easy prey to communicable and infectious diseases.
- iv) **Roadside Dhabas** and vendors selling food in open conditions and vegetable vendors washing vegetable in ponds etc., however, make one and all, rich and poor, equally vulnerable to diseases.
- v) The fast changing fashion of eating outside and at road side eating counters has rather generalized the vulnerability to one and all excepting the elite ones

5.7.3 Involvement of Govt. Departments :

During Pre-Disaster period the lead department shall be the Health Department and major support department is Urban Development and PHED with support from Municipal Corporation & Municipalities.

5.8 The Typical Effects: *Traffic Accidents*

Traffic related accidents can happen in air, on road and rails and water. Road accidents are daily happenings all over the world. Rail and air accidents also frequently happen. And the accidents happen every now and then. Some study has shown that number of deaths due to road accidents far exceeds the casualties from all hazards put together all over the world.

The traffic accidents are so quick and fast (excepting those related to water ways) that all depends on the drivers response time, on the one hand, and the set of mind of the other party involved, on the other. For, every traffic accident is collision in momentum. Therefore the prime cause of these accidents is momentum.

5.8.1 Mitigation Measures :

Since traffic accidents involve collision and momentum in which momentum is the key factor regulating speed is the first mitigation measure. The other one is the mental state in which drivers are while driving. Most of the traffic accidents are largely driver oriented and partly

external conditions oriented. Therefore, the mitigation measures too have to be driver and external conditions related. They are:

i) Enforcing Legal Requirements consisting of a set of do's and don'ts for two wheelers, light and heavy vehicles

ii) Providing directions for safe driving is the duty of the concerned government department. These directions consist of

- for the vehicle
- for the driver, and
- appropriate signs & signals along the road

5.8.2 The Factors at Risk

The factors involved in accidents are both internal and external. The risk involved, therefore, covers both.

(i) Internal factors: consist of those about the means of transport—the vehicle the driver and the driven.

(ii) External Factors: consist of people on the road, the other colliding factors, the road-side structure etc.

5.8.3 Involvement of Govt. Departments :

During Pre-Disaster period the lead department shall be Department of Transport & major support depts. shall be Dept. of Home with its Traffic Police, Police and Fire Department and Disaster Management Department.

5.9 The Typical Effect: Nuclear Hazards

The dropping of Atom Bombs on Hiroshima and Nagasaki was the maiden experience of nuclear hazards causing one of the worst man-made disasters in the history of mankind. Since then we have, if not dropping of another nuclear bomb, then certainly horrendous experiences in nuclear accidents. The accident at the site of a nuclear power station at **CHERNOBYL** in erstwhile USSR and another similar accident in Three Miles Island in USA and recently in Japan caused by Tsunami are worst examples. Besides we have a host of nuclear powered satellites hovering over our head the re-entry of which in earth's atmosphere on account of mission or control failure may expose us to radiation which will remain there for centuries.

As such, even if Bihar does not have any nuclear power plant or anything nuclear based, yet the danger of radiation is always lurking over our head in the form of these satellites.

In 2011 in Japan, a massive earthquake triggered Tsunami and the menacing Tsunami damaged the nuclear plants causing radiations. A combination of such natural and man-made hazards may result in multiple of disasters and leave people and nations maimed for a very long time.

5.9.1 Mitigation Measures

A source of Nuclear Hazards once created is there, like natural hazards, for all the time to come. It may be buried under sea or in deserts but it can never be neutralized. As such the only mitigation measure for nuclear hazards consist of observing mutual agreements not to make use of nuclear weapons and safeguard and protect the nuclear installations with tooth and nail. Beyond that nothing much can be done by way of mitigation.

5.9.2 The Factors at Risk

The factors at risk in case of nuclear hazards are the very existence of life, life nourishing environment, and the complexion of the mother earth.

5.9.3 Involvement of Govt. Departments :

The lead Department shall be the Dept. of Atomic Energy Govt. of India with DMD as a support department.

BBB

6. Disaster Preparedness

Disaster preparedness is disaster mitigation from the people side. It is to arm the stake holders to face the disaster impact squarely without feeling the pinch of it to the extent possible.

6.1 Disaster Preparedness: *Kind and Characteristics*

While formulating response plan, worse case scenario and trigger mechanism have to be kept in view while working out mitigation measures and strategy. For, this alone shall help in the formulation of disaster mitigation as well as disaster preparedness in a more comprehensive and responsive manner

Disaster Mitigation and Disaster Preparedness both are interrelated and therefore, have to be mutually supportive. Disaster Mitigation is preparedness from hazard point of view and Disaster preparedness is mitigation of disaster impact through people's and institutions' empowerment. It is to equip people and institutions with awareness, knowledge, skill, equipment and materials to blunt the impact of hazards.

6.2 Disaster Preparedness: *Measures*

The goal of disaster preparedness is to develop capacity and capability for SELF-HELP & MUTUAL-HELP at the community level and for PUBLIC-HELP at the institution level. The disaster preparedness justifies itself in the development of Self-Help and Mutual- help to the extent possible so that no Public-Help may be required. But, it is a dream out of which each disaster has jolted us to wake-up and find things entirely different.

The disaster preparedness are normally based on four constituents: Research and Study, Meticulous Planning, Capacity Development and Networking.

- i) **Research and Study** of hazards and disasters provides an understanding and a base for meticulous planning for preparedness.
- ii) **Meticulous Planning** includes creation of special setups, the set of programme and activities, the disaster preparedness has to have for capacity development and spells out specific role play for stakeholders.
- iii) **Capacity Development** prepares and empowers stakeholders to play their roles in the proposed manner and provides them with required equipment and material to facilitate their role-play

- iv) **Networking** helps in establishing linkages among the dedicated-to-disaster management institutions at various levels and among specialized institutions for extending required support.

6.2.1 Research and Study

Research & study is the bed-rock of all our knowledge and understanding. It helps us in knowing our subject in detail as well as in design. In the case of disaster preparedness, it provides us the facts and figures to work out a plan and formulate appropriate programme and activities. In that respect, apart from research and study on specific issues, hazard-wise disaster mapping helps in disaster preparedness.

A mapping is done with a premise and a point of view. In case of disaster mapping the premise has to be about the areas of impact and resultant effects and the point of view has to be the worse case scenario. Such mapping will be of great help in formulation of capacity development programme and activities on the one hand and devising the response plan, on the other.

6.2.1.1 Hazard Mapping: *Earthquake*

The typical effects of an earthquake are: the destruction of structures and damages to infrastructure. As a result of the destruction of structure lives are lost, property is damaged and services are disrupted. As a result of damages to infrastructure the supplies are lost. The development is reduced to naught, and all helps have to toil to reach victims.

The worst case scenario is the 1934 earthquake wherein houses along with inhabitants got buried in the yawning gap in earth, the whole station of Jamalpur got reduced to rubbles, the townships of Darbhanga, Muazaffarpur and Munger were completely gutted. And recently, in Sept 2011 in Sikkim earthquake, even after a week of the incident, helicopters found it difficult to reach the epicentre of the earthquake in the mountainous terrains.

6.2.1.2 Hazard Mapping: *Floods*

The typical effect of floods are: inundation, speed, depth and duration of stay of water, loss of life by drowning, falling of houses; loss of agriculture, stocked food grains, sources of livelihood, loss of livestock; the resultant scarcity of food, of drinking water and of clothes; excessive dependence on support and help for everything;

fear of epidemics, unsocial elements, exploitations; damages to social and physical infrastructures and above all, the trauma caused by loss and by fear of going back to resume life amidst ruins.

The worst case scenario is the Kusaha floods of 2008 when the river Kosi chose to flow where it flowed around hundred years before. In the process it swept away everything from its presence, annihilated all social distinctions and reduced everything to nothing. And recently (2011), the discharges from UP and MP bursted the River Sone into fury of floods so swiftly that those farming their field in the bed of the river found themselves marooned and prayed for their life.

6.2.1.3 Hazard Mapping: *Drought*

The typical effects of drought are: drying of land, loss of agriculture, loss of drinking water, shortage of food, death of livestock, excessive dependence on govt. supplies, loss of livelihood, excessive migration, excessive sufferings of those marginalized and deprived; women, children, SC/ST, BPL, old and sick and differently challenged.

The worse case scenario is the famine of West Bengal and the drought in Bihar in 1941. The case of West Bengal is horrendous where, it is reported, the hungry preyed upon their own to satiate their hunger. And, in Bihar the land of over two dozen rivers, people were forced to eat leaves and grass.

6.2.1.4 Hazard Mapping: *High Speed Wind/Gale /Hail Storm*

The typical effects of cyclones are on the loosely fitted and free standing structures. Its mighty wind just blows away and brings the free standing ones down. In the process there is loss of life and there are casualties. But the worst affected are the marginalized and the poor who are deprived of roofs over their head and find small possessions missing in action.

The worst case scenario can be the one blowing into Patna on 23rd of June 2011, turning day into pitch dark, uprooting age-old trees and breaking windows and glasses of building and homes and giving people a glimpse of the dooms day.

6.2.1.5 Hazard Mapping: *Fire*

Irrespective of the causes of fire, its becoming a hazard depends on factors that can be controlled. Therefore, the typical effects of fire as a hazard are: it destroys what helps it in becoming a hazard, the organic materials, it catches and spreads with the help of materials in close proximity. Sometimes, with the help of strong wind, it spreads by leaps and bounds also.

The worse case scenario of fire in Bihar is the usual ones: the burning of hutments in rural areas in almost all the districts of Bihar and the unusual one: the fire in the New Secretariat which destroyed documents, office equipments, furniture etc. in the top two floors. Both are instances of human negligence but one supported by nature: strong wind taking a spark to the thatched straw roofs, and the other supported by poor repair & maintenance resulting in short-circuit.

6.2.1.6 Hazard Mapping: *Man-Made Disasters*

Man-made disaster can neither be predicted nor mapped. It can be assumed that they will happen in manners that each time is different but result remains the same: the loss of life, property etc. There is no worse case scenario and yet examples have to be kept in mind like Rajdhani Express accident near Gaya, the air-crash near Patna airport, the capsizing of overloaded boats all over Bihar and the collision of vehicles happening every now and then.

Hazard mapping shall be done by Bihar Institute of Disaster Management with the active participation of the hazard wise lead departments. It will be done to identify the hazard wise vulnerable areas as well as for working out the prevention and mitigation programme and activities.

6.2.2 Meticulous Planning: *Programme and Activities*

Planning includes programme and activities, organizational setups for the conduct of programme and activities and role play of the various stakeholders. Meticulous Planning in case of disaster preparedness will include hazard wise formulation of programme and activities, other components remaining the same.

Programme and activities will include hazard wise awareness generation at the ground as well as at the institutional level, skill development for

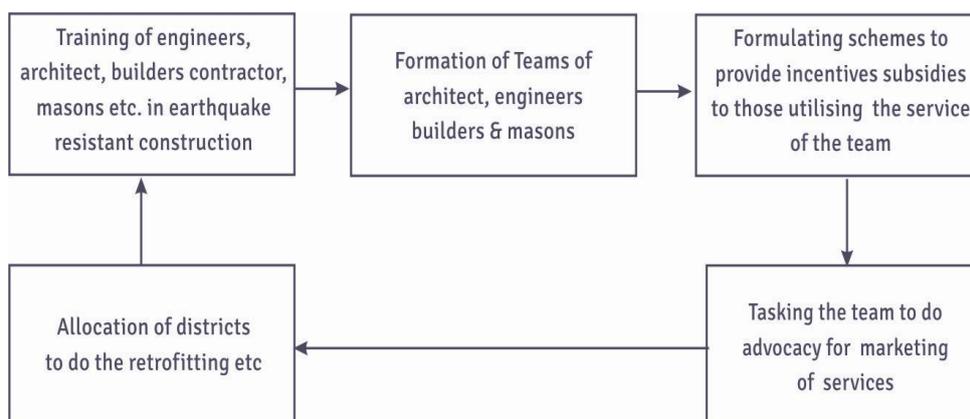
making use of equipment and material and training for team building and for being mutually supportive and self-supportive. Training and skill empowers functionaries and people with understanding and knowledge to act in a particular manner. Equipment and materials help in minimizing the loss of life and property to a large extent.

Hazard wise programme and activities can be:

6.2.2.1 Programmes & Activities: *Earthquake*

The earthquake related programme & activities for disaster preparedness shall be

- (a) At the state level: Training of architect, engineers contractors and masons in building earthquake resistant structures, and retro fitting of all existing structures.



For long-term preparedness, introduction of earthquake based courses in engineering colleges, and train engineers, architects, contractors and masons to do advocacy as well as marketing of services.

- (b) At the Institutional level like quick response from National Disaster Response Force/State Disaster Response Force, training programme for rescue operation, clearing of debris and providing training to Quick Medical Response Teams consisting of the medical, paramedical and police staff, training Panchayat wise groups of volunteers, social workers and representatives from CBOs & NGOs in rescue and relief.
- (c) At the District & Block levels training programme for functionaries in managing relief and rescue operations in association with civil societies, NGOs and local bodies to be

undertaken by apex training institution like BIPARD.

- (d) At the community level, program and activities to bring home to them the do's & don'ts.

It is illustrative, not exhaustive.

6.2.2.2 Programmes & Activities: *Floods*

- (a) At the State level, vulnerable district wise training of team of divers for search & rescue operations, at least 10 teams of 5 members in each vulnerable districts.
- (b) Training of district level functionaries in managing relief camps, relief distribution and making use of support services from the corporate bodies, civil society & NGO sectors.
- (c) At the Gram Panchayat level, training of volunteers and mock drills, deployment of life jacket and boats in adequate number, construction of flood of shelters, awareness creation etc.

It is illustrative, not exhaustive.

6.2.2.3 Programme & Activities: *Drought*

- (a) At the State Level training of irrigation engineers in water resource management and conservation programme; deputation of trained engineers during monsoon to apply the water conservation programme in drought prone areas.
- (b) At the district level implementation and monitoring of water conservation programmes and activities.
- (c) At the Gram Panchayat level orientation of communities in rain water conservation, digging and desiltation of ponds and wells, repair & maintenance of Ahars and Pynes.

It is illustrative, not exhaustive.

6.2.2.4 Programme & Activities: *High Speed Wind*

- (a) **At the State level:** formulation of schemes to provide financial support to the poor and the marginalized to have properly fitted roofing's.

Training of architect and engineers and masons in the low cost housing technology and construction of the same.

Formulation of schemes to support the trained technical personnel to get engaged in low-cost housing building programme on contract basis under Indira Awas Scheme etc.

- (b) **At the district level:** training of government functionaries in the monitoring and evaluation of earthquake and cyclone resistant low cost house construction.
- (c) **At the community level:** orientation of deprived section in repairs maintenance of low cost houses.

It is illustrative, not exhaustive.

6.2.2.5 Programme & Activities: Fire

- (a) **At the State level:** Strengthening and Expansion of fire fighting facilities upto thana level, making mandatory for all commercial buildings to keep fire fighting arrangements, regular mock drills to keep people aware about the fire hazards and update fire fighting preparedness and provide adequate number of fire extinguishers in all government buildings.
- (b) **At the district level:** Creating awareness among people to take adequate measures to avoid fire incidents, mock drills to keep response machinery in readiness and alert, monitoring and implementation of the programme and activities
- (c) **At the Gram Panchayat level:** Creating awareness among people to prevent fire incidents, and training volunteers in fire fighting.

It is illustrative, not exhaustive.

Preparedness related programme and activities shall be coordinated by DMD and implemented by Fire Services Department in association with other stakeholders such as, resident welfare associations, panchayat representatives, multi-lateral organizations, NGOs, CBOs and corporate agencies and municipal bodies.

6.2.3 Meticulous Planning: *Organizational Setups*

Programme and activities require organizational setup for planning, implementation and monitoring. While the agencies for planning and monitoring have to be the same for the sake of quantum and quality of programme planned and programme implemented, the implementation has to be better done by another agency.

Agencies associated in hazard wise planning of programme and activities shall be

- Department of Disaster Management
- State Executive Committee
- Concerned Government Departments

Agencies involved in the implementation of programme and activities will be

- District Collector
- District level Line Departments
- Specialized agencies / Local Bodies/PRI/PACS
- Civil Society
- NGOs

Agencies involved in the monitoring of the implementation of programme and activities shall be the same ones involved in planning but done through

- State and district Emergency Operation Centres
- District Disaster Management Authority
- District level line departments

6.3. Capacity Development

Capacity development is a resultant output of a set of inputs provided to increase understanding of issues and in the light of the increased understanding and appreciation, to act in a desired manner in a given situation. The response is not wooden but enlivened by the use of intelligence if the situation happens to be at variance. It is a modulation which will be required, in the context of disaster management, by the state level institutions, and government departments, the district level agencies, stakeholders other than the state and its agencies, and the people in the unit of a community.

6.3.1 Capacity Building: *The State level Institutions etc.*

The best test of good governance, the touchstone on which it is rubbed by nature and other stakeholders, is disaster management; the scale of disaster risk reduction of which prevention, mitigation, preparedness, response and rehabilitation are aspects, and each aspect has its own divisions and subdivisions. Disaster Management is also the test of leadership and its capacity to manage itself, its machinery and its resources. For the State, of which leadership and good governance are the two faces of the same coin, it must inspire its people with belief that it will ultimately take care of all their omissions and commissions and see them through all crises.

The high quality of leadership was revealed in responding to the Kusaha crisis of L₃ level, the national level disaster, caused by the Kosi menace. But the State's preparedness, its mitigation measures and its ability to manage disasters through its resources and institutions are yet to be tested.

Disaster Management is crisis management. Crisis management requires patience, advance planning and preparedness. And advance planning and preparedness lie in anticipating things based on which moves and steps are planned and rehearsed. Such moves and steps for the State shall lie in forming statutory bodies and making them functional and efficient by having well qualified and active experts and members, arming its departments with officers well trained in disaster management and in wedding developmental initiatives with disaster mitigation inputs, and creating sufficient space and facilitating training facilities for other stakeholders to play their chosen role in the expected manner.

The bodies required to be strengthened/ constituted by the State are:

- i) Bihar State Disaster Management Authority
- ii) District(s) Disaster Management Authority and
- iii) State Emergency Operation Centre
- iv) Bihar State Institute of Disaster Management
- v) District Emergency Operation Centres

The other stakeholders for whom the State has to create space and facilitate training in preparedness are

- (i) The Corporate Bodies
- (ii) The Professional Bodies
- (iii) The Specialized Institutions

- (iv) The State-level NGOs
- (v) Multi-Lateral Agencies
- (vi) The Panchayati Raj Institution, Urban Local Bodies, Municipalities and
- (vii) Media

In order to keep these institutions and stakeholders well prepared to respond to any disaster situation, following measures are required to be taken by the State:

- (i) Defining their roles and responsibilities
- (ii) Orientation in preparing disaster mitigation and preparedness related action plan.
- (iii) Formulation and conduct of programme and activities to build their capacity for hazard-wise preparedness
- (iv) Organizing disaster site visits and placing them to have first hand feel about realities at the ground level.
- (v) Facilitating interaction with other specialized institutions / stakeholders on a regular basis.

6.3.1.1 Roles and Responsibilities of the Statutory Bodies

Well defined roles and responsibilities help in focused planning, coordination and implementation of programme and activities. For the statutory bodies provided in the Disaster Management Act, 2005, they have been elaborately stated as follows:

A. Statutory Bodies

i) State Disaster Management Authority

Powers and functions of State Authority- (1) Subject to the provisions of this Act, a State Authority shall have the responsibility for laying down policies and plans for disaster management in the State.

ii) District Disaster Management Authority :

Powers and functions of District Authority - (1) The District Authority shall act as the district planning, coordinating and implementing body for disaster management and take all measures for the purposes of disaster management in the district in accordance with the guidelines laid down by the National Authority and the State Authority.

B. Government Departments:

The Govt. Departments, in order to work for disaster resistant development as well as for disaster prevention, mitigation & preparedness, shall

- (i) create specialized setup, Disaster Management Cell within the Dept. and man the same with senior level officers drawn from key depts..
- (ii) work out disaster management plan on annual basis.
- (iii) intonate developmental schemes with disaster mitigation measures.
- (iv) allocate funds for the disaster related programme and activities.

In order to do all these the capacity building inputs required for the officers manning the DM cell in each dept. shall be

- Orientation in the State Disaster Management Plan
- Identification and selection of mitigation & preparedness measures
- Training in intonating developmental schemes with disaster mitigation measures.
- Preparing financial estimate for the departments DM Plan.

As such, these departments have to be thoroughly groomed up in disaster preparedness exercise so that their participation in disaster management is with full understanding and knowledge.

In order to perform the task, the DM cell in each department shall have specially educated and trained functionaries who would go through the exercise of formulating programme and activities and intonating developments schemes with disaster preparedness/mitigation inputs.

C. Other Stakeholders :

The stakeholders other than the government are conglomeration of a variety of organizations from different sectors. But, at the time of disaster, they come forward to provide financial, material and manpower support that more often than not become surplus/extra/additional. In order to avoid this, there is an urgent need to provide them space and specify their roles and build their capacity so that they may act as a part of the larger team.

The roles that they may happily play and comfortably accept be:

- financial support
- support in the form of equipment and material.
- Manpower support in relief distribution and managing relief camps
- Adopting a Gram Panchayat for the implementation of mitigation and preparedness measures.

For these, the capacity building inputs required for other stakeholders could be:

- Orientation in disaster management
- Orientation in equipments and materials requirements in managing disaster caused by various hazards
- Training of designated persons in relief distribution and relief camp management
- Training in adopting a Gram Panchayat for the implementation of mitigation and preparedness measures.

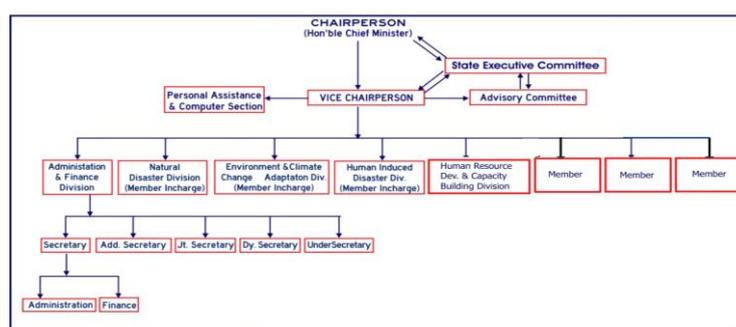
D. The Specially Created Institutions

The Disaster Management specific institutions shall cater to the specific requirements of disaster management. As such apart from their orientation in the State Disaster Management Plan and familiarization with various stakeholders with different roles, these institutions shall be resource centre for capacity building of other institutions and departments.

Capacity of all these statutory bodies, government departments and state driven organizations to perform largely depends upon their organizational structure and the kind of human resources they have. Between the two, organizational structure is more important.

For example, the organizational structure of the State Disaster Management Authority shall be:

Organizational Structure of BSDMA*



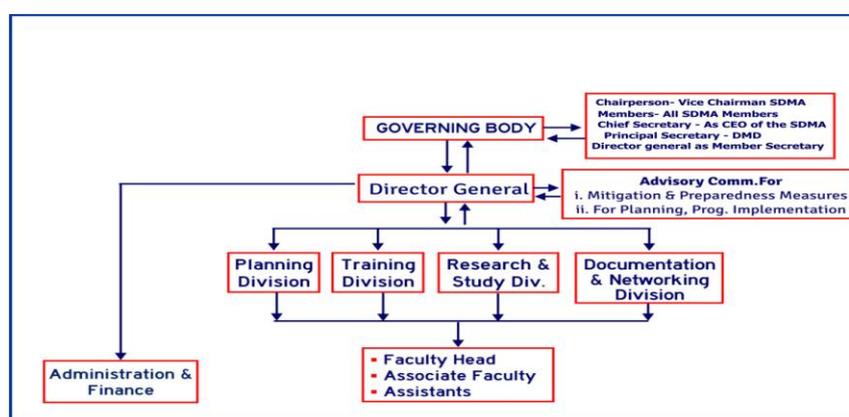
*The organizational structure has been drawn on the basis of provision made in the Disaster Management Act, 2005 on the

one hand and requirements of the factors included in the plan. It is, however, indicative and not binding

The Members of the State Disaster Management Authority shall be drawn from sectors related to disaster management and key sections of stakeholders. They shall conduct research & study in their respective hazard specialization area and make recommendations about the mitigation, preparedness and coupling of development with disaster mitigation measures. They shall organize interaction Meets, Workshops and lectures on specific hazard based issues. They shall keep the stakeholders including government functionaries updated on development and disaster related issues.

A specialized institution for training, study and research in disaster management, Bihar State Disaster Management Authority (BSDMA), should be established at the State level on the pattern of National Institute of Disaster Management (NIDM).

Tentative Organizational Structure of BSIDM

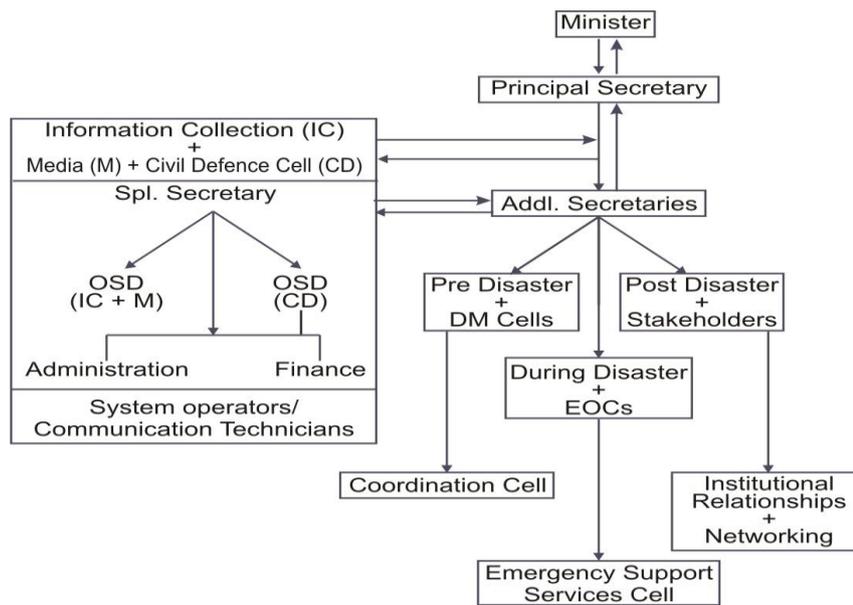


BSIDM shall be a dedicated institution to undertake research and study, need assessment, and formulation of modules of programme and activities. So it should have full time faculty with panel of resource persons who would be experts in the specific field of study.

The BSIDM shall map hazard wise and district wise prevention, mitigation and preparedness related programme and activities and provide necessary inputs to the DMD for planning, implementation and monitoring during pre-disaster period.

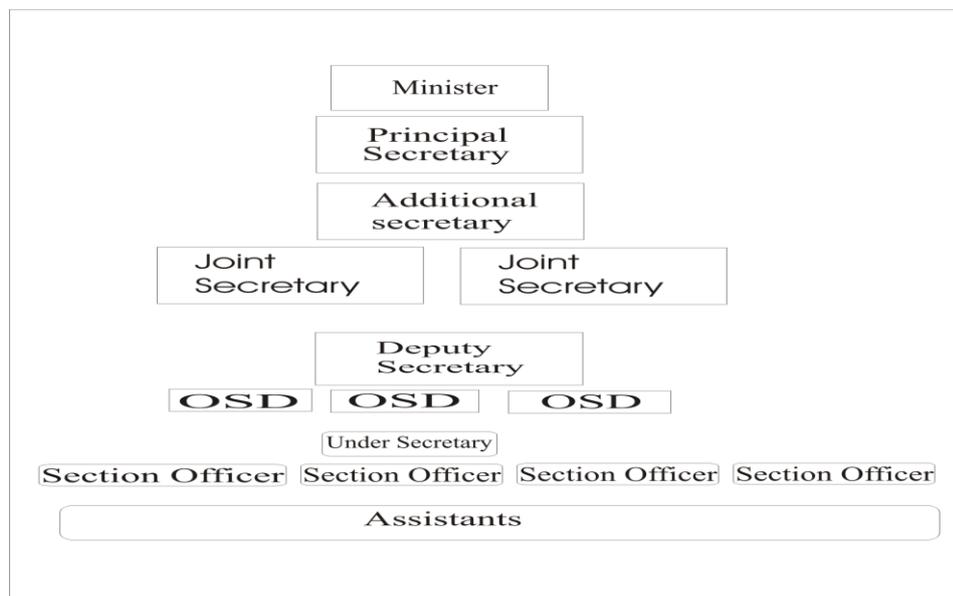
Disaster Management Department shall be strengthened by adding professional staff to make it run as a more efficient and professionally managed government Department.

**Suggested Organisational structure
of
Disaster Management Department**



**The organizational structure has been drawn from the Disaster Management point of view, on the one hand, and other factors included in the Plan. The positions, however, may be named as per the govt. norms. What is important is the functioning of the Department to manage disaster risk reduction.*

**Present organisation structure of
Disaster Management**



Presently Disaster Management Department is structured like any other government department. So long as its sole business was relief distribution, there was no need to change that. But with the paradigm shift from relief distribution to disaster management its role has become multidimensional, its concern has become multispectral and

its dealings spread over stakeholders of varied hues and dimensions. In order to take all these in its stride, the Disaster Management Department has to restructure its setup to perform the designated roles in a well orchestrated manner. The Department shall be instrumental in:

- ❖ Setting-up two specialized state-level institutions –the State Disaster Response Force on the pattern of NDRF and a Bihar State Institute of Disaster Management (BSIDM) to support in devising preparedness, mitigation and response measures.
- ❖ Setting up the Emergency Operation Centres (EOCs) at the state and district level, creating required infrastructural facilities and manning with qualified and competent professionals to run the Centres on 24×7 basis and assigning specific roles and responsibilities to EOCs during L₀, L₁, L₂, and L₃ times.
- ❖ Encouraging other stakeholders to come out of the confinement of relief distribution and participate in the whole gamut of disaster management exercise—from preparedness to restructuring and create sufficient space for others.

In order to work on the above line DMD may have to hire the services of experts and professionals for which following measures shall be required to be taken.

- i) Orientation of the Hon'ble Cabinet Ministers including the Hon'ble leader of the Opposition and the Hon'ble Member of the Legislative Assembly and Legislative Council in disaster management as an exercise, briefing them about the State Disaster Management Plan and informing them about the roles expected of them to play in all the four stages of disaster risk reductions, mitigation, preparedness, response and prerequisites.
- ii) Orientation of the members of the State Executive Committee in monitoring the activities of the Depts. EOCs and DDMA.

6.3.2 Capacity Building: *The Institutions*

There are six institutions involved in disaster management. They are BSDMA, DMD, SDRF, BSIDM, DDMA and EOCs, All the members and functionaries of these institutions shall be briefed about

- The disaster profile of Bihar
- The State Disaster Management Plan
- The roles and responsibilities of the respective institutions in all the four stages of disaster management
- Other stakeholders /players.

Since they shall be specialized institutions dedicated to disaster management they shall be expected to work out and organize their own capacity building programme and activities. But it is required to be focused and stressed that true test of their capacity shall lie in incapacitating communities to the extent that they entirely come to depend on self-help and mutual help.

6.3.3. The District Administration, having support from DDMA, shall work out its own district level Disaster Management Plan, its mitigation and preparedness need, the plan implementation strategy and its upward linkages to the State and downward linkages to the communities.

From the State side, the officers shall be oriented in:

- the organization of District Disaster Management Authority, its functioning, its roles and responsibilities, the making of District Disaster Management Plan, the involvement of local bodies in the plan preparation and implementation.
- the formation and running of Emergency Operation Centres at the district and panchayat levels, the modalities of its functioning, its roles and responsibilities at Lo, L₁, L₂ period.
- the upkeep of equipment and materials and management of stores and manpower.

All these orientations through well structured programmes are specifically required because of the whole exercise of disaster management still being relief centre.

6.3.4. Capacity Building: *District Administration*

District Administration has a statutory body—District Disaster Management Authority at its own level to formulate disaster management related plan and, together with the state-level plans, implement the same.

In fact the district level departments, commonly known as line departments, are the eyes and ears, hands and feet of the state level departments.

In order to function in a desired manner it should have two cells under Chief Executive Officer: Planning & Monitoring Cell and Programme Implementation and Training Cell.

As such, the district level functionaries shall be specifically groomed in the implementation of programme and activities, in their monitoring assessment and evaluation, and in organizing rehearsal and drills, through local bodies, at the community level. Their capacity building shall be of that level so that they become resource persons for imparting education and training programmes at the community level.

Apart from their role in disaster preparedness, they being the nearest respondent on behalf of the state, the district level functionaries shall be specifically encapacitated to respond to any incident with ownership and to contribute in a personalized manner in the incident management at the ground level.

6.3.5 Capacity Building: *Other Stakeholders*

Stakeholders in disaster management other than the state, from ground level upward, are the communities, PRIs, the local bodies, CBO,s & NGOs, the block level functionaries, the District administration, the Corporate bodies. Of these the PRIs are the constitutional bodies and have well defined roles to play in disaster management.

6.3.5.1 Capacity Building: *Communities*- Communities are the victims as well as first respondents of any disaster. As such, disaster preparedness of a state is required to be measured in terms of community preparedness. But, before preparing people, the state itself, its machinery, its concerned institution, its functionaries at all level shall have to be prepared.

That is, before the disaster preparedness is initiated at the community level, the Gram Panchayat bhawans shall be in place and functional, the District Disaster Management Authority, the District level Emergency Operation Centre, the District Disaster Management Plan shall be ready; the State Disaster Management Authority, the State Disaster Response Force, the Bihar Institute of Disaster Management and State level Emergency Operation Centre all shall be ready to get engaged to support community empowerment .

However, disaster preparedness of the communities shall consist of:

- i. Imparting knowledge and understanding about hazard-wise typical effects of disaster
- ii. Typical effect wise how they should prepare themselves to reduce risk and cope up with the same.
- iii. How they have to prepare themselves to see through the emergencies.
- iv. How they have to prepare themselves for SELF-HELP
- v. How they have to prepare themselves for MUTUAL-HELP.

These inputs shall be provided in small, homogenous groups at the community level, in schools, to panchayat representatives, in Gram Sabha and always end up with constituting a team of young community level volunteers to keep interacting with the groups at regular intervals and provide support at the time of disaster.

With each package of inputs, the team of young community level volunteers shall be provided with emergency kits, first-aid kits, life-saving kits etc. so that the volunteers get separately trained in operating/making use of them during disasters.

Hazard wise disaster preparedness of the communities shall consist of the following:

- A. Earthquake:** Since earthquake destroys structures which in turn kill people, the preparedness of the communities shall revolve round the kind of structure they are residing in.

"It is thus seen that the masonry house constitute 84.7% of the total housing units.... It has been observed that under the action of moderate to severe earthquake occurrences (e.i. Latur 1993, Chamoli 1999, Kachchh 2001 and J& K 2005) the masonry building performed the worst, causing the largest loss of lives as well as the properties of the residents. Hence, it is considered that protection of such building will lead to reduction of vulnerability of the buildings and their occupants ..." — Prof. A. S. Arya, "Seismic Assessment of Masonary Building", Journal of South Asia Disaster Studies, Vol.1, No-1, Nov.2008

Apart from awareness about retrofitting done, the non-structural preparedness measures shall consist of:

- i. Awareness about the typical effects of earthquake as a hazard, knowledge about proneness of the area and residence one is living in ,

- ii. sharing of the knowledge with family members and preparedness measures: how and where to take refuge under table or in a nook or corner of the house, move away from glass windows, bookcase and unsecured heavy object.
- iii. know the location of main switch in the house
- iv. not to rush out of house if an open space is not there.
- v. get furnishings and household appliances properly fitted.
- vi. keep a torch light , mobile phone and a first aid kit within reach
- vii. organize a team of young volunteers in rescue, debris removal, passage clearing operation as well as relief operations.

B. Flood: Since the typical effects of floods are : inundations, seasonality, velocity and depth of water, the scope for disaster preparedness for communities is larger than in other forms of hazards. The preparedness shall be at the onset of the rainy season in the form of:

- i. remaining alert for the early warning
- ii. packaging of dry food stuff for the family + a can of drinking water
- iii. ready to shift to higher places like embankment etc.
- iv. keeping women and children mentally prepared for shifting
- v. remaining in contact with the local volunteers for help

C. Drought: Since onset of drought is very slow and its typical effects directly related to agriculture, the preparedness on the part of the people will consist of

- i. developing a culture of water harvesting and storage in the drought prone areas
- ii. promoting social forestry in the area
- iii. protecting and channelizing the source of water like streams, river in the locality.
- iv. economizing water consumption
- v. selection of crops suitable for drip irrigation
- vi. arrangements for alternative source of drinking water

D. High Velocity Wind: Formation of cyclone is a long process, its movement is largely predictable but its onslaught is, for the people in general, sudden. Its destructive wind, storm and rain make the hazard specifically an agony for the poor. The preparedness on the part of the poor and marginalized would consist of :

- i. to keep the roof of their hutments firmly tied
- ii. to remain alert for warning
- iii. to orient their family members about high speed wind and what they are expected to do.
- iv. avoid keeping anything heavy or sharp on roofs of hutments
- v. identify an alternative and safe place to take refuge in case of emergencies.

6.3.5.2 The Panchayati Raj Institutions

i) The Panchayati Raj Institutions are the local bodies nearest to the people in the rural areas. Within the framework of the Bihar Panchyati Raj Act, 2006 itself, PRIs at all the three levels –Gram, Panchayat, Panchayat Samiti and Zila Parishad- shall play the seat anchor role in disaster management.

(a) Gram Sabha can form as per Article 10 (A) of the Bihar Panchayati Raj Act, 2006, more than one Vigilance Committees. One Vigilance Committee for Disaster Management can be formed and approved in Gram Sabha

ii) As per Article 2, Gram Panchayat has been given power and responsibility to organize relief work during natural disasters. Apart from this, at serial number 6 of General Work is stated "Collection of essential data of the villages"—under this provision Gram Panchayat can get collected disaster related data of the villages" which can be an authentic basis for preparedness and mitigation measures.

Apart from these, in Article 33 special provisions have been made for Gram Panchayats to constitute a Gram Raksha Dal' under the leadership of Dalpati to guard the villages during normal days & to protect people from suddenly happened event, fire floods, breach in embankments, collapsing of bridges etc. For disaster management at the Gram Panchayat level the Gram Raksha Dal can be trained and groomed as disaster response force.

(b) At Panchayat Samiti level, as per the Article 42 of the Act, upto 25000 rupees can be sanctioned for immediate relief distribution among the victims of disaster.

Beside as per Article 47 of the Act, it can request Zila Parishad for required help by passing resolution to that effect in a specifically called meeting of Panchayat Samiti

(c) At Zila Parishad level, as per article 69 of the Act, upto Rs. 1 Lakh can be sanctioned for relief work. Beside the Article 73 of the Act empowers it to ask for required help from government departments.

Keeping in view the authority reposed in Panchayats, a focused training of the elected representatives of PRIs in disaster management is one of the most essential measures to be taken. Their capacity building shall be through training, orientation in supervising preparedness and mitigation measures, managing the Emergency Operation Centre at Gram Panchayat and ensuring the participation of communities and CBOs in disaster management related training & exercises. Their orientation has to be in

- the preparedness and mitigation measures planned in their Panchayat.
- expected contribution and role play from the PRI representatives
- constitution of Gram Raksha Dal
- managing Gram Raksha Dal during L₀, L₁ & L₂ period

Their training shall be in

- Site selection of shelter and making advance preparation for the support like selection of volunteers, distribution of duty etc.
- Awareness Generation about disaster among communities
- How and why to keep people reminding about early warning system participation in preparedness drills etc.
- How and why to keep collecting contact numbers and keep them updating for having a good network both for information dissemination and support solicitation.

Just as each government department has to make disaster management plan of its own, similarly selected representatives of each gram panchayat be so educated and trained that they may prepare disaster plan of their own Gram Panchayat on the basis of self-help and mutual help and by making use of Gram Raksha Dal.

6.3.5.3 The Local bodies: CBOs and NGOs

The local community based organizations, the civil societies and voluntary organizations are expected to be quite helpful in disaster preparedness because of their regular interaction with the local communities and their knowledge and experience of the local area and happenings there. Grooming of such organizations and social workers and making use of their services in disaster preparedness mitigation, response and rehabilitation shall be of immense help in disaster management specifically in handling marginalized and vulnerable groups like women, children, old and differently challenged. The kind of training required to be given to this group of stakeholders shall be:

- a) The forms of hazards the area is vulnerable to, its typical effects, the mitigation measures the preparedness required; response mechanism.
- b) The skills to help the injured, the wounded, the socially deprived section of society, women and children and old people etc.

Orientation in data collection, networking and keeping contacts alive.

6.3.5.4 The Block level functionaries are the terminal points of the long chain of government functionaries. Being nearest to the communities in general their positioning is of extra significance. So, these functionaries are required to be groomed in three respects as government functionaries reporting to district administration, as linkage with Panchayat Raj Institutions on the one hand and local CBOs, NGO on the other and as government functionaries in touch with communities.

- (a)** As government functionaries they shall be given orientation in
- Disaster Management
 - State & District Disaster Management Plan.
 - Their position and role-play in mitigation, preparedness response
 - Supervision and monitoring of the implementation of mitigation and preparedness measures
 - Upkeeps of all equipment & machinery
 - Data collection and dissemination of information
- (b)** As linkage with PRIs, CBOs etc.

- Planning, scheduling and implementation of awareness generation, training and skill development programmes
 - Holding of periodic meetings, gathering of information, data collection etc.
 - Keeping in touch with communities
- (c) As government functionaries in touch with people, they shall be specially oriented in
- responding to road and boat accidents
 - the incidents of local fire
 - protection of sensitive structures

safety of vulnerable groups like women, children, old and differently challenged.

6.3.5.5 The Corporate Bodies and state level civil societies shall be groomed to provide regular support in managing disaster risk reduction in general and mitigation and preparedness in particular. For that, suitable space shall be created in the form of funding certain preparations, purchase of equipment and machinery, awareness generation programme and activities, adopting Block/ Gram Panchayat, donation, cost of certain consultancy services, cost of workshop interaction meets etc.

As it is, as a part of their corporate social responsibility, they make rich contributions in relief and rehabilitation work, which is, although timely, but temporal in nature. But instead of relief distribution, their help in implementing and managing a bunch of two to three worst affected Gram Panchayats, in implementing mitigation and preparedness measures with freedom to include some additional inputs from their own side, that kind of participation shall not only set a perfect example of public private partnership but also bring some freshness of approach in the implementation of mitigation and preparedness. For that the corporate bodies and others shall be given

- orientation in State Disaster Management Plan.
- a detailed briefing about the kind of space available for them to contribute on a regular basis.
- some modalities to have periodic interaction.

6.3.5.6 Multilateral and Bilateral Agencies provide adequate support in kind and cash at the time of disaster. Seldom these agencies have been approached for providing support in the

implementation of awareness building related programme and activities.

Karnatak has already initiated this kind of support and got World Bank support in setting up Backward linkages for Early Warning System and Data Processing Centre.

6.4 Networking

Networking stretches one's reach to a great extent and charges one with confidence beyond comprehension. It could have as many basis as there could be. In disaster management, networking could be on the basis of information, service, support and institutional.

6.4.1. Networking: Information

Information dissemination is a crucial part of disaster management. For that strong networking may be set up with:

- ❖ National Geological Research Institute, Patna
- ❖ Indian Meteorological Department, Patna
- ❖ National Remote Sensing, Agency, Patna.
- ❖ National Informatics Centre, Patna
- ❖ Bihar State Remote Sensing Agency
- ❖ National Emergency Operation Centre

6.4.2 Networking: Service.

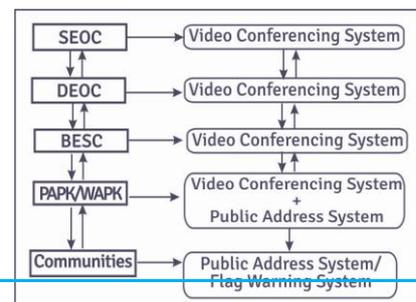
For service sector, networking with the following institutions:

- ❖ National Institute of Disaster Management
- ❖ Indian Medical Association
- ❖ National Disaster Response Force
- ❖ Council for Scientific & Industrial Research
- ❖ Indian Council for Agriculture Research

6.4.3 Networking: Support

Support is largely in terms of equipment, materials and trained manpower. For that networking has to be with:

- ❖ Armed Forces
- ❖ Railways



- ❖ Large industrial houses
- ❖ Medical Colleges & hospitals
- ❖ Multilateral and Bilateral institutions
- ❖ Bharat Sanchar Nigam Limited.

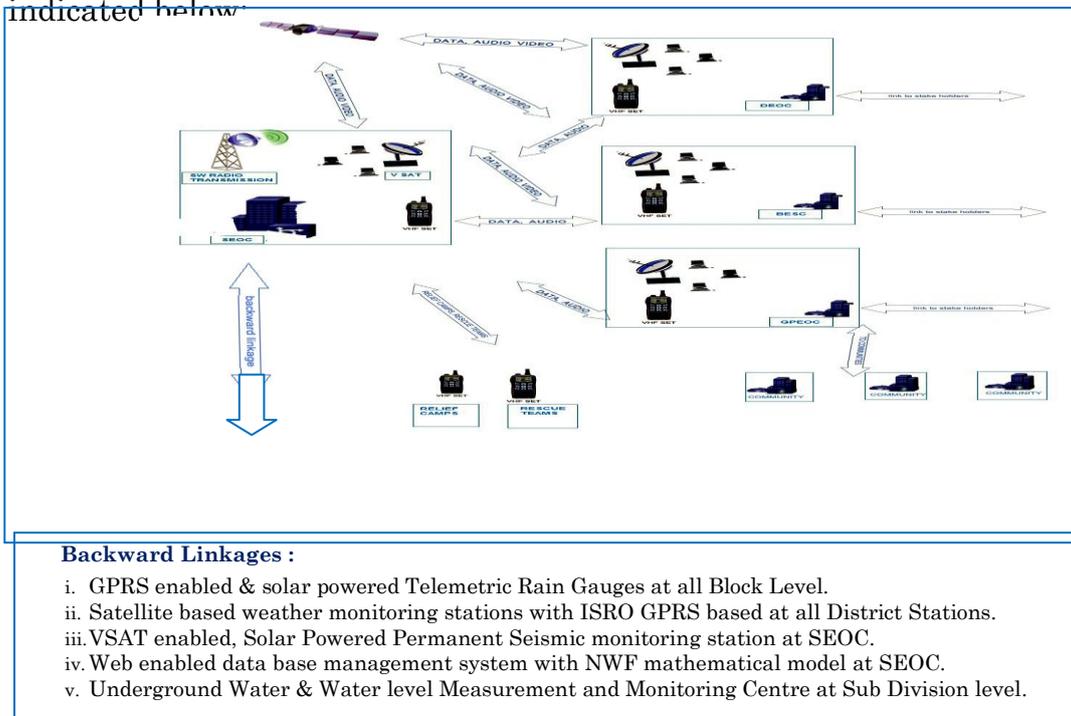
6.5 Early Warning System

They say forewarned is forearmed. Early Warning System does the same. It provides us time to get ready to take shelter, to save life, property etc. Since, its objective is risk reduction, earlier the warning is received, the better.

Early Warning System for being efficient and timely has to have equally efficient backward linkages. The more elaborate and designed the backward linkages shall be, the more accurate data processing will be and timely the early warning.

Early Warning System is the crux of disaster preparedness and response. Since almost all the districts of Bihar are prone to floods or high speed winds, the hazards that provide sufficient space in time to deliver early warning, the efficient use of the system assumes special significance in the given perspective.

The set up created for Early Warning System in the Disaster Management plan is as indicated below



That is, the State Emergency Operation Centre is linked with the District Emergency Operation Centre and further down to the Panchayat Apada

Prabandhan Kendra through two way audio-video communication and data collection(V-Sat) and two way audio communication and data collection (VHF) and processing system and one way communication system (SW/HAM Radio). Such an arrangement facilitates the supervision and monitoring of mitigation and preparedness measures during Lo period. EOCs get converted into a channel for data collection and monitoring, making communities aware of the disaster risk reduction measures being taken in their panchayat and what kind of vulnerability and risks they are heir to.

Beside, the Panchayat Emergency Operation System being located in the thick of communities, the services of the same could be utilized for all sorts of data collection and information gathering for the formulation of developmental schemes and plans.

During L₁, L₂, L₃ period the system will, apart from delivering early warning, provide day to day position, support in search and rescue and movement and positioning of the victims.

The system suggested also provides for networking with support services, keeping in touch with search & rescue team, relief camps, onsite camp office, service providers so that required instructions be given to them from the control room, that is, State Emergency Operation Centre, by the Incident Commander directly.

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7. Sankalp Kendra

A Concept in Community Based Disaster Management

7.1 The Bedrock of the Concept

Sankalp Kendra is an integrated development-cum-disaster management set-up at the Gram Panchayat level. Its visualization has found precedence in the raised platform making scheme under Flood Proofing Programme of the Ganga Flood Control Commission. Rather, it is a far comprehensive version of that programme. It is a wedding centre of pre and during disaster activities shall be the work station for the people during the pre-disaster days and shelter, relief and support centre during disaster days.

7.2 The Concept

Disaster Management shall always be a touchstone for the State's concern for the people, on the one hand, and its disaster risk management abilities on the other. It shall always be a touch stone for the people's capabilities of self-help and mutual help, on the one hand and their reduced dependence on public help, on the other.

7.3 Community Based Disaster Management

Disaster Mitigation, Preparedness and Response, that is, Disaster Management, is intrinsically related to attitude to life, mode of living and culture of concern. It is the concern for certain values that keep changing our mode of living and attitude to life. That concern has to be developed through disaster-centric education, training and programme implementation. Because, a community which is prepared to face disaster, receives and understands warnings of impending hazards and has taken precautionary and mitigation measures, shall be able to cope better and resume their normal life sooner. It, therefore, becomes important for all stakeholders to lay greater emphasis on ways and means for community based disaster management. The requirements to address these issues at four levels shall be:

State Level

- Provisions in the State Plan
- Coordination
- Training
- Strengthening of Warning Systems

District Level

- Provisions in the District Plan
- Rehearsals
- Coordination
- Training of Officers & NGOs
- Setting up and strengthening of Warning Systems
- Strengthening of data base

Gram Panchayat Level

- Panchayat Level Plan
- Training to PRI Representatives, Members of PACS, SHGs
- Documentation of earlier disasters
- Checklist of resources available

Community Level

- Do's & Don'ts of each disaster
- Awareness
- Rehearsal of life saving skills
- Checklist of items needed in disaster situation
- Crop, property, livestock & life insurance, crop insurance etc.

7.3.1 Roles & Responsibilities of Stakeholders

At the **State level**, the State Disaster Management Authority through District(s) Disaster Management Authority will formulate and monitor the implementation of CBDM project.

At the **District Level**, the District(s) Disaster Management Authority will implement the CBDM Project. The concerned DDMA will seek the support and cooperation of Mukhia and Ward Representatives in the implementation of the project and subsequently to organize management of the project.

The DDMA's will encourage through the Gram Panchayats the Community with its PACS and SHGs to participate in the setting up of the Kendras and subsequently use the Kendras as a resource centre for livelihood and life-saving activities.

7.3.2 Sankalp Kendra: As a CBDM Multiplex

Sankalp Kendra has been visualised as a centre for promoting life skills in the people during pre-disaster days and developing surviving skills during disaster days. It is a congregation of social infrastructure and form and non- farm activities based structure. It would operate in Panchyat Bhawans or other Community bhawans.

Sankalp Kendra will be entrusted with the following tasks:

During Pre-Disaster period

- Collect Gram Panchayat wise data about the local demography, agricultural practices, local resources, education and literacy, livelihood and poverty. All socio-economic demography related status of Gram Panchayat available on day to day basis.
- Data about mitigation and preparedness measures required and implemented at the Gram Panchayat level
- Involvement of all sections of society in mitigation and preparedness exercise.
- Facilitating the benefits of general insurance (crop, livestock) and life insurance to the people and organizing immunization and other health related, protective measures to the social-economically deprived and marginalized section and others.
- Issuance of early warning system; and engaging communities and target groups in mock drills and preparedness etc. during pre-disaster period.

During L₁, L₂,L₃ period

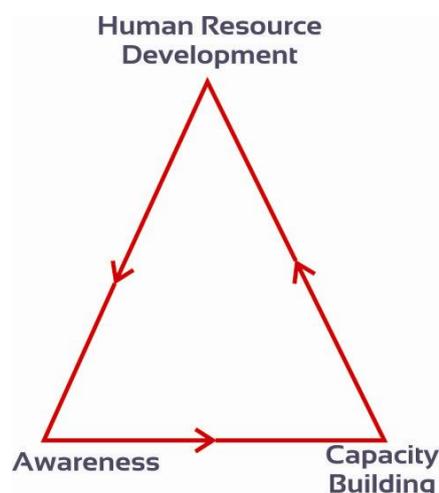
- Putting people, PRIs, local bodies, Block & District and state level institutions and bodies on alert about the situations, keeping in touch with DEOC and SEOC on a regular basis and disseminate the instructions, advise, directions among those concerned and the communities affected.
- Providing support in damage assessment and in extending specialized support to women, children, old, sick, differently challenged and socially marginalized groups.

- Extending support in relief distribution, rehabilitation and resettlement work by providing classified information about the location, victims and damages.

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8. Awareness Generation, Capability Building & Human Resource Development

In disaster management, *awareness*, *capability building* and *human resource development* are like three corners of an equilateral triangle: one cannot be at the top unless the other two form the base. That is, if *awareness* and *capability* form the base then alone *human resource development* can happen. If *capability* and *human resource* form the base, then *awareness generation* can happen, and if *awareness* and *human resource* form the base then *capability development* can happen.



8.1 Awareness Generation

Disaster Management largely succeeds to the extent communities participate in mitigation and preparedness measures which, in turn, depends upon how much they are aware about the nature of hazards, the degree of vulnerability and the extent of risk, they are threatened with. It is so because organized awareness results in motivation, organized motivation results in participation and organized participation results in preparedness. Thus, key to preparedness is to the extent awareness has been organized at the community level or the institution level or the State level

8.1.1 Awareness Generation: *At the Community Level*

Awareness generation at the community level will have to be done in three modes:

- (i) **Campaign Mode** through local NGOs, Civil Societies, CBO,s and in Gram Sabhas focusing on hazards, typical effects of hazards etc.
- (ii) **Demonstration Mode** through puppet shows, street plays etc.
- (iii) **Learning Mode** through small group meetings, Self-Help Group meetings, class room teachings, structured meeting of teachers, Anganwadi, ASHA workers, community leaders PACS, PRIs and SHG etc.

Awareness Generation is required to be followed by orientation and capability development programmes about what to do in a given disaster situation. The capability development inputs are required to be supported with handouts with lots of visuals about do's & don'ts at the community, family and individual level.

The orientation and capability development programme at the community level shall be backed by drills and rehearsals organized periodically by community level team of volunteers as also through the community level institutions & setups.

8.1.2 Awareness Generation: *At the Institutional Level*

Awareness generation exercise at the institutional level has to be based on disaster site visits within as well as outside the state. It should be focused on direct interaction with the communities in general and victims in particular. The community level interactions be followed by interaction with such local institutions that work with communities in mitigation, preparedness and response time:

Such institutions normally are:

- Gram Panchayat and PACS/ULB
- Local CBOs, NGOs
- Block Development Office,

8.1.3 Awareness Generation: *At the State Level*

Awareness generation at the State level has to be organized at three levels:

- At the Legislative level
- At the Executive level, and
- At the Statutory Bodies and Specialized Institutions level

The awareness generation at these levels has to include interactions at the community level, at the implementation agencies level and at various stakeholders' level. It has to be in the form of site visits, workshops and issue-based Interaction meets. These should be organized at all the three levels separately and among the three levels together so that homogeneity in thought, feeling and action may be achieved at the policy, plan and implementation level.

8.2 Capability Building

Capability Building is skill development. Skill development is either in relation to self or other than the self. For example, swimming is a skill in relation to the self, whereas, the skill to operate a fire extinguisher is a skill in relation to the fire extinguisher.

8.2.1 Capability Building: *At the Community Level*

Capability building at the community level has to be largely self-orientated like swimming, firmly thatching of roofs, taking out an injured lying under debris and carrying safely for medical aid, rescuing a person while drowning etc.

8.2.2 Capability Building: *At the Ground Level Institutions*

Capability building at the ground level institutions one has to build around self as well as simple technologies based equipments: For example, plying of motorized boats, debris removal, fire extinguishers, first aid, snake/dog bite treatment, driving two wheelers, four wheelers setting up of tents, operating communication equipments, repair and maintenance of the same. The institutions that have to deal directly with the first respondent, that is communities, are.

- Thana level Citizen Committees
- Gram Panchyat + Gram Katcheri
- PACs
- Local CBO, & NGOs
- Urban Local Bodies

For this category of institutions the capacity development programme and activities have to deal with:

- comprehensive understanding of hazard wise disaster caused
- hazard wise impact of disaster on people, livestock, property structures, agriculture, infrastructure etc.
- segment of impact wise operation to provide help and support with rescue, relief and shelter.
- Keeping people alert and prepared on a periodic basis for the eventualities, that is, organizing drills and rehearsals.

The programme and activities have to be in training and skill development mode coupled with practical and demonstrative exercises supported by IEC materials.

As these institutions are also slated to play important roles in disaster mitigation and disaster preparedness exercises, their capacity has also to be built in:

- (i) Disaster wise mitigation measures and their repair and maintenance
- (ii) Disaster wise preparedness measures and their applications within the institutions as well as at the community level.

8.2.3 Capability Building: *At the Support Institutions Level*

Institutions that are in support/reinforcement roles and have to directly deal with the first level of institutions and indirectly with communities include:

- District Disaster Management Authority
- District level Emergency Operation Centre.
- District level line Departments.
- State Disaster Response Force
- Corporate Bodies
- Multi lateral Agencies
- State Level Civil Societies, NGOs etc.
- Media

Capacity Building exercise of these institutions/organizations/setups that have to provide re-enforcement/support to the institutions dealing with communities has to be double deckered: first it has to be oriented about the need for disaster-wise support and reinforcement needs of the local bodies and institutions engaged in rescue and relief operation and second, their own capacity building exercise in :

- i) Knowledge and information about how well the first category of institutions are equipped.
- ii) What kind or extended support/reinforcement they would require.
- iii) Preparation of Detailed Damage Assessment Report (DDAR)
- iv) Equipment and material for search & rescue, relief and shelter, health and hygiene required in the situation and training in their uses and operations.
- v) Training in incident and crisis management.
- vi) Training in restoring communication, transport, mobility
- vii) Organizing return of the victims and deactivation.

Apart from these response related capacity building, the institutions/ organizations/setups shall also be provided Capacity Building inputs for planning, implementation, monitoring and evaluation of all mitigation and preparedness related exercises.

8.2.4 Capability Building: At the Supervisory and Monitoring Institutions Level

The supervisory and monitoring institutions shall include:

- ❖ State Disaster Management Authority
- ❖ State Executive Committee
- ❖ State Government Departments
- ❖ State Emergency Operation Centre
- ❖ State Level Civil Societies/Corporate Bodies
- ❖ Media

The supervisory and monitoring institutions have to have three tier capability development exercises:

- i) about the Community Based Disaster Management
- ii) about the implementation level institutions
- iii) about the support services related specialized institutions

i) The community level disaster management shall include

- Communities
- Communities based volunteer groups, PRIs, PACS, Local CBOs, NGOs, BDO

The capability development inputs for this level shall include:

- hazard wise-mitigation & preparedness measures, implementation.
- Feedbacks received
- Further needs for mitigation/preparedness/equipment material support

ii) the capability of supervisory and monitoring institutions, that is

- District Disaster Management Authority
- District Emergency Operation Centre
- Line Department
- Local Bodies

Shall Include

- The District Level Disaster Management Plan
- The Disaster Management Advisory Committee
- The disaster preparedness of the line departments & Local Bodies
- Networking

iii) The capacity building of supervisory & monitoring institutions, that is

- State Disaster Response Force
- Bihar State Institute of Disaster Management
- Apex Training Institute
- State level NGOs, Multilateral organization

Shall Be

- Briefings about their organizational setups, manpower, DM Plan, Mitigation Preparedness Plan,
- hazard wise mitigation/preparedness, need assessment/ how much implemented and how much yet to be implemented, past performances, lessons learnt, capacity enhancement needs etc.

8.3 Human Resource Development

Human Resource Development is a tailor-made developmental exercise. It conditions and is conditioned by the organization for which the human resource is being developed. In the case of disaster management, the exercise has to be two layered: first, sensitizing in disaster management and second, orientation in the roles and responsibilities of the organizational setup they are going to man.

The institutions/organizations for which human resources are to be developed are:

- (i) The community level Volunteers/Gram Raksha Dal
- (ii) The State and the District level Emergency Operation Centre
- (iii) The State Disaster Response Force
- (iv) The State and the district level functionaries of government departments.

8.3.1 The community level volunteers / Gram Raksha Dal

Since there is a statutory provision to form Gram Raksha Dal in each Gram Panchayat, ideally Gram Raksha Dal should be developed as community level volunteers. During pre-disaster period they shall provide support services in the implementation of mitigation and preparedness measures and to Gram Panchayat and Gram Katchehri in their functioning and to the Panchayat Emergency Operation Centre in data collection information dissemination etc. And, during disaster periods, provide escort, rescue and other required services at the community level, shelter camps level.

The developmental inputs required for these volunteers/Raksha Dal are:

- as Gram Raksha Dal
- as Community level Volunteers
- as community level support team for disaster management

8.3.2. The State and District Apada Prabandhan Kendra

The Emergency Operation Centres are the nerve centre for disaster management. During pre-disaster period, the Centres are the data collection centre and mitigation and preparedness tracking channel. During disaster period, it is the coordinating agency for the response measures.

The human resources for these centres shall be technically qualified and conversant in data collection and analysis, information dissemination and early warning system operation and record keeping and maintenance. Such human resources may be drawn from Civil Defense, Home Guard Nehru Yuva Kendra, National Cadet Corps and other similar setups.

8.3.3. The State Disaster Response Force (SDRF)

SDRF has been setup on the pattern of the National Disaster Response Force and shall be equipped with capable manpower, equipment and material to provide support and extension services at the time of disaster. Its human resource shall be groomed in hazard wise disaster response and shall be armed to the teeth for quick response on the trigger mechanism basis.

The human resource development for the Force shall be like NDRF based on hazard wise needs assessment, nature of location and communities, the latest technologies and a lot of drills and exercises.

8.3.4. The State and District level Govt. Departments

The human resource development for the government departments has to be on voluntary basis and from within the departments. In order to keep them within the fold of disaster management, some policy decisions about special incentives, laddering of promotion and channelizing of movement may be created so that those who volunteer to work in the area of disaster management may be properly groomed and productively utilized at all levels.

This kind of arrangement is essential because those working in the State Disaster Management Authority, Disaster Management Department, the District Disaster Management Authority, supervising the functioning of EOCs have to be well educated, trained and informed in disaster mitigation, preparedness and response so that they may play their designated roles efficiently, effectively and intelligently.

Such a human resource shall be required in all government departments because each department has to intonate their development plans with disaster mitigation inputs and work out mitigation and preparedness measures, financial allocations etc. All these can be done by well oriented and trained staff members only.

To develop such human resources training modules, resources materials, resource persons a resource agency be required. The Bihar State Institute Disaster Management (BSIDM) or the Bihar Institute of Public Administration and Rural Development (BIPARD) shall be developed as the apex agency for grooming, training and developing human resources for disaster management.

The spring head of all these, however, shall be the manning of the Bihar State Disaster Management Authority (BSDMA) with professionals and experts drawn from all segments of disaster management.

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The State Disaster Management Plan

Section- III

DISASTER RESPONSE

“—the readiness is all”

—William Shakespeare

9. Disaster Response

- 9.1 The State Disaster Management System
- 9.2 The Disaster Response Plan
- 9.3 Crisis Management Group
- 9.4 The Incident Management Team(IMT)
- 9.5 The Emergency Support Groups
- 9.6 State Emergency Operation Centers (SEOCs)

10. The Relief Operation

- 10.1 Check-List for Relief Camp (1)
 - 10.2 Check-List for Relief Camp (2)
-

9. Disaster Response

The State of Bihar is prone to all major hazards, both natural and man-made—flood, drought, earthquake, fire, cyclonic storm, industrial & chemical accidents and epidemics—but mainly suffers regularly from the ravages of flood and menaces of drought, fire & cyclonic storm. Out of 38 districts in the State almost all of them are susceptible to disaster caused by one hazard or another.

In such a State, which is virtually a house of hazards, RESPONSE has to be necessarily a well-organized and well-orchestrated act which entirely depends upon four key elements: first, the kind of Disaster Response system within the framework of State Disaster Management Plan is in place; second, the kind of prevention and mitigation measures have been taken; third, the sort of incident management preparedness is at disposal and fourth, the kind of grooming persons manning the system have received.

9.1 The State Disaster Management System

The Disaster Management System within the framework of the State Disaster Management Plan has been designed to serve pre-, during-, and post-disaster concerns with varying permutation and combination of organizational setups. With the National Disaster Management Authority along with National Institute of Disaster Management and National Disaster Response Force at the top of the system, similar bodies have been envisaged at the State level. The State level Authority shall operate through the State Executive Committee with the support of Bihar State Institute of Disaster Management and the Government Departments and other stakeholders operate through the Department of Disaster Management with the support of the State Emergency Operation Centre.

At the State level other stakeholders that have been provided space in the system are: the Multilateral Agencies, Corporate Bodies and International and National level NGOs and Civil Societies.

At the district level, the District Disaster Management shall operate through the District Emergency Operation Centre, with the support of local bodies along with local NGOs and community based organizations.

A system is a conglomeration of institutions and setups that are orchestrated from a definite point of view. Here, the point of view being disaster management

consisting of prevention & mitigation, preparedness and response the *State Disaster Management System* (SDMS) has been designed to address, to a large extent, each one sequentially and not simultaneously. Besides, the subject (disaster) being basically uncertain in character, its extent and scale being unpredictable, the system provides for the maximum of vertical and horizontal outreach from State to Gram Panchayat and Govt. Department to NGO.

The institutions and setups in SDMS have been made multi-purpose and thereby, both human resource and cost wise, economical. The team of well-groomed personnel engaged in responding to a disastrous incident also gets engaged in preparedness and mitigation measures during pre-disaster period. Such an arrangement is bound to bring about consistency, continuity, commitment and comprehensive understanding about disaster in the personnel involved so that they play their designated roles in during disaster situations with relative understanding and compassion.

The apex body in the disaster management system is the *State Disaster Management Authority* (SDMA) headed by the Hon'ble Chief Minister as the Chairman, Chief Secretary and three others as members. One of the members has been appointed as the Vice-Chairman.

The *State Authority* shall have the support of *Bihar State Institute of Disaster Management* for providing inputs to formulate guidelines on prevention, mitigation, preparedness, and Research and Development on vulnerability management related issues.

The prime executive body for disaster management at the state level is as per the Act, the *State Executive Committee* (SEC) headed by the Chief Secretary. The *State Executive Committee* shall function through *Disaster Management Department* (DMD) and other line departments.

The *State Emergency Operation Centre* (SEOC) shall operate on round the clock basis and be the *Command Centre* during disaster response period. It shall function as the data collection, programme monitoring and response providing centre for Disaster Management Department and cautioning and warning centre for the people at large. It shall be fully equipped centre with the best of gadgets and equipments.

A *Shadow* SEOC shall be located in the State Police Headquarter building which is being constructed in Patna. If the SEOC becomes dysfunctional, the

Shadow Centre shall also function as SEOC for providing material support for relief and rehabilitation.

The State Govt. has already resolved to setup **State Disaster Response Force** (SDRF) on the pattern of NDRF. SDRF shall be, hazard specific, that is, separate force for Earthquake, Flood, Fire, Drought and Cyclonic Storm. SDRF, in association with NDRF, shall also prepare Civil Defence, Home Guard, Fire Brigade, Police, BMP and local youth in disaster response. They shall be trained to equip Gram Panchayat and communities with necessary skill of self-help which is the first help one is forced to bank upon at the time of disaster.

The **Bihar State Institute of Disaster Management** (BSIDM) has been incorporated in the system to develop requisite understanding of hazards, gather information and knowledge identify and apply technologies and promote hazard specific research and development in the state. Besides, if the culture of living copingly with disaster and promoting hazards intonated development has to be initiated, then for that we need a specialized institution to support it. BSIDM shall develop and maintain close linkages with the multilateral agencies and corporate bodies both for getting associated with international bodies through them and for getting support at the time of incidents.

The main objectives of BSIDM shall be:

- ◆ Hazard mapping and vulnerability studies.
- ◆ Strengthening of information technology for Natural Disaster Management.
- ◆ Monitoring and impact assessment of natural hazards.
- ◆ Human Resource Development mainly by imparting training.
- ◆ Early Warning System.

The **District Disaster Management Authority** (DDMA) consisting of District Magistrate as Chairman & 'Adhyaksa,' Zila Parisad as Co-Chairman shall be over all incharge of response to L₁ level incident. It shall be an extended arm of Department of Disaster Management during responses to L₂ & L₃ level incidents. Since the Urban Local Bodies will play an equally important role, it is envisaged to make the Mayor/Chairman of the municipal bodies also as co-chairman of the Authority.

DDMA shall associate Local Bodies and Local Voluntary Organizations both in mitigation and preparedness as well as in incident management.

District Emergency Operation Centre (DEOC) shall be the **Control Room** for response to L₁ level incident and **Monitoring Centre** during pre-disaster

period. During L₂ & L₃ incident DEOC shall be onsite Control Room for SEOC. The centre will also be equipped like SEOC with appropriate gadgets and equipments. The structural layout of the DEOC prepared for NDM-Division, Ministry of Home Affairs, New Delhi considering all seismic zones, has been included in detail for consideration. (See page nos.162-165)

Keeping the larger interest in view the *Sankalp Kendras* at Gram Panchayat level have been visualised as a multi-purpose centre for wedding development project to disaster prevention, mitigation and preparedness measures and to enable communities to face the initial onslaught of a disaster on the strength of self-help and mutual help till the public-help arrived.

9.2 The Disaster Response Plan

Disaster response is a three-legged race against time. It requires co-ordinated and concerted efforts of three main functionaries at the state, district & community levels .The three main functionaries are the government machinery, the non-government organization and the affected communities. It involves three sets of activities: planning, mobilization & operationalisation.

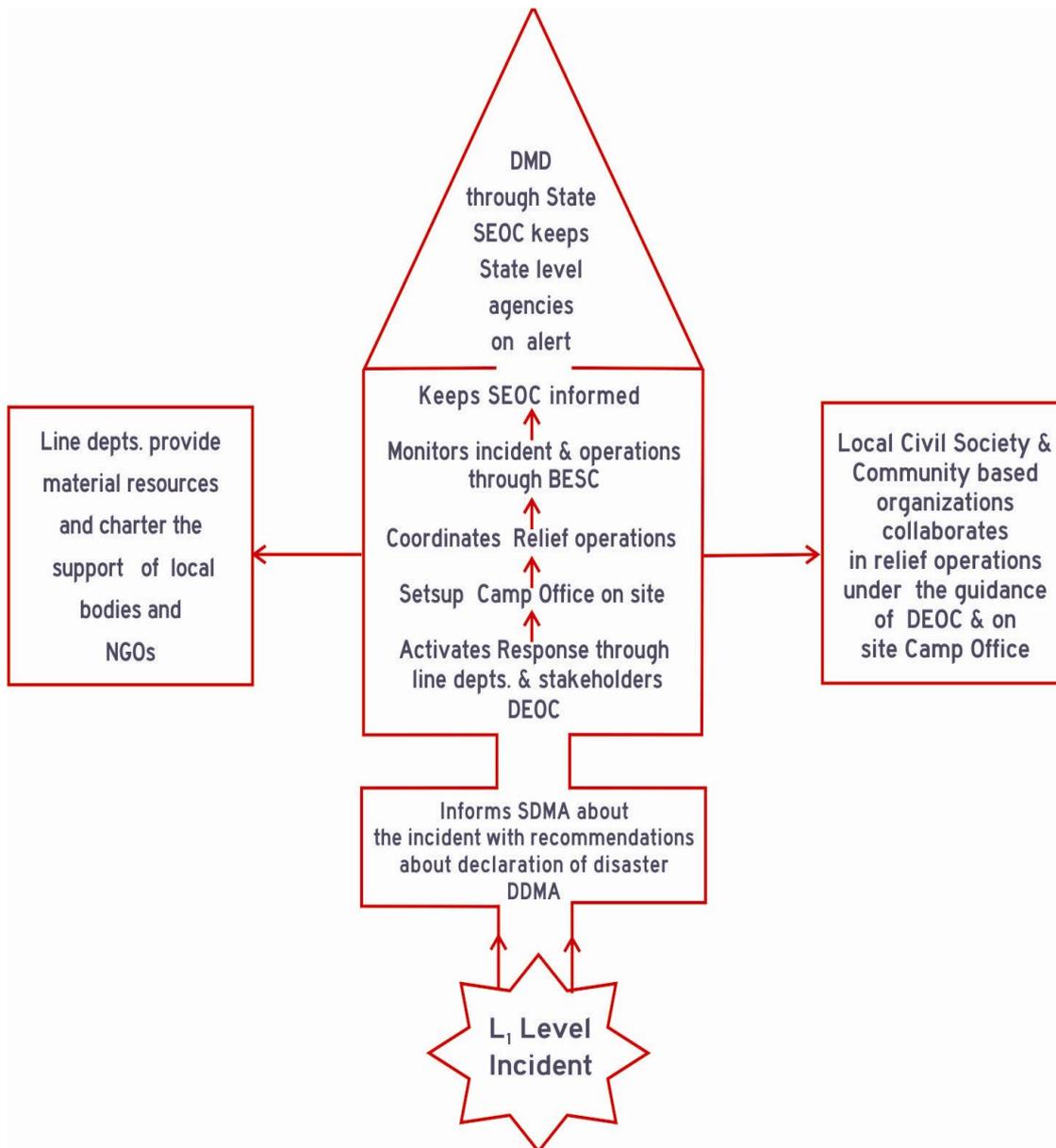
Disaster response shall require materials and logistics management, carrying out search and rescue operations, providing shelter and relief, caring for health and sanitations, communicating to a host of stakeholders, documenting and reporting. Each of these functions are highly specialized ones and require professionals to perform these roles. But the irony of the situation is that such professionals are few and far between. They shall have to be groomed and nurtured. This is a necessity as well as a compulsion for the State. Therefore, in line with the thinking of the State, specialized institutions, like SDRF and BSIDM have been included in the State Disaster Management System.

Disaster Response Plan structures the channelization of response down to the site of incident and from site of incident to command centre. It is the laddering of roles and responsibilities so that the response measures could be automatically taken on the basis of trigger mechanism.

Incident Response Matrix –L₁

In L₁ level disaster DDMA shall be the prime institution and District Magistrate the Incident Commander. DEOC shall become the Command Centre and Block/Anchal shall become on site centre to manage the operations.

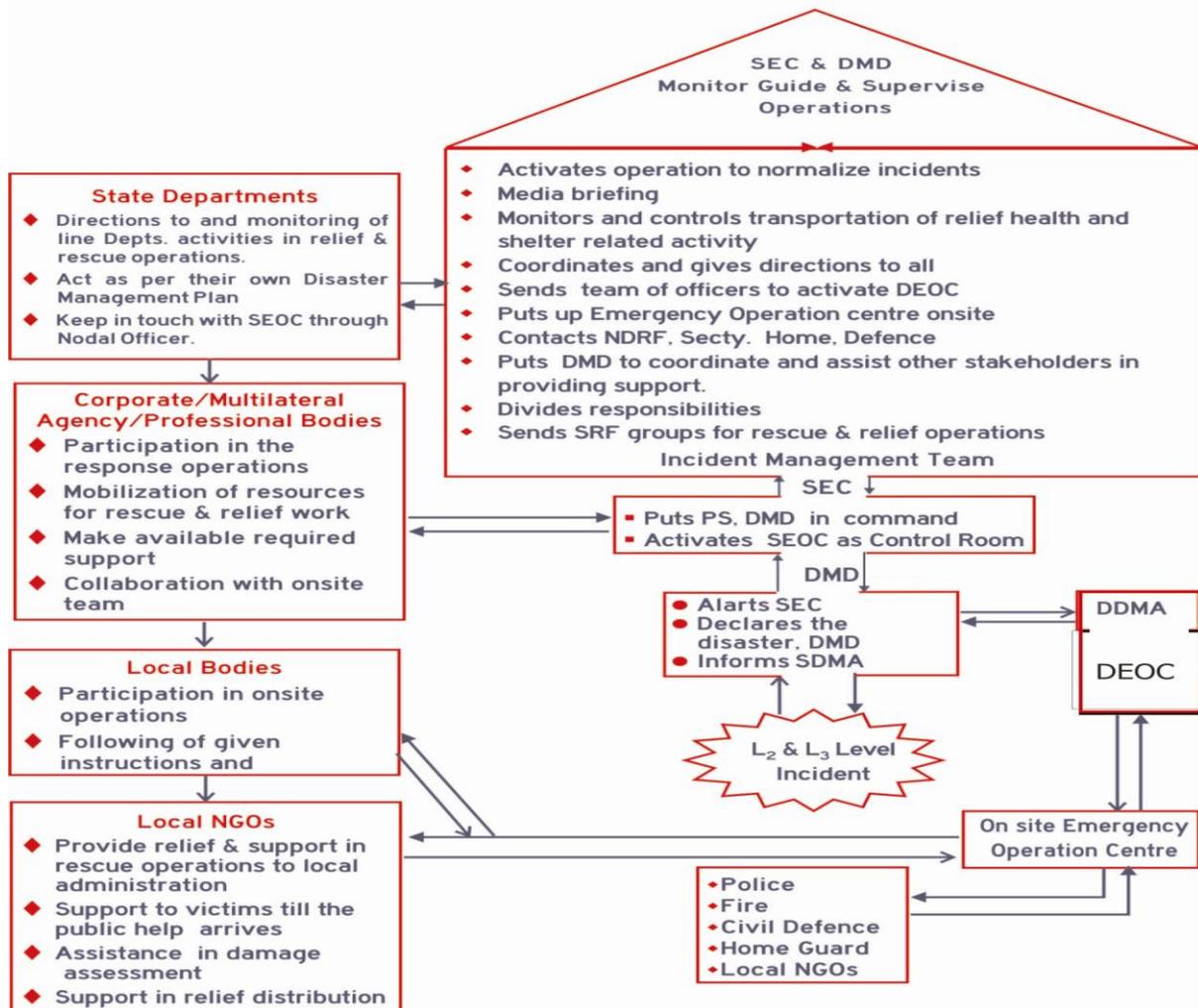
L₁ Level Disaster Response



In case of L₁ level incident the Disaster Response Plan shall emanate at the district level. The main respondents shall be: DDMA, DEOC, Block and Anchal. In this case the state level agencies shall remain in the state of preparedness. DDMA shall be over all incharge but DEOC with DM as Incident Commander, shall manage the operations.

In case of L₂ level incident the response shall emanate at the state level. The main respondents shall be: DMD, SEOC, DMD & SDRF & NDRF. In this case DMD shall be overall incharge but Chief Secretary /as chief of SEC/Principal Secretary, DMD shall manage the operations. The Centre level agencies shall be in readiness to respond.

Incident Response Matrix L₂ & L₃ (0 to 6hrs.)



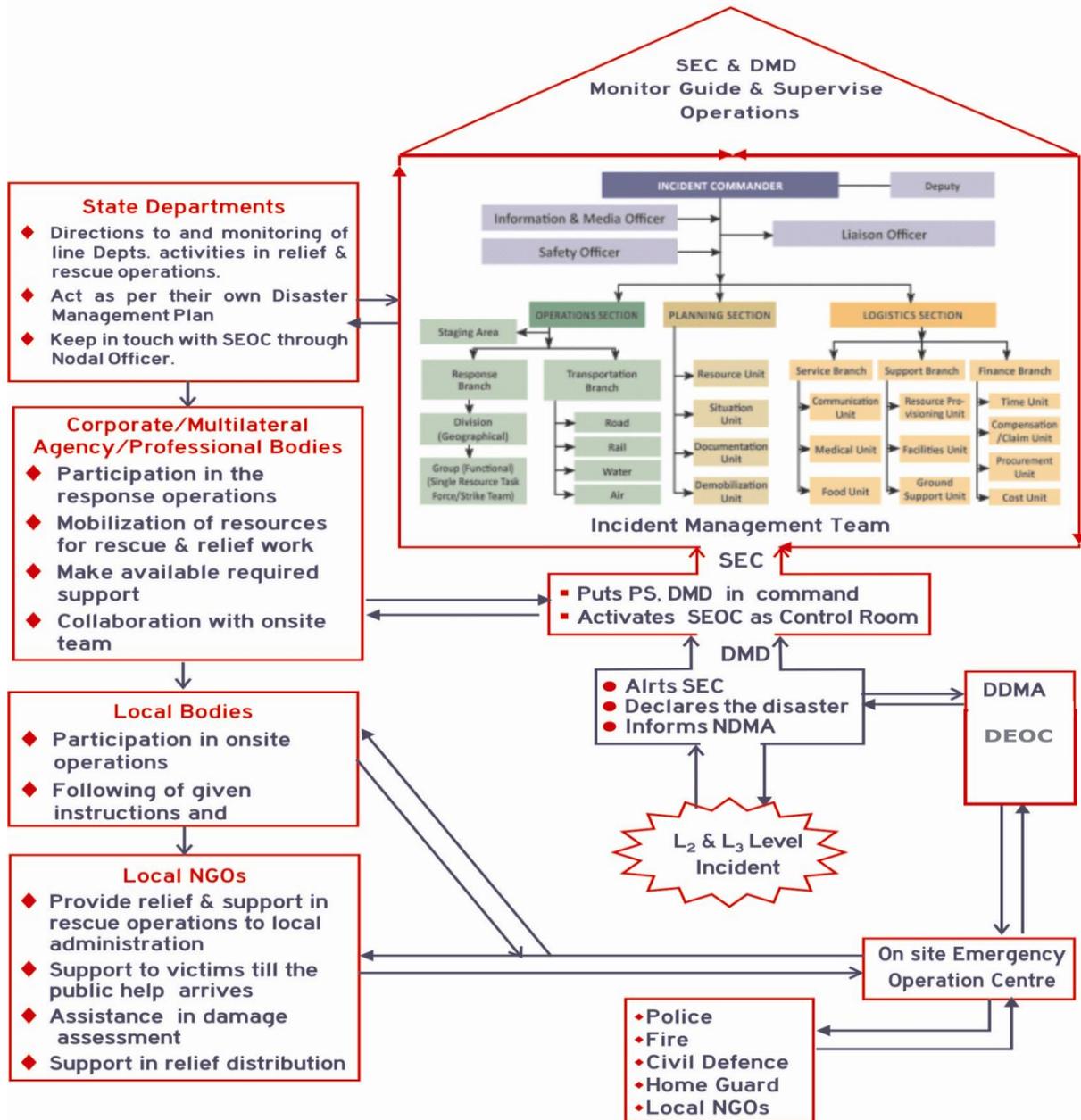
SDRF shall depute Emergency Support Groups to provide emergency support functions to the team already engaged onsite. Various departments shall provide resources and support for which DMD shall coordinate both at the state and at the district level.

In case of L₃ level incident the Disaster Response shall emanate at the state level but the respondents shall include NDMA, NDRF, Defense Ministry, Home Ministry and others Ministries of the central government.

Keeping the Central Agencies informed of the developments about the incident, measures having been taken and support specifically required, SEC together with DMD and other line departments, shall plan, execute, monitor and coordinate the response.

Incident Response Matrix L₂ & L₃ (After 6hrs.)

Incident Response Matrix L₂ & L₃ (After 6hrs.)



DMD shall coordinate the operations and liaise with NGOs, CBOs, corporate houses, professional bodies and others on donations and relief issues and organizing, receiving, safe-keeping and supplying the same for distributions among the victims. DMD shall also coordinate with various Govt. departments on response related issues and take care of the documentation of impact and damage assessment with the assistance of DDMA.

SEOC shall gather information, keep in touch with all centres, pass on directions to all concerned and provide feedback from field to the Incident Management Team.

The Disaster Response shall cover State, District, Block & Gram Panchayat and will consist of four main respondents:

- i) Crisis Management Group
- ii) Incident Management Team
- iii) Emergency Support Groups
- iv) Emergency Operation Centres
- v) Block/Anchal Emergency Support Centre

Each of the four respondents shall cohere and contribute in the disaster response in a concerted manner.

9.3 Crisis Management Group

The Crisis Management Group shall be headed by the Chief Secretary with Development Commissioner and Principal Secretaries/Secretaries of concerned department as members. It may also be supported by professionals, as the case may be, and special invitees depending upon the nature of the crisis and requirement of its management.

9.4 The Incident Management Team (IMT)

The Incident Management Team shall be constituted in the DMD with representatives of other line departments. It may be supported by professionals and experts.

IMT shall function under the guidance of Crisis Management Group/Chief Secretary and be the ultimate authority to direct operations and monitor development and allocate responsibilities. Led by the Incident Commander, who shall be the Chief Secretary/Principal Secretary, DMD, IMT shall have power to raise resources and support as per the need of the hour. The SEOC shall function as the Control Room and the centre of operations.

In case of L₁ level incident, the District Magistrate shall be the Incident Commander and shall constitute the Incident Management Team and the District Emergency Operation Centre shall function as the Control Room and the centre of operations.

In the event of L₂ level incident, the Principal Secretary, Disaster Management Department shall be the Incident Commander. The State Emergency Operation centre shall be the Control Room and the Centre of operations.

In the event of L₃ level incident, the Chief Secretary shall be the Incident Commander and the Crisis Management Group/State Executive Committee members shall comprise the Incident Management Team. The State Emergency Operation Centre shall be the Control Room and the Centre of Operations.

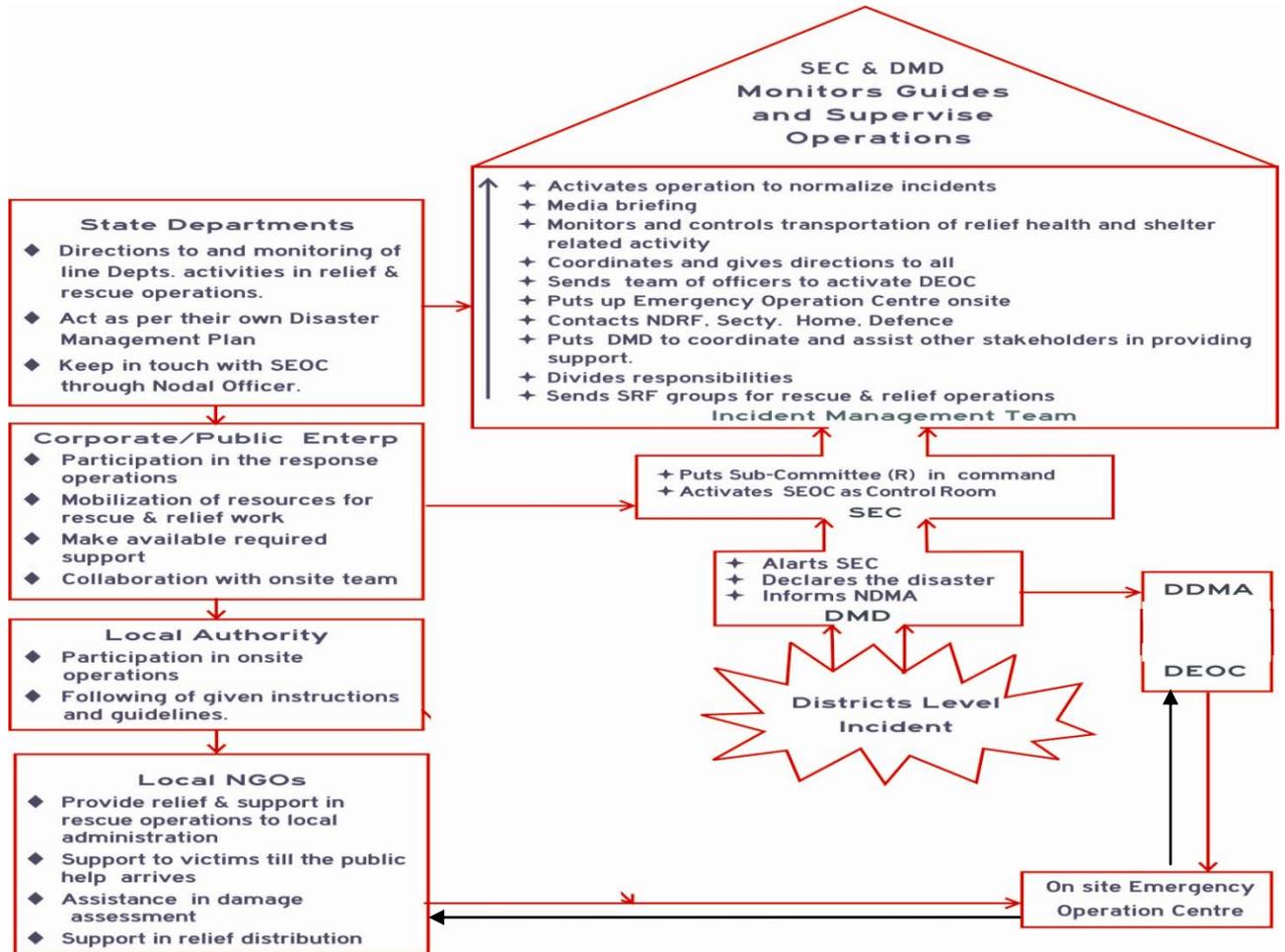
In all the three levels of incident, the common steps for IMT shall be:

The first response of the IMT shall be to assemble at EOC, take stock of the situation, inform the higher authorities and decide upon a line of action. (Planning)

In case of L₃ level incident the first couple of decisions to be taken shall be whether Divisional Commissioner shall be supervising the operations or someone from the state shall be positioned. And second, whether an Onsite Emergency Operation Centre shall be set up or District EOC shall be the Control Room for the Response Operations. Other decisions to be taken, inter alia, would be:

- Mobilization and dispatch of Emergency Support Groups for search & rescue etc. (in case of L₂ & L₃)
- Planning and Strategising response
- Organising support and resources—both material & human
- Constituting Operation Management Team and assigning responsibilities
- Organising damage assessment
- Briefing higher authorities and Media about the event in detail
- Monitoring relief distribution, shelter and health related issues.
- Coordinating required measures.
- Planning rehabilitation
- Keeping in touch with higher authorities
- Organizing documentation

Incident Command Structure –L₂ & L₃



9.5 The Emergency Support Groups

Disaster situation is a war situation. As in war, here also we have casualty and damages. Only that in disaster situation, we are at the receiving end and give only passive resistance in the form of saving lives, salvaging some damages, recreating all that was made, to build back better. With such a situation in view, fourteen emergency functions and well trained teams to carry out each function have been suggested. These teams have been called **Emergency Support Groups**.

Emergency Support Functions (ESF) constitute the backbone of Disaster Response Plan and consist of groups of persons groomed to provide specific assistance in a dedicated manner and with missionary zeal. They shall attend to all immediate needs of the victims, the area, the stakeholders, the district administration and the State. They shall respond to all the possible

requirements to mitigate the impact. They shall assess the damages done and take measures required to repair the damages and control the situation. Each of the Emergency Support Functions shall have a set of supporting departments, a set of functions in emergencies and in normal times. Given below are the function wise details under each head which may further be improved to suit a particular perception.

The fourteen Emergency Support Functions are:

- i. Communication
- ii. Search & Rescue
- iii. Relief & Shelter
- iv. Health & Sanitation
- v. Livestock Shelter & Fodder
- vi. Drinking Water & Supplies
- vii. Power
- viii. Transport
- ix. Public Works
- x. Removal & Clearances
- xi. Information Dissemination & Helpline
- xii. Damage Assessment
- xiii. Donation Management
- xiv. Media

(i) Communication :

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Dept. of Science & Technology 2. BSNL & other Services Provider 3. AIR / Television 4. Satellite phones 5. Mobile phones 6. SW/Ham Radio 7. Police Wireless 	<ul style="list-style-type: none"> ❖ To restore communication facilities after disaster. ❖ To provide emergency communication linking EOCs, IMT, ❖ To provide communication to communities ❖ To ensure communication facilities to support State and district 	<ul style="list-style-type: none"> ❖ To update hardware & software in communication technologies. ❖ Repair & maintenance of Early Warning Systems & Communication equipments ❖ Periodic checking of communication system among disaster related setups. ❖ Provide training at

	actions ❖ To coordinate the temporary communication requirements	GPEOC level in communication technologies
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(ii) Search & Rescue :

Supporting Deptt.	Emergency Functions	Normal Time Functions
1. Home Deptt. 2. Fire Deptt. 3. Civil Defense 4. NDRF 5. SDRF 6. BMP / Police 7. Army 8. Navy 9. Air Force	❖ To check the evacuation tools & equipment ❖ To work out evacuation Plan ❖ To establish linkages and coordination with camp office ❖ To carry drinking water and packed food, emergency medicine etc. for the victims. ❖ To prioritize evacuation of children, women, old, disabled etc. ❖ To avoid overloading .	❖ Repair and maintenance of evacuation tools and equipments ❖ Maintain fitness exercises ❖ Prepare teams of search and rescue operators at the district & Pahchayat level ❖ To maintain a list of and keep in touch with those whom you train.

(iii) Relief & Shelter

Supporting Deptt.	Emergency Functions	Normal Time Functions
1. Deptt. Foods & Civil Supplies 2. State Food Corporation 3. Associations and Clubs 4. Building Construction Department 5. Corporate Bodies 6. Voluntary organization	❖ To carry cooked dry, fast food materials in properly packaged form for immediate distribution. ❖ To organize the supply of drinking water ❖ To setup Shelter camps, Kitchen camps, mobilize volunteers for cooking, serving, washing etc. ❖ To organize Supply of food grains and vegetables ❖ To line up teams of local youths to carry those rescued to relief and shelter camps.	❖ Create Awareness and organize a system of saving food grains on household basis for emergency needs. ❖ Groom officers to maintain stock of fast food like chura & Sattu for at least three days at the Block level.

	<ul style="list-style-type: none"> ❖ To maintain record of names, villages, Panchyat & blocks to which the victims belong ❖ To setup latrine & bathrooms ❖ To take special care of children, women, old and disabled, specially those separated from families. ❖ To setup disaster relief centre to receive, collect, sort out and distribute relief materials ❖ To organize proper supply chain to reach the same to victims. 	
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(iv) Health & Sanitation

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Deptt. of Health 2. Government and Private Hospitals 3. Red Cross Society 4. Indian Medical Association 5. Voluntary Bodies 	<ul style="list-style-type: none"> ❖ To check the equipments & stock of medicines ❖ To teams formation of medical personnel ❖ To organize first aid providing team in larger number ❖ To organize mobile medical van to attended to emergency needs ❖ To carry medical camp setting facilities ❖ To establish trauma counseling desks ❖ To keep an eye on the possibilities of outbreak of epidemics ❖ To include locally available medical staff in health check up exercise. 	<ul style="list-style-type: none"> ❖ Checking and replacement medical kits/medicines. ❖ Procurement of more number of up Dated First Aid Kits ❖ Train young boys & girls at the Block, Panchayat and Community level in providing First Aid. ❖ Train young boys & girls in helping and carrying seriously injured.

	<ul style="list-style-type: none"> ❖ To keep record of patients treated ❖ To visit shelter camps to keep an eye on sanitation and make adequate arrangements for the same. 	
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(v) Livestock Shelter & Fodder

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Deptt. Of Animal Husbandry & Fisheries 2. Veterinary College & Hospital 3. Fodder Suppliers 	<ul style="list-style-type: none"> ❖ To setup feeding camp for animals at some distance from shelter for human beings ❖ To vaccinate the animal if not vaccinated earlier. ❖ To organize disposal of garbage. ❖ To mobilize veterinary team locally 	<ul style="list-style-type: none"> ❖ Vaccination of livestock camping at Gram Panchayat level ❖ To line up suppliers of fodder bricks during emergency. ❖ To enlist district wise veterinary doctors available with phone nos. ❖ To maintain stock of medicines needed in emergencies.

(vi) Drinking Water & Water Supplies

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. PHED 2. Civil Supplies 3. Mineral Water Manufacturers 4. Corporate bodies 5. Donor Agencies 6. Local NGOs 	<ul style="list-style-type: none"> ❖ To identify the sources to provide drinking water & restore supply. ❖ Restoration of well ❖ To install hand pumps ❖ To provide halogen tablets ❖ To distribute mineral water bottles of available in large stock. 	<ul style="list-style-type: none"> ❖ Installation of elevated hand pumps in identified shelter areas. ❖ Contact with corporate bodies for supply of water bottles during emergency. ❖ Raising of platform of wells and handpumps. ❖ Keeping a couple of set of water purifiers.

(vii) Power

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Deptt. Of Energy 2. Electricity Board 3. Dept. of Non-conventional Energy 4. Genset Suppliers 	<ul style="list-style-type: none"> ❖ To carry repair and maintenance kits for genset etc. ❖ To check electricity supply line and restore supply ❖ To organize alternative source to provide electricity ❖ To carry some genset of petrol, diesel, spare battery etc. ❖ To organize power supply to hospitals, shelter camps, kitchen, onsite EOC etc ❖ To carry candles, match boxes, solar lamp, petromax etc. 	<ul style="list-style-type: none"> ❖ Interaction with Electricity Board for keeping updated about generation and supply situation. ❖ Interaction with Non-Conventional Energy Dept. to get informed about possible source of electricity in emergency situation. ❖ To enlisting of suppliers of genset. ❖ Maintaining stock of solar lamp, petromax, candles , torches etc. with spare battery chargers.

(viii) Transport

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Deptt of Transport 2. Transport Agencies 3. Air force 4. Boat Owners 5. Ambulance service Providers 	<ul style="list-style-type: none"> ❖ To know loading and unloading point nearest to the incident site. ❖ To coordinate the transport requirements of the emergency support forces. ❖ To arrange transportation of relief and rescue materials. ❖ To coordinate and provide transport facilities to all support agencies ❖ To regulate the movement of traffic onsite ❖ To organize transportation of sick and wounded 	<ul style="list-style-type: none"> ❖ To keep updated the list of transport facility providers. ❖ To enlist the Ambulance service providers with phone nos. ❖ Alternative roadmap of the vulnerable areas in the state ❖ To enlist contact nos. of helicopter service providers. ❖ To have the list of boat owners number of boats their phone nos.

(ix) Public Works

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Public Works Deptt. 2. Road Construction Deptt. 3. Pul Nirman Nigam 	<ul style="list-style-type: none"> ❖ To restore the road connectivity ❖ To construct temporary bridges where required ❖ To organize repairing of health centre, schools, important buildings ❖ To undertake supervision and surveillance of construction works done. 	<ul style="list-style-type: none"> ❖ Storing of equipment and materials required in emergencies. ❖ Enlisting the Construction companies for support in need ❖ Have arrangement to borrow their manpower equipments , materials if needed

(x) Removal and Clearances

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Civil Defence 2. Home Guard 3. Municipalities 4. Scout & Guides 5. NCC 6. NYK 	<ul style="list-style-type: none"> ❖ To organize voluntaries for removal of dead bodies both human and animal ❖ To organize local force for clearing debris of building, bridges, road etc. for reconstruction ❖ To organize local for chopping and removing of fallen trees etc. ❖ To organize burning or burying of the dead bodies 	<ul style="list-style-type: none"> ❖ Keeping equipment like gas cutters, cranes etc in order. ❖ Enlisting truck owners. ❖ Enlisting workers in municipalities and grooming them to work as a team ❖ To keep regular interaction with them to get response at the time of emergencies .

(xi) Information Dissemination and Helpline

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Deptt of Information & Public Relations. 2. Scouts & Guides. 3. Media 4. College and 	<ul style="list-style-type: none"> ❖ To gather correct information from authorities onsite. ❖ To keep the list of persons recued with full details about each ❖ To keep the list of 	<ul style="list-style-type: none"> ❖ To get orientation in handling host of persons in extreme physical & mental hand ships ❖ To study books on psychology, public relations, mass

Universities	<p>persons missing</p> <ul style="list-style-type: none"> ❖ To keep the no. of dead bodies and the locations they have been put ❖ To keep a track of which team is positioned where ❖ To make use of the public address system to call any body ❖ To keep 5 to 6 scouts around to provide escort services. ❖ To schedule working in short duration shifts 	<p>communication for having proper mind set.</p> <ul style="list-style-type: none"> ❖ To cultivate maintaining cool in extreme conditions.
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(xii) Damage Assessment:

Supporting Deptt.	Emergency Functions	Normal Time Functions
<ol style="list-style-type: none"> 1. Disaster Management Department 2. Deptt of Agriculture 3. Deptt. Of Rural Development 4. Deptt. Urban Development 5. Public Works Deptt. 6. Deptt. Of Animal Husbandry 	<ul style="list-style-type: none"> ❖ To have the format of the damage assessment format in mind. ❖ Affected <ul style="list-style-type: none"> ❖ Block ❖ Panchayat ❖ Population ❖ Human lives lost ❖ Livestock lost ❖ Resources damaged ❖ Infrastructure damaged roads, bridges Schools hospitals, Govt. Buildings electric supply, water supply ❖ Crops, orchards ❖ Synthesized Assessment 	<ul style="list-style-type: none"> ❖ Developing tools & for technique for Rapid Damage Assessment ❖ Identification & Training of Manpower for Damage Assessment

(xiii) Donation Management

Supporting Deptt.	Emergency Functions	Normal Time Functions
<p>1. Disaster Management Dept.</p> <p>2. Dept. of Supplies</p> <p>3. State Warehousing Corporation</p> <p>4. Cooperative Dept.</p>	<ul style="list-style-type: none">❖ To set up donation management camp onsite❖ To create three centres<ul style="list-style-type: none">❖ Fund❖ Relief❖ Services❖ To carry receipts Stamps etc. for cash / cheque / draft❖ To identify storage centre for receiving relief materials for storing, packing and proper distribution of the same❖ To keep records of supplies sent, with whom and when❖ To post volunteers required, and take care of their basic needs : food and rest etc.	<ul style="list-style-type: none">❖ Providing orientation in human resource and materials management to NGOs works❖ Train them in material handling, packing and distribution.

(xiv) Media

Supporting Deptt.	Emergency Functions	Normal Time Functions
<p>1. Dept. of Information & Public Relations</p> <p>2. Disaster Management Department</p>	<ul style="list-style-type: none">❖ Organize media briefing by senior officer incharge❖ Provide graphic and statistical details to the extent possible❖ Organize visit to shelter, relief and various activity camps.❖ Organize briefing on daily basis preferably in evening	<ul style="list-style-type: none">❖ Development of Pamphlets/ Literature for disaster Awareness❖ Educating people about hazards.

	❖ Make the media men interact with other Emergency Functionaries if possible.	
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(xv) Law and Order:

Supporting Deptt.	Emergency Functions	Normal Time Functions
1. Dept. of Home Affairs 2. District Administration	❖ Posting of Police Home Guard, Civil Defence forces in strategic places ❖ Deputing a magistrate to keep vigil and give necessary orders.	

9.6 The State Emergency Operation Centre (SEOC)

The State Emergency Operation Centre has been located in the premises of Old Secretariat Patna where all important departments dealing with disaster management and Chief Secretary's office is located. It has been specifically designed to meet the requirements of round-the-clock operations.

SEOC shall be the nucleus of State Disaster Management System. It has been designed to function as Control Room during emergencies and Monitoring Centre during normal days.

As a Control Room SEOC shall be the seat of Incident Command for which it shall be suitably equipped and manned.

As a Monitoring Cell, SEOC shall be an exchange of data collection, processing and dissemination.

The Emergency Support Groups would be located in the SEOC and perform their functions under overall command and control of SEOC..

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10. The Relief Operation

Relief in a disaster situation broadly means relief from all the facets of impact that a disaster has subjected the affected populace. Among the disturbances that a disaster brings about are:

- i. dislocation
- ii. deaths
- iii. damages
- iv. destructions and
- v. destitutions

Of these the prime concerns of a relief operation are: dislocation, destitution, debris clearance and disposal of dead bodies of humans and animals in the same sequence.

- i. Dislocation:** The first impact of a disaster is dislocation, that is, disjointment of population from other family and community members, property and place. The first concern of relief operation, therefore, is search, rescue and evacuation. The methods and instruments to use for these vary from hazard to hazard. The search, rescue and evacuation teams have to be, therefore, constituted, trained and equipped hazard wise.

The basic aim of search, rescue and evacuation is to locate the victims of disaster who may be trapped or isolated, bring them to safety and provide them with medical aid, water and food, The prime objective of this exercise is to ensure the survival of the maximum possible number of victims. Besides, bringing about physical and material relief, the aim is also to control panic and confusion and to provide moral support.

Evacuation involves the removal of a population from zones at risk of being affected by an aftermath of disaster. It is a very sensitive exercise in the sense that although people remain in danger, they are reluctant to leave their house (even if partially damaged) and property behind to the extent possible. As compared to search and rescue where the subjects are only too willing to accept support, in evacuation the subjects require persuasion and convincing that to accept support was in their best interest.

- ii. Destitution:** The victims of any disaster are largely destitutes. They are unable to support themselves. It is to provide them with the required support that the relief camps are operated.

The litmus test of a relief operation is in providing shelter which is generally called, relief camps. For, before those dislocated reach a relief camp, they remain in the state of panic and shock and therefore, oblivious of themselves

They are not themselves. But once they are in a relief camp, the normalcy starts dawning on them. And the first call of normal being is to make hue and cry, to demand. The management of a relief camp therefore, is essentially the management of hue and cry, not only of the victims but also of visitors and helpers.

Relief management therefore is in fact management of three kinds of target groups: each one characterized by entirely different set of concerns.

- **Victims of Disaster:** concerned about getting food & water, medical attention etc.
- **Visitors :** concerned about the victims, their needs etc., and
- **Helpers:** concerned about providing supplies & services to the victims , on the one hand, and support for keeping the supply chain alive.

As such, the essential requirements for a Relief Operation are :

- i. Shelter
- ii. Food & Drinking water
- iii. Communication
- iv. Clearance & Access
- v. Water & Power Supplies
- vi. Temporary Subsistence supplies
- vii. Health & Sanitation
- viii. Public Information
- ix. Security
- x. Constriction Requirements
- xi. Disaster Welfare Inquiry

In any relief operation to save human lives and provide relief to the affected communities come first. Livestock and infrastructure always come next.

In disaster situation, livestock is affected equally like humans but with, perhaps, worse predicaments, because 'livestock' do not have the advantages of awareness generation, capacity and capability building exercise. They are entirely dependent on humans who, at the time of disaster, are engrossed in saving their own family members rather than bothering to untie the knots of the noose around the neck of their livestock.

Livestock, therefore, require a separate relief management exercise and, to the extent possible, independent of and removed from relief camps for humans. Some of the relief measures for animals are:

- Stranded and affected livestock in the disaster should be rescued and taken to safer place such as cattle shelter and provided with basic needs for life: feed, fodder and drinking water.
 - These should be protected against beasts of prey, poisonous insects, snakes and reptiles.
 - Vaccine and medicines should be given to the injured and affected animals.
 - Removal of dead animals and disposal of their dead bodies should be given top priority.
- iii. Debris Clearance:** Debris from collapsed buildings, bridges and other structures as well as uprooted trees, hoardings lead to the disruption of communication services and transportation. Debris clearance, therefore, shall be the first initiative towards re-establishment of transportation and communication network, which, in turn, shall smoothen the search rescue and relief operations.

But debris clearance has to be carried out by a team of technical and duly trained persons.

- iv. Disposal of Dead Bodies: Human–** Deposal of dead bodies is very important for avoiding the outbreak and spread of diseases.

However, human dead bodies are required to be handled with great care and due respect because of sentimental values attached to the dead. Therefore, the means, process and the manner of their disposal are of great importance. The first step in this regard is to identify the dead bodies. This not only helps in compliance with legal formalities but also in establishing the religions/ethnic identification of the dead. This will help in the suitable disposal of the dead body in accordance with their religious and cultural practices.

Officially, this shall be done by police and if possible, get them to ascertain the causes of death. A proper record for future reference and for issuing of death certificate this may be required.

- v. **Disposal of Dead Animals:** In most natural disaster particularly in rural areas the numbers of animal deaths are very high. Therefore disposal of dead animals is as important as that of humans because decaying dead bodies can be a potential health and environment threats. Therefore, animal dead bodies, without waiting for the extraction of bones and hides for which people generally hold them; have to be done very quickly.

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Check-List
For
RELIEF CAMP (1)

1) Tent Camps

- ❖ The layout of the site shall meet the following specifications:
- ❖ Three-four hectares of land per 1,000 people
- ❖ Ten metres-wide roads
- ❖ Minimum distance of 2 metres between the edge of the roads and tents
- ❖ Minimum distance of 8 metres between tents
- ❖ Minimum floor area of 3 square metres per person

2) For proper water distribution campsites shall have:

- ❖ Tanks with a minimum capacity of 200 litres
- ❖ Minimum capacity per capita 15 litres/day
- ❖ Maximum distance between two tanks should not exceed 100 meters

3) Solid waste disposal containers shall be:

- ❖ Waterproof
- ❖ Insect-proof
- ❖ Rodent-proof
- ❖ Waste should be covered tightly with a plastic or metallic lid
- ❖ Waste should be incinerated or buried

4) Solid waste units shall have a capacity of 1 litre per 4-8 tents or 50-100 litres per 25-50 people

5) Excreta and liquid waste shall be disposed of in bore-holed or deep trench latrines built according to the following specifications:

- ❖ At a distance of 30-50 metres from tents
- ❖ 1 seat/10 persons

- ❖ Modified soakage pits for wastewater to be made by replacing layers of earth and small pebbles with layers of straw, grass or small twigs. The straw needs to be removed on a daily basis and burnt

6) A bench for washing shall be:

- ❖ 3 meters in length
- ❖ Double-sided
- ❖ 2 per 100 persons

7) Buildings

- ❖ Buildings to accommodate victims during relief shall have:
- ❖ Minimum floor area of 35 sq. meter per person
- ❖ Minimum air space of 10 sq. meter per person
- ❖ Minimum air circulation of 30 cubic meter per person per hour
- ❖ Separate washing blocks for men and women

8) Washing Facilities:

1 hand basin per 10 persons

Wash bench of 4-5 meter per 100 persons

1 shower per 50 persons in temperate climates or 1 shower per 30 persons in hot climates

9) Toilet accommodation in buildings housing displaced persons shall meet these requirements:

1 seat per 25 women

1 seat and 1 urinal per 35 men

Maximum distance from building should be 50 meters

Plastic or metal refuse containers with closed lids with 50-100 litre capacity per 25-50 persons

10) Latrines

Depending on the type and duration of the disaster, different types of excreta disposal measures need to be taken in the camps. People must be discouraged from open defecation. The area must be adequately lighted and the approach road must be clearly demarcated. The most suitable types of latrines are:

Shallow trench latrines

Deep-trench latrines

Pit privies
Borehole latrines
Septic privies
Urinals
Mobile latrines

Community latrines

Attempts shall be made to provide community latrines with water, so that cleaning is practical

There shall be separate blocks for men and women

At least five seats per 100 persons

Must be 1.5 km away, and downhill from any water source

The bottom of the latrine shall be at least 15 m above the groundwater table. In the presence of limestone formations and fissured rocks, additional precautions are necessary to protect sources of water supply.

The site shall be dry, well drained and above flood level. The surroundings should be cleared of all vegetation, waste and debris.

Laundry

In temporary encampments people shall be expected to wash their clothes in plastic or iron tubs

One washing stand for every 100 persons is recommended

Proper drainage and soap traps shall be provided for the wastewater

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Check-List
For
RELIEF CAMP (2)

Following standards shall be maintained for food & water supply:

Food

For the Marooned

- ❖ Only non-perishable, ready to eat and long-lasting food items should be included.
- ❖ Food shall be packed in small packets for individual use.
- ❖ Airdropping shall be done from minimum heights with ropes and hooks, to ensure minimum damage to supplies.
- ❖ Supplies shall be dropped from stationary and not moving helicopters.
- ❖ Food shall be tagged first and then distributed.

Storage

- ❖ If possible, food shall be kept in a shade in a dry and cool place.
- ❖ Food shall be kept covered at all times.
- ❖ It should be stored in plastic bags and kept in airtight containers.
- ❖ Salt and spices shall be stored in their original packing
- ❖ To prevent looting, guards shall be posted at warehouses and supply depots.
- ❖ Damaged stocks shall be stored separately to protect the remaining stock from odour and damage.
- ❖ Maintain food stock register and report to appropriate authorities.
- ❖ Prompt transport schedules and delivery of perishable food stocks to the needy at the earliest need to be maintained.

- ❖ Kerosene and other combustible items shall be stored in a separate room. Match boxes are also necessary in such situation.

Cooking (Prepared Food)

- ❖ Community Kitchen with adequate capacity to be catered.
- ❖ If cooking with firewood, a charcoal grill or kerosene stove it shall be done in the open.
- ❖ Canned food shall be heated in a separate container and not in the supply can.

Water

- ❖ People shall be warned of the hazards of drinking contaminated water.
- ❖ Water sources located in the vicinity of sewage outfalls, chemical plants, solid waste disposal fields and abandoned mines shall be avoided.
- ❖ Malodorous, highly coloured or highly polluted water should be avoided.
- ❖ Water suspected of contamination by human or chemical waste shall not be used until it has undergone laboratory analysis.
- ❖ Wells contaminated by the disaster shall be emptied immediately.
- ❖ All debris in wells such as leaves, sticks, silt, mud etc should be removed after the water has been pumped or drawn out.

Chlorine or bleaching powder shall be added to all wells to avoid further contamination.

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The State Disaster Management Plan

Section- IV

"Build Back Better"

11.1 Background

11.2 Policy Statements

11. "Build Back Better"

11.1 Background:

Rehabilitation provides best opportunity for integrating disaster prevention and mitigation with development planning. It is an opportunity to build back better, that is, recreating a settlement which is wholesome from individual, familial, social & economic point of view. For that following fact have to be kept in view:

- i) that in rehabilitation we shall be dealing with people physically and mentally at a loss. They shall be people grossly disturbed and grievously dispossessed.
- ii) the place shall be in bad shape and the old habitation partly ruined and mostly damaged and, therefore, dangerous.

Therefore, rehabilitation has to begin with psychological counseling, generous materials support and creation of situational togetherness coated with harmony and goodwill. In Response situation hard work and dedication is thrust upon even those who are lethargic and dishonest to a cause. But in Rehabilitation situation there is disturbing calm and all passion spent in the workforce as well as in victims. As such, those who are by nature hard working and committed are required to be put on the job during rehabilitation period.

In rehabilitation situation government has to begin with playing the role of a provider and end by playing the role of a facilitator. It has to withdraw when confidence, will power and self determination among the victims have been restored.

In rehabilitation the **first step** is construction of houses that have to be made with the hazard profile of the area in view, the need of the target groups in mind, on the one hand, and the minimum requirements for a comfortable living, on the other.

The **second step** is to create some source for livelihood for the settlers. Unless the habitation is wedded with a source of livelihood, people are bound to leave the shelter to settle where they could earn two times meal.

Thus, the essentials of rehabilitation could be summed up as:

- i) Care and attention to victims through provision of goods and services and psychological treatment.
- ii) Restoration of essential services such as communication, water supply and power supply.
- iii) Provision of housing to humans and shelter to animals
- iv) Creation of income-generating activities for people to earn their livelihood.
- v) Creation of schools and health care centres and sanitation facilities
- vi) Strengthening of environmental infrastructure
- vii) Facilitating people's participation in their own welfare.

11.2 Policy Statement:

The following policy statements shall be observed with due care and attention:

- i) The rehabilitations work shall be planned on the basis of the Assessment Report on the nature, extent and intensity of damage caused by the disaster.
- ii) The planning shall also include in the Rehabilitation plan the prevention and mitigation measures for other hazards that the area is susceptible to.
- iii) The rehabilitation, reconstruction and recovery efforts shall aim at restoring the affected structures to a condition better than what existed before the disaster.
- iv) In the reconstruction and resettlements efforts also the involvement of various stakeholders –governmental bodies, non-governmental bodies, non-governmental organizations, private institution and international agencies shall be solicited.
- v) The rehabilitation shall be used as an opportunity for integrated development in the form of creation of livelihood option, protection of environment building and strengthening of physical, social and economic infrastructure and orientation of people to behave as citizens and not as subjects.
- vi) Till the completion of the rehabilitation exercise, the service and infrastructure to which people had access to during the crisis period shall be maintained.
- vii) The process of rehabilitation shall be made participative, sustainable and self-supporting. The communities shall be involved at all the stages of rehabilitations.
- viii) The ‘local’ and ‘global’ good practices shall be woven in the policy framework in order to make rehabilitation a community based disaster management initiative.
- ix) Due weight-age shall be given to the contextual problems, developmental priorities and gender issues at the time of implementation of the reconstruction process.
- x) Priorities in favour of vulnerable groups (orphans, females heads of family, handicapped or differently abled) with the aim of reinstating and mainstreaming them into economic and social life shall be duely supported.
- xi) In the above regard, the rehabilitation process shall also take into account the psychological effects of exposure to violence, particularly on children and women.
- xii) In the reconstruction exercise all the legal provisions building codes, fire protection related provisions, certification and other cross-cutting issues shall be taken care of.
- xiii) Decisions on all priority sectors shall be taken bearing in mind that institutional strengthening, reconstruction of infrastructure as well as restoration of supply of essential goods and services shall be linked to production, notably agriculture, health / sanitation, primary education, access to land etc.
- xiv) Towards the completion of the rehabilitation process, the system of free distribution of goods and service shall be removed in a phased manner.

- xv) On the whole, the principles of sustainable community development shall be followed that consist of
- Promote and support sustainable agriculture
 - Support local business
 - Protect water resources
 - Conserve energy and support renewable energy initiative
 - Preserve green space
 - Generate awareness and education on sustainability
- xvi) About roads and other civic amenities the following principles shall be followed :
- Adequate drainage and sewerage system
 - Well developed system of connecting roads
 - Transportation facilities
 - Communication system such as postal, mobile, telephone services
 - Proximity of social infrastructure, education, health banking etc.
- xvii) On the health front, primary health care centres designed to meet all basic needs for healthcare shall be included in the plan :
- xviii) Following approaches and steps underlying the livelihood perspective shall be taken :
- rational and planned growth of agriculture and cottage industry
 - Creation of employment opportunities
 - Special programmes for the youth, woman and physically handicapped.
 - alternative cropping pattern, irrigation and water harvesting techniques
 - Social forestry
 - Promotion of skilled labour through training
- xix) All construction work—houses, infrastructure, roads and bridges shall be built hazard-resistant.
- xx) All rehabilitation and reconstruction plan shall be projectised in detail keeping in view the cost-effectiveness in terms of input and output so that funding arrangements could be made on project basis
- xxi) Immediately after the damage assessment has been done and based on that rehabilitation plan has been prepared, the designated government agency shall approach appropriate national and multilateral agencies for funding the same.

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The State Disaster Management Plan

Section- V

"The Roles and Responsibilities of & Guidelines for Government Departments & Other Stakeholders"

12. The Roles and Responsibilities of & Guidelines for Government Departments & Other Stakeholders

Disaster Management is not an individual but a team exercise – a team not of individuals but of a variety of organizational setups and community clusters whom we know as Stakeholders. They are stakeholders because, directly or indirectly, their interests are somehow affected by the impact of a disaster.

Government Departments are stakeholders by their very executive concern and responsibilities towards the people in general and the victims of a disaster in particular, stakeholders other than the government departments are so because of their organizational interests and objectives or their organizational social responsibility, or organizational concern for the welfare of the people.

The stakes being different both in nature and kind, it becomes essential to place them in a position where they serve their own interest and, in the process, serve the larger interest of communities in disaster management.

The Government Departments playing lead or support roles in disaster management are :

A. Government Departments :

Out of 44 government departments presently in the State Government, 26 departments by very nature of their work, either primarily or secondarily, directly or indirectly, have to contribute in disaster management. Those departments are:

- i. Department of Home
- ii. Department of Disaster Management
- iii. Department of Water Resources
- iv. Department of Agriculture
- v. Department of Food & Consumer Protection
- vi. Department of Panchayati Raj
- vii. Department of Health & Family Welfare
- viii. Department of Education
- ix. Department of Labour
- x. Department of PHED
- xi. Department of Transport
- xii. Department of Social Welfare

- xiii. Department of Building Construction
- xiv. Department of Energy
- xv. Department of Environment & Forest
- xvi. Department of Industries
- xvii. Department of Animal Husbandry
- xviii. Department of Finance
- xix. Department of Road Construction/Rural Works
- xx. Department of Rural Development
- xxi. Department of Urban Development
- xxii. Department of Cabinet Coordination
- xxiii. Department of Rural Works
- xxiv. Department of Information & Public Relations
- xxv. Department of Planning & Development
- xxvi. Department of Minor Irrigation

In the State Disaster Management Plan the roles and responsibilities of the State and its Departments have been shifted from that of a mere **Provider** to those of a **Doer**, a **Provider** and a **Facilitator**. This has been necessitated because of the creation of specialized institutions to work on disaster management and to share most of their workload at the formulation, planning and implementation stages.

The Bihar State Disaster Response Force (BSDRF), on the pattern of the National Disaster Response Force (NDRF) and the Bihar State Institute of Disaster Management, (BSIDM) on the pattern of the National Institute of Disaster Management has been included in the Plan. These two organizational setups together shall share the Pre-and during disaster period work with the Departments. As a result, the departments shall feed them with their respective requirements in the form of programme and activities together with fund allocations and approve the final form in which they have been included in the State Plan by BSIDM.

As the Disaster Management Act, 2005 provides for the making of disaster management plan by each Government Department based on which the annual disaster management of the State shall be prepared, a provision in the Plan has been made for each department to have a Disaster Management Cell (DMC) manned at least by two Deputy Director level personnel and headed by Joint Secretary level officer. The roles and responsibility of the Cell shall be:

- To deal with disaster management related issues of the Department.
- To participate on behalf of the department in the Disaster Management related programme and activities.
- To work out annual disaster management related programme and activities of the department along with estimated budget for the same.
- To incorporate disaster management related inputs in the developmental projects of the department.
- To co-ordinate with Disaster Management Department, BSDMA, BSIDM and BSDRF on disaster issues related to department.
- To follow up with DMD and BSIDM and provide inputs in integrating its programme and activities, hazard wise or disaster related activities wise, with those of other departments.
- To monitor the implementation of programme and activities of the department.
- During disaster the officers of the Cell shall remain present at the State Emergency Operation Centre (SEOC) and shall provide required support in disaster response related requirements.
- Review the enactment administered by the department along with its policies and rules and regulations with a view to incorporate therein the provisions necessary for disaster prevention, mitigation or preparedness related inputs.
- To provide assistance as required by the Bihar State Institute of Disaster Management for –
 - a. drawing up mitigation, preparedness and response plans, formulation of capability building, training programmes, data collection and dissemination and identification and training of personnel in relation to disaster management.
 - b. assessing the damages caused by any disaster.
 - c. carrying out rehabilitation and reconstruction work.
 - d. In consultation with the BSDMA/ DMD working out the total budget out lay for the annual programme and activities.

The Disaster Management Cell shall at least have following infrastructure facilities :

- *An independent room or enclosure with sufficient space to have :*
 - i. *a computer set with all accessories like scanning, internet etc.*
 - ii. *a fax machine*
 - iii. *a photocopier*
 - iv. *an LCD TV for monitoring news*
 - v. *a dedicated phone line*
 - vi. *a fire-proof record keeping almirah*
 - vii. *a computer operator to assist the officers.*

Keeping the above multidimensional functions in view, the roles and responsibilities of each government department have been viewed and demarcated. The functions of each department have been presented from two angles: **Disaster Phase wise**, and **Hazard wise**.

1. Department of Home

The activity area of the Department of Home is whole of the State. As such, any disaster of any size touches and involves the department. The Police, the Home Guard, the Fire department, the Citizen Council and STF have to take charge of a situation and enforce and maintain law and order. The Department of Home, therefore, has to play crucial supportive roles in case of all disasters caused by any hazard.

However, in case of disaster caused by earthquake and floods all the three wings–Police, Fire & Home Guard etc.– of the department shall play major supportive role. As such, the three phases of disaster wise roles and responsibilities of the departments shall be:

A. Disaster Phase Wise

A.1 *Pre- Disaster:*

- Orientation and training of district–wise selected team of Police, Home Guard, Special Task Force and Fire departments in search and rescue, providing security in emergencies and being available where support services are required e.g. carrying of the injured, identification of the dead, keeping record of the same and handing over of the dead bodies to relatives etc.
- Training and mock drills related programmes for the selected team of police, STF, Fire, Citizen Council and Home Guard personnel.
- Co-ordination with Urban Development Department on fire safety measures in buildings and about certification of the same by Fire Department.
- Formulating policies for the creation of Fire Safety Centers and taking fire safety related measures with community level accessibility in mind and implementation of the same in focus.
- Organizing inspection of the building by the Fire Department and sending inspection report with recommendations to the party concerned and with a copy to BSDMA & DMD.
- Pressing teams of Home Guard to monitor the observance of building code, fire safety, disaster preparedness & provide support in the same.
- Enforcement of fire related measures in the existing buildings, specifically Govt., multistoried and other strategic ones.

- Purchase and distribution of Fire Safety related equipment and machinery and organize orientation and training to promote self-help and mutual help in making use of them.
- Reviewing the functioning of Disaster Management Cell and monitoring the participation of those manning the Cell in the orientation and training programmes and bringing their leanings into practice.
- To let the team of trained personnel manning the Cell continue for as long a period as possible.

A.2 During Disaster

- Chief of Police, Home Guards and Fire services to provide assistance to the State Emergency Operation Centre.
- Provide assistance of the police, home guards and fire services to the District Magistrate of the affected districts for support in search & rescue, security and other services.
- Reviewing the situation at the Department level and organizing reinforcements if required.
- Maintenance of law and order and enforcement of traffic rules and regulations at the disaster site.
- Organizing security at the Relief Camps.

A.3 Post Disaster

- Maintenance of law and order situation at the disaster site and other related places.
- Organizing security at the Relief Camps.
- Managing Enquiry Centre
- Providing Escort Services.

B. Hazard Wise

Since all disasters are basically disturbances causing loss of life and property, the Department of Home shall play major supportive roles in varying proportions. Hazard-wise roles and responsibilities of the Department, therefore, shall be

B.1 Earthquake: In Joint lead with Urban Development Department & DMD in Pre- and during the disaster phases.

- Managing security, safe-keeping of victims.

- Coordination with support organizations through District Administration.
- Providing security during visits of the incident site by authorities and VIPs
- Monitoring restoration of communication and transport services
- Providing escort services to the victims
- Identifying & maintaining records of the deceased
- Maintaining law & order

B.2 Flood: *Major Support Providing Department*

- Support in search and rescue operations being carried out by NDRF and BSDRF
- Escort services to the victims to Health Centers and Hospitals
- Organizing safe keeping of the dead bodies
- Identification and recording of the deceased ones
- Taking charge of those separated from their families
- Organizing security at the relief camp
- Maintaining law & order in the area
- Providing support in relief distribution
- Manning Enquiry Counter
- Escort Services to visitors

B.3 Fire: *Lead Department together with DMD*

- Fire extinguishing services
- Undertaking search and rescue operation
- Escort services to the injured
- Identification and safekeeping of the dead bodies
- Support in debris clearance and relief distribution
- Maintaining law & order

B.4 High Speed Wind /Gail: *Support Providing Department*

- Support in search and rescue operation
- Escorting injured to Hospitals
- Identification and safekeeping of the deceased

- Support in relief distribution
- Maintaining law & order

B.5 Traffic Accidents: *Support Providing Department*

- ***Road***

- ***Boat***

- Providing support in rescue operation
- Escorting injured to hospitals
- Identification and safekeeping of dead bodies
- Support in relief distribution
- Maintaining law & order

B.6 Human Induced Climatic Change: *Support Providing Department*

- ***Lightening***

- ***Heat***

- ***Cold Waves***

- Escorting the victims
- Identification and safe keeping of the dead
- Support in relief operation

B.7 Epidemics: *Support Department*

- Escort services to the serving team members
- Security at hospitals and health services centre
- Identification and handing over of the dead bodies.
- Supervising quick and safe disposal of dead bodies

B.8 Industrial Disaster: *Support Department*

- Sealing off the area
- Evacuation of the population in the neighborhood
- Escort service to the injured
- Identification and safe keeping of dead bodies

2. Department of Disaster Management

Department of Disaster Management is the nodal department for disaster management at all levels: State, District & Communities. All disaster management related initiatives emanate and culminate here. As such, disaster prevention, mitigation, preparedness, response, restoration and rehabilitation in all matters the department is either in the lead or in the catalytic role.

The roles and responsibilities of the department are largely three dimensional : co-ordination with the State Departments; interaction with the specialized institutions like BSDMA, NDRF, BSDRF, BSIDM, SDMA/DDMAs and engagements with multilateral agencies, NGOs, professional bodies, corporate houses, armed forces and media. These three dimensional roles and responsibilities get further primed into Disaster phase wise and, Hazard- wise.

A. Disaster Phase Wise

The Department of Disaster Management has the following roles and responsibilities in Pre-, during – and Post Disaster Phases:

A.1 *Pre- Disaster:*

As stated earlier, disaster phase wise roles of responsibilities of the department has to be viewed at three levels:

- i.** Co-ordination with the Departments of State Government
- ii.** Interaction with specialized institutions, &
- iii.** Rapport with stakeholders other than the government ones.

A.1.i. *Co-ordination with Departments of State Governmentf:*

- To Follow-up with Departments for the formation and manning of Disaster Management Cell (DM Cell)
- Orientation and training of DM Cell personnel in disaster preparedness & response
- To get Hazard-wise GIS mapping of vulnerable areas done
- To provide support to departments in preparing prevention, mitigation & preparedness measures.
- To get integrated the measures formulated by each department to make those mutually compatible and supportive initiatives for prevention, mitigation and preparedness.

- To get the initiatives classified and categorized into hazard wise and district wise.
- To supervise and monitor the implementation of the programme and activities for disaster management.
- To keep the DM Cell of each department informed/involved
- To constitute hazard-wise Incident Management Team consisting of Lead & Support Departments.
- To constitute hazard-wise Damage Assessment Team

A.1.ii. *Interaction with Specialized Institutions :*

- Staffing and operationalising State Disaster Response Force (SDRF), Bihar State Institute of Disaster Management (BIDM), State Emergency Operation Centre (SEOC), Districts Disaster Management Authority (DDMAs) and District Emergency Operation Centres (DEOCs).
- To formulate Standard Operating Procedure (SOP) to combat disasters and oversee its compliance.
- To have periodic co-ordination meetings of DM Cell, specialized institutions and other stakeholders.
- To update and refresh the networking with specialized institutions at the national and international level.
- To create and update disaster management related databank, phone nos., name and address for use during response period.
- To position and strengthen Civil Defense modalities at appropriate levels and equip them to work as Disaster Management Support Force (DMSF).
- To get organized mock drills at the State and district level to cultivate in all concerned the habit to respond in a well prepared manner.
- Through concerned DM Cells to get the ground level information and data gathering and delivery system installed, periodically checked, repaired and maintained so that Early Warning System could really be early in sending warnings.
- To get the hazard wise and departmental need wise GIS mapping done and make the same available to concerned DM Cell for the need based formulation of prevention,

mitigation and preparedness related programme and activities.

A.1.iii. Rapport with other Stakeholders:

During disasters a host of multilateral, bilateral, international NGOs, professional bodies, corporate houses, local bodies and civil societies extend their helping hand in relief and disaster response related operations so much so that most of the materials and resources remain unused and subsequently become problematic to keep them properly for future use. But, during Pre-disaster days these stakeholders remain dormant perhaps because either they are not approached with proper proposals or do not visualize any role for them to play.

Thus, the vast pool of material and human resources in the form of other Stakeholders are required to be tapped and mainstreamed. In the mainstreaming of other stakeholders the Department of Disaster Management shall keep in view some of the needs noted below:

- Strengthening of EOCs.
- Strengthening of Early Warning System
- Awareness generation programme and activities
- Capacity building of stakeholders and responders
- Vulnerable area adoption for the implementation and maintenance of disaster prevention, mitigation and preparedness measures

A.2 During Disaster

During disaster caused by any hazard the Department of Disaster Management shall be the main lead organization with following roles and responsibilities

- To command and coordinate the disaster response operation
- To dispatch NDRF & BSDRF to the incident site
- To call the hazard wise concerned Incident Management Team
- To alert the higher authorities
- Media briefing and information dissemination.
- Resource allocation to the districts for combating disaster situations.
- To organize/coordinate the setting up of Relief Camps, Health Camps, Livestock Shelters, Distribution of Relief etc.

- To organize the restoration of communication, transportation
- To organize clearance of debris
- To organize receiving of relief materials
- To send reinforcements at the incident site if required
- To organize relief distribution
- To hold meeting with donor agencies
- To organize disposal of dead bodies both human and livestock

A.3 Post Disaster

- To select the sight for resettlement of victims
- To get the resettlement plan prepared
- To firm up resources
- To deactivate the response operation but continue with relief and other support services operations
- To start rehabilitation
- To dismantle relief camp and support services in a phased manner

B. Hazard Wise

Hazard wise roles and responsibilities of the Department of Disaster Management shall be at two levels: at the level of Lead Department and at the level of Support Department.

B.1 Earthquake:

- To form the Incident Management Team
- To form the Damage Assessment Team
- To organize orientation and training of responders including community in disaster management
- To coordinate with relevant departments regarding enforcement of Building Codes, Fire Safety Rules and Certification of Building etc.
- To follow-up with Road & Building Construction Department about the availability of heavy duty cutting, debris clearing machines, their specifications, placement, storage and their operators & upkeep of the same for ready use.

- To follow-up with concerned agencies about the arrangements for putting up stop gap bridges on emergency basis & formation and training of the team for the erection of temporary bridges.
- To follow-up with BSNL about the arrangements for the restoration of communication system & act accordingly
- To follow-up with Health Department about facilities available, both in private & public sector, for health services in emergencies in vulnerable areas and act accordingly
- To follow-up with PHED about the drinking water facilities created in the vulnerable areas and Department's readiness to provide the same in emergencies & act accordingly
- To follow-up with Energy Department about arrangements for the restoration of power supply and providing for supply of power through alternative sources of energy & act accordingly
- To follow-up with DDMA's about the implementation of mitigation, preparedness and response measures and present status of the same & act accordingly
- To organize the orientation and training of personnel to undertake earthquake resistance constructions and retrofitting on a large scale
- To follow-up with Fire Department about the reach and capacity of their fire-extinguishers, fire safety policy and plan to increase their spread and improve their capacity and policy to train security guards, habitants of high rising building, civil defence, Home Guards personnel and volunteers in fire safety measures & act accordingly
- To follow-up with Armed Forces about the emergency support services available with them and keep in regular touch with them.

B.2 Flood:

Twenty eight out of 38 districts of the State being flood prone this is one major disaster for which the concerned departments have to remain specifically prepared. The Department of Disaster Management has to be specifically in readiness on the following counts:

- To follow-up with Water Resources Department about the repair and maintenance of the embankments & act accordingly

- To follow-up with Water Resources Department about the status of prevention, mitigation and preparedness related programmes and activities & act accordingly
- To follow-up with DMs/DDMAs about the shelters and the facilities available there & act accordingly
- To follow-up with Food & Civil Supplies Department for the positioning of supply of grains and fast food stuff etc. in the area & act accordingly
- To follow-up with Department of Transport and Department of Cabinet Coordination (Civil Aviation wing) about the availability of transportation facilities & act accordingly.
- To make arrangement for the storage and packaging of the relief materials.
- To follow-up with Department of Science & Technology and Indian Meteorology Department about the functioning of the gadgets and equipments at the ground and EOCs level and do the needful.
- To follow-up with NDRF & BSDRF about their preparedness & organize periodic meetings with them.
- To form the Incident Management Team consisting of officers from the Lead and Support Departments.
- To form Damage Assessment Team.

B.3 Fire:

- To follow-up with Home Department about Fire Safety Policy, Measures, Equipments and Machinery and orientation and training programme of firemen and team of youth(s) from vulnerable communities both for the urban and rural areas.
- To organize survey and study of Fire Safety in Urban areas, where high rise buildings are in abundance.
- To strategize the putting up of Fire Safety measures in government, multistoried and strategic buildings in particular and other places where concentration of large population is likely to be there.
- To strategize the installation of easy to operate fire safety devices at the Police Station, Gram Panchayat and vulnerable community level and get orientation & training conducted in

operating the same and get repair/ maintenance/replacement of the same organized both in urban & rural areas

- Encourage the Urban Development Department and Municipal Corporations to strategize the widening of roads and lanes, removal of encroachments etc. for the movement of fire fighting engines during disaster
- Encourage Urban Development Department to take a policy decision and enforcement of the same in the construction of high rise buildings for which appropriate fire fighting devices are available
- Encourage Urban Development Department to make it mandatory for apartments to have underground water storage tank etc. for use in fire emergencies
- In case of widening of roads and lanes being not possible, then get the decision to equip Fire Department with compatible fire extinguishing vehicle etc.

B.4 Drought:

- Drought being a slow on-setting hazard, response to it may be coupled with mitigation measures to hold it from further intensification
- Drought has to be viewed from flood point of view, on the one hand, and from rain harvesting point view, on the other
- Encourage Water Resources Department, Department of Minor Irrigation, Department of Agriculture & PHED and other specialized agencies to take up drought prevention and mitigation measures.
- To coordinate with Urban Development Department/Panchayati Raj Department/PHED/Rural Development Department/ Building Construction Department/ 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.
- In association with Department of Agriculture, Rural Development Department and Department of Environment and Forest & through other specialized agencies work out drought prevention, mitigation and preparedness measures from crop

management and social forestry point of view and get the same implemented.

B.5 High Speed Wind/Gail:

- Analyse the data regarding high speed wind/gail received from IMD and take necessary measures
- Coordination with the Electricity supply companies and BSNL for organizing restoration of power & communication linkages in vulnerable areas
- Work out a strategy to combat the impact of high speed wind/gail.

B.6 Traffic Accidents:

- *Road accidents &*
- *Boat Capsizing*

- In both the cases—road and water transportation— in association with Transport Department and District Administration monitor mitigation and preparedness measures taken to prevent accidents.
- Depending upon the nature of accident and magnitude of disaster, respond effectively and carry out relief operations promptly.

B.7 Industrial Disaster:

- In association with the Department of Labour and Department of Industries, DMD shall get formulated, Disaster Mitigation and preparedness measures
- DMD, in association with Home Department, Industry Department & Labour Department, shall form the Incident Management Team and the Damage Assessment Team for support in Response and Damage Assessment.

B.8 Epidemics :

- In association with Health Department, Municipal Corporation, PHED, Bihar State Health Society and Urban & Rural Development Departments, DMD to identify specific disease wise vulnerable areas and encourage the concerned agencies to take up prevention, mitigation and preparedness measures for each identified and formulated for implementation.

- DMD shall formulate Incident Management and Damage Assessment Teams of officers and professionally qualified representatives of these departments for respective purposes.

3. Department of Water Resources

The Department of Water Resources shall be the lead organization for working out floods related prevention, mitigation and preparedness measures. In the process, the department in association with Department of Agriculture, Department of Minor Irrigation and PHED, shall survey, study and explore the options to integrate the flood management with drought management so that excess of water resources in one case meets the dire requirements in the other.

A. Disaster Phase Wise

A.1 Pre- Disaster :

- Formation of Disaster Management Cell and man the same with senior personnel drawn from key sections of the Department.
- GIS mapping of the flood prone areas and condition of embankments and other structural flood prevention and mitigation measures
- Developing Early Warning System to disseminate timely information regarding impending floods to the people of the area likely to be inundated
- Developing Flood Management Information System for all river basins of Bihar
- In view of the findings, formulation of further prevention, mitigation & preparedness related programme and activities along with budget for integration with those of other departments
- Co-ordination with DMD for the finalization of programme and activities and for implementation of the same
- Providing support in the implementation of the programme and activities
- Supervision and monitoring of the implementation of flood prevention/mitigation/preparedness schemes
- Working out long-term remedial measures for intensively flood prone areas in consultation with BSDMA, DMD, BSIDM and other specialized institutions in the country
- Keeping in view drought prone areas in its purview so that intensively flood-prone areas and intensively drought prone areas may become mutually supportive in the long run

- While giving due weightage to anti-erosion, spur protection and embankment strengthening, non-structural measures related specifically to siltation prevention and clearing shall also be kept in focus and given priority.
- While giving effective implementation of Bihar Irrigation Flood Management and Drainage Rules, 2003, it shall be kept in mind that the Rules have to include the development needs of the area, on the one hand, and the water needs of the drought prone areas, on the other
- Co-ordination with Nepal for the preparation of risk maps and techno-economic evaluation of the threat of flood on a regular basis.
- Installation of required number of rain gauge stations along the inundating rivers
- Keeping track of catchment area in Himalayas and take prevention, mitigation and preparation measures accordingly
- Systematizing Multi-Channel communication networking to support disaster management
- Form a team of trouble shooters drawn from key sections of the department for deployment during emergencies. The team may include, if needed, competent retired persons of the department.
- Since Flood is a calendar bound incident, the planning and execution of the flood related disaster management shall be done in four distinct phases :
 - From mid-October to November end field visit to formalize and finalize anti-erosion schemes for implementation.
 - From November and to December end inviting bids and awarding contracts for the implementation of the schemes.
 - From January beginning to May end completion of the contracts awarded.
 - From Mid June to Mid October depending upon factors beyond control, flood-fighting in particular and disaster management in general begins and ends.
- Effective implementation of Bihar Irrigation, Flood Management & Drainage Rules, 2003 shall be undertaken .

- Close coordination with National Water Commission and Ganga Flood Control Commission be done so that techno economic evaluation in coordination with Nepal, preparation of risk maps with the help of remote sensing and satellite imagery be prepared.
- Flood Fighting Force (FFF) consisting of engineers & support staff shall be constituted and placed in vulnerable areas to prevent/mitigate major disaster
- Number of rain gauges shall be increased to cover all the 534 blocks and gauge stations to cover all the major rivers causing inundation.
- Establishment of dedicated satellite based or radio based communication system for flood management.

A.2 During Disaster:

- Department of Water Resources shall be, along with Disaster Management Department, the joint lead department during disasters caused by flood
- Deployment of team of trouble shooters at the site of incident to take preventive measures

A.3 Post Disaster:

- Survey and study of the source of flooding for taking long-term preventive measures
- Providing for the upkeep and maintenance of the same

B. Disaster Wise

B.1 Earthquake:

- GIS mapping of the breaches in embankments caused by earthquake
- Repairing of the breaches and maintenance of other embankments

B.2 Floods:

- GIS mapping of vulnerable areas
- Coordination with Nepal and IMD for assessment of rainfall and floodwater flows in the catchment areas of Himalayas
- Placement of rain gauge stations along the flooding rivers

- Repair, maintenance and upkeep of the same for getting regular flow of information.
- Formation of trouble shooting team
- Placement of trouble shooting team at strategic places
- Take measures for flood protection/fighting at vulnerable spots of embankments/zamindari bunds; supervision and monitoring of the implementation of the programme and activities for flood protection/fighting.
- Providing support to DMD in disaster response as a joint lead department

B.3 Drought:

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

B.4 High Speed Wind /Gail:

- Take remedial measures for flash floods caused by cyclonic Storm/High Velocity Wind/Gail.
- Send team of trouble shooters to the affected areas

B.5 Traffic Accidents:

- **Boat**
 - To avoid boat accidents put up sign boards about depth of water, muddy bed etc. at ferrying points along the rivers.

B.6 Epidemics:

- In association with Urban Development Department, Municipal Corporation and Municipalities, Health Department and DMD coordinating the prevention of River pollution

4. Department of Agriculture

The Department of Agriculture shall be the lead department for disaster caused by Drought. Besides, the Department shall be one of the major support departments for disasters caused by earthquake, floods, fire and cyclonic storms.

The Department, through its Disaster Management Cell, shall coordinate with Indian Meteorological Department, ISRO State office, Water Resources Department, Minor Irrigation Department, PHED, DMD & other concerned departments/agencies for collection of data & based on that working out prevention, mitigation & preparedness measures for disaster caused by drought.

A. Disaster Phase Wise

Disaster phase wise roles and responsibilities of the department shall be :

A.1 *Pre- Disaster :*

- Formation of DM Cell and manning the same by drawing personnel for key sections of the Department.
- Facilitating the identification of drought prone areas through GIS mapping, rainfall estimation etc.
- Survey and study of identified drought prone areas
- Formulation of prevention, mitigation & preparedness measures along with budget allocations in association with Water Resources, Minor Irrigation and PHED departments
- In consultation with PHED, Minor Irrigations & Rural Development Department formulation implementation and monitoring of rainwater harvesting policies and programmes and activities
- Formulation of agricultural product policy for the area, working out contingency crop plan in case of delay in monsoon and strategizing the storage and supply of needs, fertilizers and pesticides in order to promote compatible agriculture practices in the area
- In association with the Department of Forest and Environment workout programme and activities for the ecological betterment of the area.
- In association with the departments of Water Resources and Minor Irrigation plan for providing irrigation facilities during drought.
- Formation of Damage Assessment Team

A.2 *During Disaster :*

- Crop damage assessment
- Working out alternative cropping for the drought as well as flood affected areas and organizing all the inputs required for the same

A.3 *Post Disaster :*

- Providing support in the implementation of alternative cropping programme in drought as well as flood affected area
- On the basis of crop damage assessment organize payment of input subsidy in accordance with State Disaster Fund norms in association with Disaster Management Department

B. Disaster Wise

B.1 Earthquake :

- Crop damage assessment
- Payment of Agriculture Input subsidy
- Working out crop contingency plan

B.2 Floods :

- Crop damage assessment
- Payment of Agriculture Input subsidy
- Working out crop contingency plan

B.3 Drought :

- 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 areas

- Organizing the irrigation facilities
- Working out alternative cropping programme and activities

B.4 Fire :

- Crop Damage Assessment
- Providing Agriculture Input subsidy
- Supply of Seeds and Fertilizers

5. Department of Food & Consumer Protection

The Department of Food & Consumer Protection is a key support department in case of disaster caused by earthquake, flood, drought and fire. Its roles and responsibilities largely cover during and post-disaster period. But careful planning of agri.–product storage and packaging during Pre-Disaster period shall provide great help in relief distribution during disaster period.

A. Disaster Phase Wise

The Department of Food & Consumer Protection is a major support department During & Post–Disaster period. During Pre-disaster period, however, the department has roles to play in preparedness specifically in flood and drought prone areas.

A.1 Pre- Disaster :

- Formation and manning of DM Cell with personnel drawn from key sections of the department.
- In consultation with Water Resources, Disaster Management and Agriculture Department, marking of flood and drought prone areas and making storage, packaging and supply of food grains during and disaster and post disaster period.
- Implementation of Food Security Act effectively.

A.2 During Disaster:

- Making arrangements for the supply food and relief materials
- Making arrangements for the running the kitchen at the relief camp site.
- Compliance of food grain demand received from Disaster Management Department in time of earthquake, flood, drought, fire and epidemics.

A.3 Post Disaster :

- Maintain the supply of foodgrains till the rehabilitation is complete

B. Disaster Wise

B.1 Earthquake :

- As earthquake disrupts ground level movements, the aerial supply line remains the only option. But then for dropping supplies an appropriate packaging of food products have to be

there. Such packaging materials in adequate quantity have to be kept in readiness for bulk as well as in small packets.

- Organize security of the godown and provide escort services to the supplies.
- Coordinate procurement of goods and supplies required for the relief distribution.

B.2 Floods:

- Make arrangements for the supply of food grains at the incident site, relief camps.
- In consultation with DMD plan and systematize the distribution of relief materials.

B.3 Drought:

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

B.4 Fire:

- In consultation with DMD organize distribution of food grains to the victims for a period specified.

6. Department of Panchayati Raj

Panchayat is the most important of all the local bodies. It is so positioned that between the first stakeholders, that is, communities and the District Administration it takes both in its stride without taking a giant leap. At the district level the Chairperson, Zila Parishad is along with District Magistrate, the Co-Chairperson of DDMA and at the community level Gram Panchayat is the only field level institution elected representatives of the people in general.

As such, the Department of Panchayati Raj is a key department positioned to play significant roles in the implementation of programme and activities from pre-disaster to the of "Build Back Better" phase.

A. Disaster Phase wise

Disaster Phase wise the department has following roles to play:

A.1. Pre Disaster

- Formation of DM Cell and manning the same with senior personnel drawn from key sections of the department.
- Advising elected representatives Zila Parishad, Panchayat Samiti, Gram Panchayat level to provide support in the implementation of Disaster Management related programme and activities
- Getting them oriented in supervision and monitoring of programme implementation.
- Advising them to make use of Gram Sabha to spread awareness about hazard and the need to get prepared and remain alert:
- Orientation of the elected representatives in galvanizing larger community participation in disaster management
- As provided in the Panchayati Raj Act getting Disaster Management related Statutory Committee formed and activated.

A.2. During Disaster

- Advise Panchayat Representatives to provide support to search & rescue team, persuade people to evacuate and help in identification of victims & relief distribution.

A.3. Post Disaster

- Advise Panchayat Representatives to provide support in the resettlement of the people in a planned manner.

B. Hazard Wise

B.1. Earthquake:

- Advising Panchayati Raj representatives to do advocacy for construction of earthquake resistant houses as per the technical specifications available.
- To organize awareness generation about earthquake among communities

B.2. Flood:

- Advising Panchayats to do advocacy for the construction of houses and public buildings to the extent possible at a higher level.

B.3. Fire:

- Training volunteers at Panchayat level for fire fighting

7. Department of Health & Family Welfare

The Department of Health and Family Welfare shall be the lead department in case of Epidemics and a major support department in case of disaster caused by all hazards. As such the department shall keep its health services providing centre and facilities for mobile and on site medical services in readiness on 24 × 7 × 365 days basis.

Besides, the health department shall equip its Primary Health Centres in vulnerable areas with medical facilities and staff so that adequate support be provided to the victims on immediate basis.

A. Disaster Phase Wise

The disaster phase wise roles and responsibilities of the Department shall be;

A.1. Pre Disaster Phase

- Formation of Disaster Management Cell and manning the same with senior personnel drawn from key sections of the depts.
- Formulation of Disaster Management Plan for each of the Medical College & Hospitals, District Hospitals & Health Centres.
- Formulation of policies and programmes to make Emergency and First-Aid Services available up-to Gram Panchayat level.
- Orientation and training of medical service rendering staff members in disaster response and rendering health services in 'non-lab' situations.
- Disaster-proofing of all Medical Colleges and Hospitals and other health facilities.
- Networking with local private hospitals and nursing homes for support services during emergencies
- Networking with national level specialized medical services and research centres for guidance and support during epidemics.
- Enlisting and safekeeping of disaster-wise medicines at the district level and sufficient stock at the state level.
- Facilitating the creation of Trauma Centre, Mobile as well as floating Medical Service Vans, Boats, Air Ambulances, Boat Ambulances etc.
- Formulating Standard Operating Procedure for Mass Casualty Management, for Tagging and tapping, for Medicines Supply

Management, and Emergency Admission Procedure with adequate record keeping.

- Identifications of sources for bulk supplies of medicines during emergencies.
- Review and updating of protection of equipment, safe-keeping of medicines.
- Orientation and training of Hospital staff in disaster response plan and procedures.
- Emergency communication network with SEOC, DEOC Hospitals and Private hospitals
- Checklist for the stocking of drugs and other services and facilities required in emergencies at the District Hospitals.
- To strengthen Bio-Medical Waste Management to check its adverse impact on human and cattle health.
- Development of Air-Ambulance landing sites in Medical College Hospitals
- Preparation of Triage Protocol (Tagging, Tapping etc.)
- The dept. shall get the medical teams trained to respond quickly in medical emergencies. Department of Disaster Management may provide support for the training.

A.2. During Disaster

- Positioning of well trained, fully equipped emergency medical team and facilities at disaster site.
- Networking with hospitals in safe neighboring districts and making arrangements for the transportation of patients after first aid.
- Setting-up of Trauma Centre
- Setting up morgue for the safe keeping of dead bodies.
- Keeping the Information Centre at the incident site posted about the name and address of deceased and whereabouts of the victims attended and dispatched.

A.3. Post Disaster Phase

- Continued running of the Trauma Centre

- Post disaster disease prevention and control
- Training of selected male and female young ones in the community in first aid and paramedics.
- Keeping available dog-bite, snake bite water-borne infections and flu etc. related medicines in stock at the Primary Health Centre
- Regular Visit of the Relief Camps by physicians.

B. Hazard Wise

Of all the departments, hazards wise services of the Health Department tend to vary considerably. As such, Department has to make hazard specific preparations.

B.1. Earthquake

- The preparations shall be made keeping in mind injuries caused by falling off and from buildings, heavy structures-specifically bone injuries etc.
- Since roads shall either be breached or obstructed the setting up of medical camp etc. shall have to be flown. As such kits etc. have to be kept ready for that kind of carrying.
- Since other supplies etc. shall be disrupted, the food and drinking arrangements for the medical staff shall be part of the baggage.

B.2. Flood

- Getting ready medical mobile boats and Air Ambulances.
- Getting ready with Floating Hospitals.
- Getting SOP ready for Response during flood.
- Preparation of checklist of medicines and equipment etc. for hospitals and Medical Service Providers, Medical Camps etc.
- Having its own transport arrangements to move in emergencies.
- Pooling and positioning of ambulances in strategic places.

B.3. Drought

- 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 basis

- Arrangement of provisions for the medical staff manning the camps
- Making arrangements for community centered medical services rather than camp centered services.

B.4. Fire

- Checklist of onsite First Aid Services
- Creation of special team for rescue and carrying of fire-victims.
- Creation of special ward in Hospitals to treat the patients.
- Check list of medicines and treatments required by the victims at the camp level and at the Hospital level.
- Health Dept. shall create a special ward for fire patients in Medical College and Hospitals, District Hospitals and equip them with qualified and competent medical staff and appropriate facilities and medicines.
- Dept shall have tie-ups with fire patients treating specialized sector at the state and national level with clearly spelt out support and services they shall provide in emergencies.

B.5. High Speed Wind

- As the disastrous impact of cyclonic storms is more or less spread and scattered over a vast area, mobile medical van equipped to provide treatments for injuries inflicted by cyclonic storms.
- Enlisting the kind of injuries and victims cyclonic storms render and directing medical colleges and hospitals, district hospitals and other medical service center to prepare accordingly.

B.6. Epidemics

- The Department of Health shall get a study of epidemic prone areas and period of outbreak and remedial measures required. Based on the findings solicit guidance and support from the specialized institutions at the national and international level.
- Based on the epidemic calendar the dept. shall workout a set of programme, activities and SOPs for Pre, during and Post epidemic period and give directions to Civil Surgeons to implement and follow the same religiously .
- The Dept. through its DM Cell shall supervise and monitor the implementation of progamme and activities.

- The Dept. shall keep ready team of doctors and support staff to press in service if reinforcement needed.

B.7. Transport Accidents

- *Road &*
- *Boat*

- Making use of the mobile medical vans to provide on the spot medical aid
- Tagging and flapping of victims before getting transported to the nearest hospital.
- Organizing postmortem of the deceased.

– B.8. Industrial Accidents:

- For Industrial Accidents, the Dept. shall prepare hazard profile of the industrial areas in the State in consultation with the Dept. of Industries and Labour.
- The Department shall also gather information about the kind of medical preparedness a state should have for Chemical, Biological, Radiological and Nuclear Disaster. And based on the details gathered shall create facilities based on that in the Medical College and Hospital in the state capital and get trained a team of doctors and support staff.
- The dept. shall get the medical teams trained to respond quickly in medical emergencies. Department of Disaster Management may provide support for the training.

8. Department of Education

The role and responsibilities of Department of Education shall consist of the following :

A. Disaster Phase wise

A.1. Pre Disaster Phase

- Formation of Disaster Management Cell and manning the same by senior personnel drawn from key Directorates.
- Incorporating costs for preventive and mitigation measures for earthquake, flood, fire and cyclonic storm prone areas to construct disaster resistant school buildings.
- In association with Fire Dept. getting fire extinguishers installed in schools and teachers identified and trained in operating them.
- Awareness Generation Programmes about Hazard, the kind of preparedness required and how to act at the time of disaster shall be organized in schools on monthly basis.
- Disaster Management shall be made a part of the school curriculum.
- The Department shall get quality films made on hazard wise disaster preparedness and organize their viewing by children and their parents.
- The Department shall in association with Nehru Yuva Kendra organize locality based youth clubs and get them groomed in escort services, relief work and taking care of children, women, old and sick.
- Making adequate arrangements for getting hand pumps installed, storage facilities created, toilet and bathrooms built in those schools where communities do take shelter during flood. Concerned departments shall either make the arrangements or make funds available for the same. DMD shall coordinate.

A.2. During Disaster

- Safekeeping of infrastructure of schools converted into shelters

A.3. Post Disaster

- Getting the school vacated as soon as normalcy is restored.
- Resumption of teaching work at the earliest.

B. Hazard wise

B.1. Earthquake

- Construction of earthquake resistant school buildings.
- Retrofitting in already constructed buildings.

B.2. Flood

- Selection of site for the construction of school building shall be done with the level of flooding water in mind.
- Open space for emergency construction of sheds etc. shall be left to the extent possible.

B.3. Fire

- Fire extinguishers be placed in schools and teachers identified and trained for using the same in case of fire in school or in the neighborhood

9. Department of Labour

The Department of Labour along with DMD shall be the lead department in case of Industrial Disaster. Its roles and responsibilities shall be

A. Disaster Phase wise

A.1. Pre- Disaster

- Formation of DM Cell and manning the same with senior personnel drawn from key sections.
- Strengthening of the factory inspection in consultation with department of Industries, Fire and Health Departments.
- Providing of orientation and training programme and activities in disaster management for the security staff at the Industrial Estates.
- Establishment of communication system to get informed in time to organize response
- Formulation of policies and programmes for strategizing location based industrial disaster management.

A.2. During Disaster

- In association with DMD and with the support of DDMA, Department of Labour shall respond to the call.
- With the help of Central Industrial Security Force and local police and BSDRF organize search and rescue and evacuation of workers and the people in the neighborhood living in areas vulnerable to the accident.

A.3. Post- Disaster

- Investigating the cause of the disaster, fixing responsibilities and taking remedial measures.

B. Hazard Wise

B.1. Earthquake

- Attending to the damages caused in industrial estates.
- Organize fire preventive measures
- Putting CISF on alert
- Organize Damage Assessment and submit report to DMD.

B.2. Floods

- Attending to the damages caused in industrial estates.
- Organize fire preventive measures
- Put CISF on alert
- Organize Damage Assessment and submit report to DMD.

B.3. Fire

- In association with Fire Department and DMD organize control measures.
- Press CISF to prevent spread
- Press Police to evacuate vulnerable population in the neighborhood
- Get the consequences of fire in the factory worked out and take action in the same light.

B.4. High Speed Wind

- In association with DMD, get damage assessment done
- Act in view of the same

B.5. Industrial Accident

- In association with DMD, get damage assessment done
- Act in view of the same

10. Public Health Engineering Department (PHED)

The Department of PHED shall be a major support department in disaster caused by earthquake, flood, drought, fire & cyclonic storms. Its roles and responsibilities shall be:

A. Disaster Phase wise

A.1. Pre- Disaster

- Formation of Disaster Management Cell and manning with senior personnel drawn from key sections of the dept.
- Formulation of Public Health Engineering related programme and activities by intonating them with hazard specific preventive and mitigation measures.
- Creation of stocks of installation materials at the district level for use in emergencies.
- Orientation and training of a team of technicians to do installation as quickly as possible.
- Strategizing the installation of hand-pumps etc. with hazard profile of the area in mind.
- In consultation with the Department of Education and DMD, provision of additional sanitation and drinking water facilities in schools and relief shelters where people take refuge during flood.
- In consultation with the Department of Disaster Management making special arrangements for the supply of drinking water in drought prone areas.
- Planning for repair and maintenance of the facilities created as a part of the programme and activities.
- Keeping a track of groundwater level and having a fresh look at the facilities created accordingly.
- Organizing interaction with Gram Panchayats for having proper sanitation facilities, and providing them support and guidance in planning, implementation and maintenance of the same.
- Procurement, upkeep and maintenance of sanitation equipment for use in emergencies.

A.2. During Disaster

- To create sanitation & drinking water facilities in relief camps.

- To create sanitation & drinking water facilities in shelter for livestock.
- Organize repair & maintenance of the same

A.3. Post Disaster

- Survey & Study of the area for the rehabilitation of victims.
- Working out layout plan for sanitation & drinking water supply in consultation with agency involved in construction of houses.
- Implementation of the plan and making arrangements for the repair and maintenance of the same.

B. Hazard wise

B.1. Earthquake

- To create sanitation & drinking water facilities in relief camps.
- To create sanitation & drinking water facilities in shelter for livestock.
- Organize repair & maintenance of the same

B.2. Floods

- To create sanitation & drinking water facilities in relief camps.
- To create sanitation & drinking water facilities in shelter for livestock.
- Organize repair & maintenance of the same

B.3. Drought

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

B.4. Fire

- Create facility for drinking water on immediate basis where the victims have temporarily taken refuge.
- Make arrangements for the sanitation facilities.

11. Department of Transport

It is statistically proven that road accidents cause more deaths in a year than all disasters put together. Death by drowning in boat accidents swells the figure all the more. The Department of Transport therefore require larger input of disaster management than normally provided.

The Department of Transport shall be the lead department in case of road and boat accidents, and a major support providing department in disaster response.

The roles and responsibilities of the department shall be

A. Disaster Phase wise

A.1. Pre- Disaster

- Formation of Disaster Management Cell and manning with senior personnel drawn from key sections of the department.
- Taking road and boat accident prevention and control measures by giving due thrust on
 - **Education:**
 - Creating awareness about road safety measures among the drivers, pedestrians and school children.
 - Lessons on road safety be included in school curriculum.
 - **Enforcement :**
 - Organized checking of vehicles and boats, drivers licenses, drinking of alcohol, repair and maintenance, certification by pollution control board etc.
 - **Engineering :**
 - Road construction with prescribed indicators for safe driving etc and properly marked lanes be done and monitored and maintained.
 - Vehicles plying on roads and boats ferrying shall be regularly inspected on the basis of standard checking procedure laid and approved.
 - **Emergency First Aid** facilities be kept in each vehicle and drivers and conductors be given training in providing First-Aid support services.

- The mobile number of mobile medical care unit be written in bold letters in front of the driver and above the back view panel.
 - As road accidents call for specialised rescue and medical relief operation, department may consider creating a separate “Road Safety Fund” to create facilities to attend to the relief etc. needs of road & boat accident victims.
- Model Boat Rules, 2011 under Bengal Ferries Act-1885 shall be introduced and enforced.
 - Orientation and training programme shall be organized for Drivers and boatmen to inculcate in them safe driving and safe sailing habits.
 - A programme shall be organized to impart training to boat surveyors, MVIs and Master trainers for making travelling by road and sailing by river safe.
 - Getting GIS mapping of roads and rivers done in flood prone areas so that appropriate driving/sailing instructions be prepared and given to drivers driving on that route.

A.2. During Disaster

- Providing transportation facilities for the relief operations.
- Providing boats for evacuation operation.
- Resumption of road transportation as soon as the road connectivity is restored.

12. Department of Social Welfare

The Department of Social Welfare shall be one of the major support departments to actively participate in the management of relief camps and distribution of relief. The department shall focus on children, women, old and sick men & women.

The roles and responsibilities of the department shall be :

A. Disaster Phase wise

A.1. Pre- Disaster

- Formation of DM Cell and manning with senior personnel drawn from key sections.
- Orientation and training of the personnel in line dept. at the district level in relief camp management and relief distribution.
- Formation and training of team of ICDS and Anganwadi Workers to provide support services in relief camps.
- Preparing Gram Panchayat wise list of dependent sections of society women, children, old and differently abled.
- Nominating personnel to take care of lactating mother, diseased and differently able persons during disaster.
- Identify the place where people could be safely housed and make the same known to all.

A.2. During Disaster

- Deputing ICDS & Anganwadi worker in providing support specifically to children & women during disaster.
- Participation in relief camp management and relief distribution through the team of ICDS and Anganwadi Workers.
- Running of child care and counseling centre in relief camps.
- Distribution of Blankets & Firewoods during winter/cold waves.

13. Department of Building Construction

The Department of Building Construction shall be a major support department in case of Earthquake, Fire and Cyclonic Storm.

The Department shall be the resource department for the training of Architects to Masons to construct earthquake resistant buildings, to generate awareness among people about the advantages of safe construction and extend support in providing technical know-how and trained personnel for building safe houses.

The Department shall subsequently try to have a Single Window Service (SWS) for providing design, technical know –how and trained manpower for private construction and also certification for proper construction, if it be so.

The roles and responsibilities of the department shall be :

A. Disaster Phase wise

A.1. Pre- Disaster

- Setting up DM Cell and manning with senior personnel drawn from key sections of the department.
- In association with Department of Rural Development, spread awareness about safe construction specifically through flagship schemes like Indira Awas, Panchayat Bhawan, School Buildings.
- Procurement and placement of heavy duty concrete cutting, debris clearing machines in district headquarters.

A.2. During Disaster

- Provide support in search and rescue from building and apartments.
- Provide support in clearing debris and roads of fallen trees etc.
- Organize construction of relief shelter for humans and livestock.

A.3. Post Disaster

- Provide support in the construction of safe houses for resettlements of victims.

14. Department of Energy

The Department of Energy plays crucial role in providing normalcy. As such, in disaster management restoration of power supply holds the key. It at once, creates the feeling of "All is well".

The roles and responsibilities of the department shall be:

A. Disaster Phase wise

A.1. Pre- Disaster

- Formation of DM Cell and manning with senior personnel drawn from key sections of the Department.
- In association with Urban Development Department work out preparedness and restoration of power supply measures in case of earthquake.
- In association with Water Resources Department prepare for emergency power supply in flood prone areas.
- In association with Labour and Industry Departments work out safety measures in Industrial Estate.

A.2. During Disaster

- Restoration of power supply.
- Making proper lighting arrangements.
- Providing dedicated power supply to the rural areas during drought-like situations as per decision of the State Government.

A.3. Post Disaster

- Power supply and lighting arrangements in rehabilitation areas.

15. Department of Environment & Forest

The Department of Environment & Forest shall be the lead department in preparing strategy / action plan for prevention, mitigation and preparedness for Human Induced Climatic Changes causing disaster.

The department shall work in association with BSIDM, Agriculture, Rural Development, Industry, Mining, Transport, Urban Development, Housing Construction, Energy, Water Resources and Health departments.

The department shall make use of **Hariyali Mission** specifically in association with Rural Development, Water Resources and Minor Irrigation Departments in mitigating climatic changes.

The roles and responsibilities of the department shall be :

A. Disaster Phase wise

A.1. Pre-Disasters

- formation of DM Cell and manning with senior personnel drawn from key sections of the department
- Preparation of strategic plan in consultation with associated departments.
- Regular checking of emissions produced by industries, chemical effluents and vehicles.
- Regular checking of water pollution both surface and ground.
- Implementation of social forestry scheme in mission mode.
- Preparation of wild life protection programme and activities during various disaster related crisis.
- Preparation of Emergency Plan for wild life housed in Sanjay Gandhi Biological Park.
- Preparation of Emergency Plan for each Industrial Estate after having studied the kind of units located there in.
- Training of the field level officers and personnel of the department in view of the above.

A.2. During Disaster

- Determining of protocol during various kinds o disaster.
- Distribution of roles and responsibilities to officers of personnel of the department.

A.3. Post Disaster

- Survey and study of the disaster affected areas and strategize and prepare an action plan for the kind of plantation which shall bring about ecological balance & betterment.
- Determining of long term strategy so that disaster impact could be minimized.
- Preparation of plan from deep ecology point of view.

16. Department of Industries

The Department of Industries shall be a major support department in case of Industrial Accidents.

In association with Labour, Energy, Fire & Forest and Environment Department, the Department of Industries shall strategize and plan for prevention, mitigation and preparedness for industrial disaster.

The roles and responsibilities of the department shall be :

A. Disaster Phase wise

A.1. Pre-Disasters

- Formation of DM Cell and manning by senior personnel drawn from major section of the department.
- Formulation of policy framework for evaluation of Detailed Project Report from disaster management point of view.
- Orientation and training of DM Cell personnel along with those of DM Cell of Labour and Energy department.
- Strategizing and planning of disaster management related facilities at the industrial estate level.
- Formation of Damage Assessment Team.

A.2. During Disaster

- Putting Industrial Estate Management on alert

A.3. Post Disaster

- Damage Assessment, if any, and taking remedial measures.

17. Department of Animal Husbandry

The Department of Animal Husbandry shall be a major support department in case of disaster caused by Earthquake, Flood, Drought, Fire & Cyclonic Storm.

The Department shall prepare livestock related prevention, mitigation and preparedness measures in case of all disasters.

The roles and responsibilities of the department shall be :

A. Disaster Phase wise

A.1. Pre-Disaster

- Formation of DM Cell and manning with senior personnel drawn from key sections of the department.
- Storage of feed and fodder at safe places in flood and drought prone areas and making arrangements for its supply.
- Prepare for the vaccination as well as treatment of livestock through Veterinary Department.
- Formation of a team for Emergency Support Services to livestock like creation of shelter, storage and distribution of fodder, vaccination and medicines during disaster days.

A.2. During Disaster

- Administering vaccination etc. to prevent outbreak of any disease.
- Making arrangements for the sale of milk of disaster affected cattle owners or value addition of the same.
- Arrangements for removal of dead cattle.

A.3. Post Disaster

- Thorough checking of livestock before handing over to the owners.
- In the event of owners not coming forward to claim the livestock, the department shall take decision in consultation with the District Administration.

18. Department of Finance

The Department of Finance shall be the Resource Department for arranging, allocating and timely release of funds.

The Department shall formulate a policy for the allocation of funds for the disaster management in general and for the coupling of development initiatives with disaster management measures, on the other.

The Department shall decide how funds flowing from various sources and resources shall be pooled and spent. It shall provide the norms based on which each department shall make allocations for disaster management and spend accordingly.

Since disaster management is no longer a relief based activity, the Department of Finance shall provide a framework for budgeting for disaster management related programmes to each department and organize orientation and training to the staff members manning the DM Cells.

The roles and responsibilities of the Department of Finance shall be:

A. Disaster Phase wise

A.1. Pre-Disasters

- Formation of DM Cell and manning with senior personal drawn from key sections of the Department.
- Formation of policy framework for the manner of pooling and utilization of funds drawn from various sources and resources.
- Orientation and training of personnel of DM Cells in the preparation of budget for disaster management and in proportionating an amount out of the fund earmarked for a developmental initiatives to meet the cost of disaster management measures.
- Orientation and training of the same target group in of requisitioning of funds during response and making of utilization certificate for funds spent during disaster response.

A.2. During Disaster

- Keeping flow of funds alive in already prescribed manner.
- Monitoring of expenditure

A.3. Post Disaster

- Collection of utilization certificate and verification of the same on the basis already laid.

19. Department of Road Construction

The Department of Road Construction shall be a major support organization during disaster caused by earthquake, flood and cyclonic storm.

The Department shall prepare for the restoration of road transport at the earliest and create materials and manpower facilities for the same and temporary bridge construction at the district level in vulnerable areas.

The Department shall also provide for the clearing of debris and work out strategies for the construction of temporary bridges.

The roles and responsibilities of the department shall be:

A. Disaster Phase Wise

A. Pre-Disaster

- Formation of DM Cell and manning with senior personnel drawn from key sections of the Department.
- Get the GIS mapping of roads and bridges in vulnerable areas done.
- Work out the requirement of materials and machinery for the restoration of roads and have them stored in strategic places in district.
- In association with Water Resources revisit the roads in the vulnerable areas keeping in view terrain heights with reference to danger level at different stretches and make preparations accordingly.
- High flood level be kept in view for major road bridges construction in future.
- Road construction with prescribed indicators for safe driving etc. and properly marked lanes be done, maintained and monitored.
- Install Technology oriented latest signs and indicators and caution notes.
- Undertake inspection of bridges to assess their vulnerability. This shall be done in association with Water Resources Department during November-January every year.
- Undertake repair and maintenance of vulnerable bridge during February-May.
- Prepare detailed road map of the state including village roads and bypass and other connecting roads so that at the time of

disaster shortest possible route to reach the site may be worked out.

A.2 During Disaster

- Restore road connectivity to facilitate movement of vehicles. Construct temporary bridges to provide connectivity.
- Clearance of debris.

A.3 Post Disaster

- Making of approach road to resettlement site.

20. Department of Rural Development

The Department of Rural Development shall be the lead department in intonating the developmental schemes with disaster management inputs, on the one hand, and bracketing the exercise for resettlement of victims with livelihood related activities.

The roles and responsibilities of the department shall be:

A. Disaster Phase wise

A.1. Pre-Disaster

- Formation of DM Cell and manning with senior personnel from key sections of the department.
- In association with other stakeholders working on rural development schemes, provide support in awareness generation and preparedness at the community level.

A.2 During Disaster

- Mobilizing Support in search and rescue, evacuation.
- Support in the management of relief Camps.
- In drought situations, step up implementation of employment generation schemes including water recharge and water harvesting activites under such schemes.

A.3 Post Disaster

- Formation of Self-Help Groups of those being rehabilitated providing skill development training and help them get engaged in income generating activities.

21. Department of Urban Development

The Department of Urban Development shall be the lead organization in the formulation of Building Codes, implementation policy and programmes for the safe and comfortable living in cities.

The department shall be a major support organization in search and rescue operation during earthquake. And, in association with Fire Department, Municipal Corporation and Nagar Panchayats, work out programme and activities to prevent, mitigate and preparedness for disaster.

The roles and responsibilities of the department shall be :

A. Disaster Phase wise

A. 1 Pre-Disaster

- Formation of DM Cell and manning with senior personnel from key sections of the department.
- Formulation of Building Codes and Building Construction Policy and strategize the implementation of the same.
- In association with Building Construction Department, organise orientation and training of architects to mason for the safe and earthquake resistant construction of houses, buildings and apartments on the one hand. and retrofitting in the old ones, on the other.
- In association with police, road construction, energy departments and BSNL work by removing encroachments, relocating the electricity supply and telephone poles etc. so that accessibility be there to reach the area during emergencies.

A.2 During Disaster

- Participate in search and rescue operations
- Removal of debris

A.3 Post Disaster

- Resettlement of victims by 'building back better' townships.

22. Department of Cabinet Coordination (Civil Aviation Wing)

The Department of Cabinet Coordination shall be a major support organization for planning air transportation of support services nearest to the site of incident.

The roles and responsibilities of the department shall be:

A. Disaster Phase wise

A.1 Pre-Disaster

- In association with district administration, identification of district wise locations for the desired landing of small craft and helicopters.
- Development and maintenance of the site for landing of small crafts and helicopters.
- Procurement of small craft / helicopters in pre and during disaster periods.

A.2 During Disaster

- Organize the transportation of men and materials nearest to the destination given

A.3 Post Disaster

- Restoration and Maintenance of landing facilities.

23. Department of Rural Works

The basis objective newly formed Department of Rural Works is to construct and maintain the rural roads falling mainly in the category of Other District Roads (ODR) and Village Roads (VR). The purpose constructing these roads is to provide **Farm to Market Connectivity** to all eligible habitations.

The department is also responsible for constructing roads and bridges and culverts and cross drainage structures under State Plan, Pradhan Mantri Gram Sadak Programme, Rural Infrastructure Development Fund of NABARAD, Border Area Development Programme. Special Component Plan etc.

The Disaster Phase wise and Hazardwise roles and responsibilities of the department shall be :

A. Disaster Phase wise

A.1 Pre-Disaster

- Formation of Disaster Management Cell and manning with personnel drawn from key sections of the Department.
- Making a map of ODR and VR indicating their connectivity to State Highways and National Highways.
- Construction of ODR, VR bridges and culverts keeping in view the vulnerability of the area and by putting mitigation measures in consultation with DMD, Water Resources and Minor Irrigation departments.
- Keeping in view the hazard profile of the area make preparations and keep ready man and materials for the reconstruction of the roads and bridges and culverts to of restore movement.
- Maintenance of roads and bridges under its charge.

A.2 During Disaster

- Restoration of road connectivity and remaining vigilant to attend to similar needs elsewhere.
- Provide support to road Construction department in restoring traffic movement.

A.3 Post Disaster

- Repair and maintenance of the damaged roads, bridges and culverts.
- Construction of roads, bridges and culverts to connect the rehabilitation site.

B. Hazard Wise

B.1 Earthquake

- GIS mapping of the damaged area and reconstruction of roads, bridges & culverts.

B.2 Flood

- GIS mapping of the damaged area and reconstruction of roads, bridges & culverts

B.3 High Speed Wind

- Gathering information about the damages caused and undertaking reconstruction work accordingly.

24. Department of Information & Public Relations

The Department of Information & Public Relations being an information dissemination wing and state to people contact through media, the department is slated to play key role in maintaining transparency and building confidence at the time of disaster as well as before and after that.

The Disaster Phase wise and Hazard wise roles of the department are :

A. Disaster Phase wise

A.1 Pre-Disaster

- Acquiring mobile units fully equipped with mass communication facilities and keeping the same on readiness to work on 24x7 basis.
- Creation of Public awareness about the hazard and vulnerability profile of the state.
- Dissemination of information about hazard wise prevention, mitigation and preparedness measures being taken by the State & required to be taken by the people.
- Publicising hazard wise Dos & Don'ts for the people to remember.
- Regular interaction with media.
- Creation of disaster management related mass communication cell at the district level.

A.2 During Disaster

- Setting up of a control room to provide information to people about the disaster, affected area etc.
- Press briefing on daily basis at a given time to provide official updation of information.
- Feedback to authorities about media report and murmurings at the indent site.
- Manning of Information Centre at the relief Camp site and responding to queries.
- Informing people on day to day basis the kind of assistance provided to victims and measures being taken to control the situation.

A.3 Post Disaster

- Information dissemination about the rehabilitation and reconstruction measures being taken by the State.

25. Department of Planning & Development

The Department of Planning & Development has been, apart from the compilation of department wise schemes and allocation of funds for each, has been assigned to work on the rehabilitation projects. The role of the department in disaster management becomes very crucial.

The Disaster Phase wise and Hazard wise roles of the department are:

A. Hazard wise

A.1 Pre-Disaster

- Setting-up of DM Cell and manning the same with personnel drawn from key sections.
- In association with DMD & Hazard wise lead and support departments work out the scheme wise funds available for prevention, mitigation and preparedness measures. And also suggest, from where the fund could be made available.
- Upkeep of rain gauges.

A.2 During Disaster

- Setting-up of DM Cell and manning the same with personnel drawn from key sections.
- In association with DMD & Hazard wise lead and support departments work out the scheme wise funds available for prevention, mitigation and preparedness measures. And also suggest, from where the fund could be made available.

A.3 Post Disaster

- In association with DMD, formulation of scheme for the rehabilitation and resettlement of the displaced people, workout funding requirements, organize and monitor the implementation of the same.

26. Department of Minor Irrigation

The Department of Minor Irrigation is the key support department for drought affected areas. In association with Water Resources and PHED, the department has to play an important role in prevention, mitigation and preparedness measures for disaster risk reduction caused by drought.

The disaster phase wise and hazard wise roles of the department are :

A. Disaster Phase Wise

A.1 Pre-Disaster

- Formation of DM Cell and manning with personnel drawn from key sections of the department.
- Constructing check dams, water storage tanks (ahars) and safe water channels (pynes).
- Clearing of the water channels.
- Promotions of water shed management in hilly areas.
- Encouraging roof-top water harvesting in plain as well as hilly areas.
- Promotion of stream water harvesting.
- Construction of community based water storage facilities like ponds.

A.2 During Disaster

- Assessing the damage to small check dams.
- Survey of blocked water ways.
- Opening up alternate channels for releasing excess of water.
- Periodic monitoring of water levels check dams.
- Providing irrigation to the drought affected lands for sowing and saving the standing crops.

A.3 Post Disaster

- Creation of new irrigation and rain water harvesting schemes.
- Promotion of research in water conservation and management in the drought affected areas.

B. Hazard Wise

B.1 Earthquake

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B.2 Flood

- In association with Water Resource Department work out ways and means of conserving the surplus water and utilization of the same in drought prone areas.

B.3 Drought

- 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.
- Strategising the cropping pattern in association with Department of Agriculture and Creation of Irrigation facilities accordingly.
- Monitoring and supervision of the watershed and rain water harvesting facilities in the drought prone areas.

7. Other Stakeholders :

Among other stakeholders in disaster management local bodies like District Board, Municipal Corporation, Nagar Parisad, Nagar Panchyat, Gram Panchyat, Multilateral and Bilateral bodies, INGO, NGO, Corporate Bodies, Professional Association, Trade Bodies, Civil Societies and Community based organizations are foremost in playing various important roles during all the three phases of disaster management. As these stakeholders are different types of organization with varying objectives working at levels ranging from district to Panchayat level, doing advocacy to empowerment of communities at the grass-roots levels, the services of these stakeholders shall be taken in consonance with the nature of their organizational complexion. It could vary from implementation of preparedness measures, to support in rescue, distribution of relief to support in the management of relief camps to providing support in rehabilitation of the victims of disasters. Besides, depending on the nature of disaster and scope of work, services of organisations like NCC and scouts and guide can be utilized to strengthen the whole exercise of disaster management.

But, in order to utilize the services of these stakeholders to their full potential there is a need to identify one or two from the support need point of view and assign each an appropriate role to each in disaster management. They being of different types with specific area of operation and field of expertise and proximity with the community, local bodies, NGOs and CBOs have an edge over government agencies in invoking community involvement and rendering specific services. Some such major local bodies and NGOs are:

1. Local Bodies:

The Disaster Management Act, 2005, provides space to local bodies like District Board, Municipalities, Municipal Corporation, Nagar Parishad, Nagar Panchayat and Gram Panchayat in the implementation of disaster management related programme and activities.

In urban areas the local bodies shall partner in the enforcement of building construction, fire safety and sanitation related policy decisions. Their service shall be utilized during disasters caused by earthquake, flood, fire & epidemics.

In rural areas Gram Panchayat shall play supportive roles during all the three phases of disaster management. Through one of the Statutory Committees, Gram Panchayats, Panchayat Samiti and Zila Parishad shall play major roles as provided in the Panchayat Raj Act, 2006. With such participation in view, the Disaster Management Act, 2005 has placed Zila Parishad Adhyaksa as Co-chairperson of the District Disaster Management Authority (DDMA).

2. With Specialized Field Operations :

There are organizations with specialized activity and resource backup. International Red Cross Society is such a body. They have a large resource base and capability to provide material, financial as well as technical support. In emergencies, they are capable of garnering support and resources from all over the world.

The roles of these organizations may be spread over all the three phases of disaster management and therefore require proper orchestration in PPP mode.

i. Red Cross Society :

A. Pre-Disaster Phase

- Identification & training of volunteers in First-Aid at the community level.
- Preparing Paramedic team at the Gram Panchayat level.

B. During – Disaster

- Mobilizing teams of trained personnel to provide First-Aid and Paramedical services at the incident site.
- Providing assistance to medical team on incident site.

C. Post-Disaster

- Identification and training of volunteers in First-Aid and Paramedical at the resettlement site.

3. NGOs & Civil Societies :

NGOs & Civil Society organisations have resources as well as interest to provide support services at the time of community needs.

- Supply of relief materials to the victims.
- Mobilizing resources for pressing needs.

- Awareness generation
- Community based preparedness related activities
- Support in the preparation of contingency plan
- Evacuation, search & rescue
- Relief distribution
- Women & Child Care
- Community mobilization
- Documentation

4. Association of Local Occupation Groups :

In every district towns such occupation groups as Doctor's Association, Trader's Association, and Citizen Forums are there who are deeply interested in the welfare of the local communities. They, at the time of any incident, are the first ones to rush with whatever helps available and subsequently get engaged in resource and supply mobilization. Their services shall be utilized during Pre-Disaster period as well so that their support during disaster may come with greater zeal and vigour

5. Religious Bodies :

Religious Bodies, like occupation groups, are major local non- government setups who extend whole-hearted support during emergencies. As they have followings at the community level, these bodies shall be made partners in working for in community preparedness.

A. Pre-Disaster

- Disaster awareness generation
- Community preparedness

B. During – Disaster

- Relief distribution
- Counseling

C. Post-Disaster

- Resource mobilization.

6. Media :

From disaster management point of view Media may safely be divided into **print** and **electronic** media. The services of **Print Media** shall be utilized for the implementation of disaster prevention, mitigation and preparedness related activities through generation of community awareness and highlighting the best practices and case studies. The services of **Electronic Media** shall be taken during disaster specifically for keeping people will informed about measures being taken and for attracting support and fast-tracking mobilization of resources.

7. Para Military Forces :

The role of Para Military forces, as supportive to police force in emergency situation, is very important. The role of the Central Industrial Security Force, particularly in disaster involving industrial units or locations, is vital. The role of Border Security Force in the remote and inaccessible areas is equally important. They shall be included to play their specific roles.

8. Civil Defence & Home Guards :

The Directorate of Civil Defence has been officially attached to the Disaster Management Department. The Civil Defence Act has been suitably amended in the context of Disaster Management. Therefore, their involvement in disaster management at the local and community level is assured. Their participation in rescue and casualty management, transportation and supply services, sewage and disposal of corpses along with basic welfare service will bring about marked impact.

Home Guards, on the other hand, are the best ones to provide security related services, escort services to the injured and watch & ward services at the supply, resources and other strategic centres during disasters.

9. Armed Forces:

The Indian Armed Forces are known for their dedication and participation in socio-development and crisis-management roles. Their contributions in controlling the situation beyond the coping capability of civil administration have been immense. Therefore, a high degree of cooperation and co-ordination among the agencies involved in disaster management is required.

Since many a time, Armed Forces are solicited to provide assistance in the relief operations, it would be ideal to have suggestions from them while planning for disaster management. And, the resource and capabilities at the disposal of the Armed Forces should get reflected in the State Plan, specifically their role in providing support in emergency support functions such as communications search and rescue operations public works and engineering, food & civil supplies.

10. Ex-Service Men's Association:

Ex-Service Personnel are one of the pools of human resources that have not been properly utilized excepting for rendering security services in residential apartments and buildings. The services of these ex-Service personnel shall be utilized in prevention, mitigation and preparedness measures as well as in manning the Bihar State Disaster Response Force. They shall be included in the disaster management structure and assigned appropriate roles in community preparedness.

11. Public & Private Sectors (*Corporate Bodies*):

Both Public Sector Undertakings and Private Sector Corporate have always played the roles assigned to them in the best possible manner. But they have never been woven in the fabric of the disaster management system as stakeholders.

With the increasing incidents of disaster due to climatic changes, it has become almost a necessity to involve both the sectors and provide them with proper role and responsibilities within the disaster management system.

They may be approached to adopt a Block or Gram Panchayat for the implementation of the programme and activities in their own way and with their inputs so that an examples in better implementation in PPP mode be set as an example for the system to emulate.

Corporate Bodies

- Education & Training
- Providing Specialized equipments
- Donation for preparedness and post- disaster activities

12. International & Multilateral Agencies:

The international and multilateral agencies have been playing crucial role in all the three phases of disaster management. They have been providing abundance of support both in cash and kind. Such international bodies like Oxfam, DFID, USAID, UNDP, UNICEF, WHO, WFP, UNPF have not only made immense contributions but also galvanized international community of nations to pour support.

These international agencies may be approached to fund EOCs, Early Warning System, and Seismic Forecasting Stations etc. These agencies may also be solicited to organize contributions for funding disaster preparedness at the community level.

UNICEF

- Relief distribution
- Immunization
- Restoration of Health Infrastructure
- Supply of educational & other infrastructure to affected schools
- Restoration of sanitation & drinking water facilities
- Establishment of Child labour prevention school
- Supply of boats
- Training support to medical personnel to control epidemics
- Financial assistance for restoration & rehabilitation
- programmes for children and women.

UNDP

- Support in Disaster Preparedness
- Imitating Community Based Disaster Preparedness Programme
- Initiating sustainable livelihood programme
- Provision of tents, family relief kit
- Incorporation of mitigation in development planning
- Preparation of District, Block, Gram Panchayat Plan
- Support in designing & implementation of Early Warning System

WFP

- Food Aid to vulnerable communities
- Support for rehabilitation & reconstruction programme

UNPF

- Support in rehabilitation of agriculture, livestock, fisheries and local food production

WHO

- Assistance in various aspects of preventive and curative health care.

BBB

The State Disaster Management Plan

Section- VI

PRE-REQUISITES

13. Policy, Legal & Technical Provisions

- 13.1 Policy Decisions Required to be Taken
- 13.2 Directions to the Government Departments
- 13.3 Creations of Backward Linkages
- 13.4 Induction of Human Resources
- 13.5 Allocation of Funds
- 13.6 Active Participation of Departmental Heads/ Executives
- 13.7 Active Participation of People's Representative

14. Financial Support & Allocations

- 14.1 Allocation of certain % of Plan Outlay
- 14.2 Annual Budget Allocation
- 14.3 Estimated Financial Requirements

15. Cross-Cutting Issues

- a. Co-ordination
- b. Implementation
- c. Monitoring
- d. Review
- e. Updation

13. Policy, Legal and Technical Provisions

Preconditions are the bedrock on which the edifice of any plan is built. Remaining in place of these conditions is essential for the implementation of the given plan. Those preconditions consist of:

- i) Policy decisions / Schemes formulation
- ii) Directions to the government departments
- iii) Creations of backward linkages for data collection and forward linkages for information dissemination
- iv) Induction of human resources
- v) Allocation of funds
- vi) Active participation of Departments
- vii) Active participation of Peoples Representatives.

13.1 Policy decisions/ Schemes formulation

The policy decisions required to be taken:

13.1.1 Creation of Specialized Institutions: The creation of specialized institutions like the State Disaster Response Force, the Bihar State Institute of Disaster Management, and the Emergency Operation Centres shall require policy decisions to be taken at the Cabinet level.

13.1.2 Creation of Special Cadre of Staff

A special cadre of staff members in government departments and placing them in a Cell to function as a team of three for formulating department wise disaster mitigation and preparedness plan and intonating the developmental schemes with disaster mitigation measures and making financial allocations for the implementation of the same.

The roles and functions of the Disaster Management Cell in each department shall be like the **internal auditors** in the finance sections of each department. Besides, during the time of disaster response, they shall participate from the department side leaving others to attend to the normal day-to-day work.

These staff members shall preferable be shifted / promoted to serve in SDMA/DMD/BIDM so that the understanding and knowledge of disaster

management may be utilized in the rendering of disaster related specialized services.

13.1.3 Formulation of Hazard specific Policies

Hazard specific policies required to be formulated and firmly implemented are:

- i) **Earthquake:** Policies regarding construction, retrofitting and financial incentives / implementation policy regarding the above
- ii) **Floods:** Policies forbidding the construction of habitation in flood prone locations, within the embankments, low-lying areas, near the banks of rivers etc.
- iii) **Drought:** Water conservation/rain harvesting/ management policy. Policy/ schemes to provide incentives for water harvesting /rain harvesting etc.
- iv) **High Speed Wind:** Policy schemes to provide financial assistance to the marginalized section for construction of low-cost hazard resistant housing/Indira Awas.
- v) **Fire:** Policy to have no straw thatched roofed in houses in the State by a stipulated time and formulation of schemes for the same
- vi) Formulation of financial/insurance schemes to promote, protect, compensate disaster related mitigation, preparedness and damages.
- vii) Build Back Better policy integrating rehabilitation with livelihood and livelihood with betterment of life and living

13.2 Directions to the Government Departments

We look upward to have help and guidance. As such, the State Level Government Departments and institutions and functionaries shall have to set examples in disaster preparedness. They shall have plan and policies as well as a structure to implement them. The government functionaries should think of disaster management as a mandatory exercise demanding due attention and care.

Directions for the creation of space for other stakeholders to play allocated/ chosen role (s). Holding of meeting with them to review the position/progress.

Holding of the meeting of DDMA/DM Cell in the prescribed manner and number. Maintaining the minutes of the meeting and circulation of the same.

13.3 Creations of Backward linkages

The creation of backward linkages for data collection and forward linkages for information dissemination shall be created for the EOCs to perform properly. On the whole the State Disaster Management System shall have the bedrock of technologies to build the edifice of mitigation, preparedness, capacity building and response for disaster risk reduction. The technological facilities wise backward linkage required to be created shall be:

- i) GPRS enabled and solar powered Telemetric Rain Gauges at all Gram Panchayats in the vulnerable districts.
- ii) Satellite based Weather Monitoring Stations in all the 38 District stations in association with ISRO and GPRS equipped weather monitoring stations at block headquarters.
- iii) VSAT enabled and solar powered Permanent Seismic Monitoring station in the State Emergency Operation Centre
- iv) Web enabled data base management, application development, customization, development and calibration of numerical weather forecast, mathematical model at SEOC.
- v) Information, report, advisories shall be made available through mobile phone, e-mail and web portal to CM; VC SDMA; Chief Secretary, Principal Secretary, DCs/DMs, SP's CEOs DDMA, BDOs, In-charge PAPK/WAPK, print and Electronic Media
- vi) Underground water measurement and monitoring center at sub-division level.
- vii) River Gauges and discharge measurement at critical locations on rivers.

13.4 Induction of Human Resources

Human resource for the dedicated institutions shall be appointed, trained and placed. For that, guidelines shall be formulated and initiatives taken. For government departments also, opportunity for the existing staff members to opt to work in the area of disaster management shall be created and offered so that a dedicated cadre could be created for disaster management.

13.5 Allocation of Funds

Adequate financial support is not only an essential requirement for the proper implementation of the provisions in a plan but is also a factor to attract all stakeholders to put in their best.

13.6 Active Participation of Departmental Heads/Chief Executive

In all disaster management related interactions, the Head of the Departments and the Chief Executives shall participate. For, it is their understanding and appreciation of the issues involved shall drive the functionaries to act in a required manner. Lack of interest on her/his part is bound to result in lack of commitment / inefficiency of the functionaries.

13.7 Active participation of People's Representatives

Political will is the driving force for the body state. The will is expressed in the form of policies and demonstrated in the form of participation. Both the forms of expression are required to nurture the disaster management related initiatives and to implement the Plan.

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14. Financial Support & Allocations

Funding for the implementation of the State Disaster Management Plan is an issue that each state has attempted to deal in its own manner. But, in spite of the paradigm shift from relief to risk reduction based disaster management, the funding of the plan has remained, if not the same, then certainly similar: relief and response oriented.

The implementation of a plan is a wholesome exercise which is required to be in consonance with the provisions in the plan. Keeping this in view, the central govt. has created the National Disaster Response Fund and at the state level State Disaster Response Fund (SDRF) has been created. In the SDRF, the central govt. provides 75% of the amount and 25% of the matching fund has to be put in by the state. The fund has to be used to maintain the standard of relief as stipulated by the Central Government based on the recommendations of Finance Commission. In addition to this, the Centre Govt. has also provided ₹Rs 5 crore annually for 5 years for hazard related capacity building. This fund and allotment is managed by the Department of Disaster Management. The funds can also be made available to the BSDMA for mitigation purpose; a State Mitigation Fund has also been created under SDMA.

There are two ways of organizing financial support for the implementation of Disaster Management Plan:

- i) Allocation of a certain percentage of the total Annual Budget to meet the establishment, programme and activities cost, rescue, relief, response and rehabilitation cost.
- ii) Allocation of a certain percentage of the total Annual Budget to meet disaster mitigation expenditure in the Annual Budget and make allocations for the same as per the annual disaster management plan.

14.1 Allocation of certain percentage of the Total Plan Outlay

Around 10% to 12% of the annual budget normally gets spent on relief, repair and rehabilitation activities every year.

Funds meant for several other heads like MNREGA, BRGF, Indira Awas Yojna, departmental projects etc. can be explored for utilizing in disaster related matters. Convergence will make the availability of funds easier.

The establishment cost of BSIDM, BSDRF, SEOC, DEOC shall be part of the DMDs annual budget.

The establishment cost of BSDMA shall include the establishment cost of DDMA.

14.2. As a part of the Annual Budget Allocations of each department

The disaster management related plan expenditure as a part of the Annual Budget of each department is another option. But this is fraught with many constraints, for example, changing priorities of the government, availability of resources, dependence on Central Government allocations etc.

On the whole, the two options shall provide government with considerable freedom to spend on disaster management.

Ideally, certain percentage of the Plan outlay along-with central allocations, donations should be used for meeting the establishment cost of the disaster management related setups, such as SDMA, SDRF, BSIDM, SEOC, DEOC and for meeting all disaster management related programme and activities expenditure.

The expenditure heads, other than establishment cost of specialized institutions for which financial allocations shall have to be organized are:

- i) Capital cost of the infrastructure and facilities - one time
- ii) **Activity Cost** : awareness generation, training, capacity development, capability building, human resource development - annually
- iii) Equipment and material cost – one time and as per need
- iv) Programme and activity cost – department wise, - annually
- v) Repair & maintenance cost – as per requirements, - annually

Broadly Estimated Financial Requirements for the Proposed State Disaster Management Plan*

Sl. No.	Major Activities	Sl. No.	Item Details	Estimated amount (₹ Crore)	Time Frame					Implementing Dept
					2013-14	2014-15	2015-16	2016-17	2017-18	
1	Equipment for Disaster Management Cell in 26 Government Departments	i)	Computer accessories	-	-	-	-	-	-	DMD
		ii)	Photocopier	-	-	-	-	-	-	DMD
		iii)	Fax Machine	-	-	-	-	-	-	DMD
		iv)	Fire proof record keeping facility	-	-	-	-	-	-	DMD
			₹ 0.02 crore x 26 Depts.	0.52	0.52					
2	State Emergency Operation Centres	i)	State & shadow SEDC level	-	-	-	-	-	-	DMD
			- VSAT	-	-	-	-	-	-	DMD
			- VHF	-	-	-	-	-	-	DMD
			- SW Radio Transmitter	-	-	-	-	-	-	DMD
			- GSM	-	-	-	-	-	-	DMD
			- LAN	-	-	-	-	-	-	DMD
			- GPRS	-	-	-	-	-	-	DMD
			- Computer + Accessories	-	-	-	-	-	-	DMD
			- GIS based information system	-	-	-	-	-	-	DMD
			- Fax Machine	-	-	-	-	-	-	DMD
			- Photo copying Machine	-	-	-	-	-	-	DMD
	- Satellite Phone	-	-	-	-	-	-	DMD		
	- Fire proof document storing facility	-	-	-	-	-	-	DMD		

		– Hot line	–	–	–	–	–		DMD
		– Tele printer	–	–	–	–	–		DMD
		– Web enabled	–	–	–	–	–		DMD
		– Data base management system with NWF mathematical facilities	–	–	–	–	–		DMD
		– LCD sets	–	–	–	–	–		DMD
		₹ 10 crore x 2	20.00	10.00	10.00	–	–		DMD
3	DEOC	– Same	–	–	–	–	–		DMD
		– ₹ 5 Crore x 38	190.00	95.00	95.00	–	–		DMD
4	Preparedness	1 Mechanized Boats in highly vulnerable Gram Panchayats (10 x 400 GP x ₹ 0.0015)	6.00	3.00	3.00	–	–		DMD
		2 Boat Ambulance (1 x 200 Blocks × ₹ 0.05)	10.00	5.00	5.00	–	–		DMD
		3 Training of Search and Rescue team 5 from each Gram Panchayat × 400 GP × ₹ 0.0001)	0.20	0.20	–	–	–		DMD
		4 Training of village level workers 5 from each severely affected villages x 10000 × ₹ 0.00005)	2.50	1.25	1.25	–	–		DMD
		5 Training of local bodies and civil society representatives at Block level 15 × 534 = 8010	0.80	0.80	–	–	–		DMD
		6 Training of officers of line departments at the district level (25 x 38 × ₹ 1500)	0.14	–	0.14	–	–		DMD
		7 Training of DM Cell Officers (26 x 3 = 78) × 3000 × twice year	0.05	0.05	–	–	–		DMD
		8 Orientation of legislators	0.05	0.05					DMD
		9 Training of school teachers & GP level workers (8471 x 15 × ₹ 1000)	12.71	3.17	3.17	3.17	3.20	–	DMD
		10 Awareness campaign (unit sub-division) (101 x 5 campaign = 505 campaigns) × ₹.	4.04	1.01	1.01	1.01	1.01	–	DMD

		20,000×4 times							
11		Distribution of First Aid Kits at GP level (5 x 8471 = 42355 × ₹1000	4.24	1.06	1.06	1.06	1.06	–	DMD
12		Distribution of fire extinguishers at GP / Thana/ School level (10 x 8471 = 84710 × ₹.3000/-	25.41	6.35	6.35	6.35	6.35	–	DMD
13		Ambulance at the Block level equipped with emergence life support systems (2 x 534 = 1086 × ₹. 40 Lakh	427.20	85.44	85.44	85.44	85.44	85.44	DMD
14		Training in First Aid and paramedics (5 x 8471 GP = 42355 × ₹. 5000/-	21.18	4.00	5.00	8.00	4.18		DMD
15		Creation of storing facilities & keeping of 1000 large tents and accessories at the district level 1000 x 28 × ₹. 8000	22.40	5.60	6.20	5.60	5.00		DMD
16		Creation of storing facilities and storing of grains and dry fast food items at the Block level spread over three Gram Panchayats (600 tones x 3 = 1800 x 534 Block × ₹.3000	288.36	57.67	57.67	57.67	57.67	57.67	Food & Consumer Protection Depts
17		Development of rain harvesting system and storing of rain water in drought prone areas providing subsidy for adoption	25.00	5.00	8.00	6.00	6.00		Minor Irrigation Depts
18		Training of Architects, civil engineers and masons in constructing earthquake resistant house & retrofittings	5.00	1.00	2.00	2.00			DMD
19		Placing at least one fire extinguishing engine at Block level, two at sub-division level and three at the district level 534+202+114= 850× ₹.30 Lakh	255.00	51.00	51.00	51.00	51.00	51.00	Home Depts
20		High Powered Gas cutters, debris remover, cranes (One set in each	38.00	5.00	11.00	11.00	11.00		DMD

			districtx38× ₹. 1 Cr.)							
		21	1000 sets of polythene sheets, blankets, bed sheets, utensil sets in each district x 38 × ₹. 1 Lakh	3.80	0.60	1.00	1.00	1.20		DMD
5	Mitigation	1	Desiltation of rivers	–	–	–	–	–		WRD
		2	Linking of rivers for providing additional flow to flooding water and subsequently harvesting the same for summer days	–	–	–	–	–		WRD
		3	Creation of Ahar & Pynes in 8 south Bihar districts & Ponds in 19 north Bihar districts. In all 27 districts @ ₹ 4 crore per district	108	18	30	40	20		Minor Irrigation Depts.
		4	Development of seven tals in the southern part of the Ganges	–	–	–	–	–		WRD
		5	Erection of Embankments	–	–	–	–	–		WRD
		6	Retrofitting in buildings	–	–	–	–	–		UDD
		7	Creation of underground water storage facilities in drought prone areas.	–	–	–	–	–		WRD
6	Response as per the relief rates fixed by Govt. of India	1	Ex-Gratia payment to families of deceased persons @ ₹. 1.5 lakh per deceased	–	–	–	–	–		DMD
		2	Ex-Gratia payment for loss of a limb or eye (5) @ 43,500 @ 62,00 depending upon % of loss.	–	–	–	–	–		DMD
		3	Grievous injury requiring hospitalization @ 3100 to be 9300.00 depending on duration	–	–	–	–	–		DMD
		4	Clothing & utensil per family @ ₹. 1400	–	–	–	–	–		DMD
		5	Loss of substantial portion of land caused by erosion/change of course of rivers @ ₹. 25000 per hect.	–	–	–	–	–		DMD
		6	For agri/horticulture crops @ ₹.3000 rained areas @	–	–	–	–	–		DMD

			₹. 6000 irrigated area							
		7	Perennial crops @ ₹. 8000 per hac.	-	-	-	-	-		DMD
		8	MilchAnimals@ ₹16,400 buffalo / cow	-	-	-	-	-		DMD
		9	Other Animals @ ₹. 15000 per animal	-	-	-	-	-		DMD
		10	Fully drainage destroyed house Pucca	-	-	-	-	-		DMD
			Pucca @₹. 3500 per house	-	-	-	-	-		DMD
			Kutchra @ ₹. 3200 per house	-	-	-	-	-		DMD
		11	Partially damaged @ ₹. 1900 per house	-	-	-	-	-		DMD
		12	Cattle shed attached with house @ ₹ 1250 per shed	-	-	-	-	-		DMD
7	Rehabilitation & Resettlement	1	As per the framework and guidelines of the Reconstruction Policy	-	-	-	-	-		Planni ng Depts.
8	Institutions	1	State Disaster Response Force Land + Building + Infrastructure	50.00	-	25.00	25.00	-		DMD
		2	Bihar State Institute of Disaster Management Land + Building + Facilities	70.00	-	10.00	30.00	30.00		DMD
			Total	1590.60	360.77	418.29	334.30	283.11	194.11	

(Rs. One thousand five hundred ninety crore sixty lakh)

* *The amount has been very generously estimated keeping in view the increasing rates of equipment and machinery. It is also suggested that there should be a single window procurement (in this case Disaster Management Dept.) procedure. The DM Cell of concerned Department shall provide technical assistance and support in the selection of equipment and machinery.*

Department wise Proposed Activities & broadly estimated Financial Requirements of those activities that could be quantified.

A. Disaster Management Dept.	Estimated amount in Rs. Crore	2013-14	2014-15	2015-16	2016-17	2017-18	Total
1. DM Cells	0.52	0.52	–	–	–		0.52
2. State EOC	20.00	10.00	10.00	–	–		20.00
3. DEOC	190.00	95.00	95.00	–	–		190.00
7. Preparedness	2846.28	576.09	587.13	578.14	571.95	552.95	2846.28
9. Response	As per Government of India Rules						
11. Institutions	120.00	35.00	55.00	30.00	–		120.00
B. Minor Irrigation							
	108.00	-	18.00	30.00	40.00	20.00	108.00
C. Water Resources Dept. 8.01,02,04, 05, & 07	As per their annual plan & approved rates						
D. Home Dept.							
	255.00	51.00	51.00	51.00	51.00	51.00	255.00
E. Urban Dev. Dept. 8.06	As per their estimated budget						
F. Food & Consumer Protection							
	288.36	57.67	57.67	57.67	57.67	57.67	288.36
G. Planning & Development Dept.	As per framework & guideline in reconstruction policy						

15. Cross-Cutting Issues

There is nothing cut and dried in life. Nor it is so in disaster management. There are overlapping issues and concerns. Such issues and concerns are:

- i) Co-ordination
- ii) Implementation
- iii) Monitoring
- iv) Review and
- v) Updation

15.1 Co-ordination

In the disaster management plan coordination is

- ✓ among the government departments
- ✓ among the agencies/institutions and
- ✓ among the stakeholders

Among the government departments the best agency to coordinate shall be the Chief Secretary who is also the chairperson of the State Executive Committee.

Among the stakeholders the co-ordination shall have to be done by the Disaster Management Department (DMD). Being the sectoral department, DMD shall have an authority to communicate, assign and solicit support from stakeholders like Central and State Govt Ministries/Departments, multilateral agencies corporate bodies, professional bodies, civil societies, NGOs and media. Besides, Media briefing shall be done by Chief Secretary/DMD only.

15.2 Implementation

The monitoring of the implementation of the Disaster Management Plan shall be under the aegis of the State Disaster Management Authority as per the mandate of Disaster Management Act, 2005.

The plan implementation shall primarily involve:

- ✓ Creation of specialized institutions like SDRF, BSIDM, SEOC, DEOC

- ✓ Equipping them with required infrastructure & technological facilities
- ✓ Hiring of qualified and competent manpower
- ✓ Providing them orientation and training
- ✓ Putting them on the job and
- ✓ Monitoring their round-the clock operations

The measures of disaster mitigation, preparedness and response shall be identified, planned and scheduled for implementation by the concerned departments and shall be monitored by Chief Secretary/DMD.

15.3 Monitoring

Monitoring of the functioning of these specialized institutions shall be done by Chief Secretary/DMD/SDMA. Monitoring of the programme and activity implementation shall be done by DMD.

During pre-disaster period DMD shall be in-charge of monitoring, during L₁ period DDMA shall be in-charge and during L₂, L₃ period SEC/DMD shall be in-charge of monitoring.

All monitoring reports along-with observations and comments of the concerned authority shall be finally sent to the State Executive Committee because it is the Chief Secretary who shall be the Incident Commander at the State level during response period as such he should be kept updated on all fronts.

15.4 Review

Review of the DM Plan on annual basis is required to be done specifically in the light of disaster taking place during the year.

A Review Committee consisting of the members of SEC, SDMA and Principal Secretary of DMD shall be constituted. In its meeting all the monitoring reports and damage assessment reports shall be reviewed to identify the aspects of the Plan required to be updated.

15.5 Updation

DM Plan updation is an exercise that shall be done on annual basis and shall be followed by briefing about the same to:

- ✓ the legislatures and
- ✓ the Departmental Heads and orientation about the same to
- ✓ functionaries of DM Cell in each department

- ✓ functionaries of EOCs, SDRF, BSIDM, DDMA, and
- ✓ other stakeholders

Such an exercise shall serve two purposes

- ✓ keep them updated about the Plan, and
- ✓ get their views and suggestions

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The State Disaster Management Plan

Section- VII

Enclosures

- i. Guidelines for Health & Family Welfare
- ii. Guidelines for Incident Commander/Incident Mgmt. Team- L₀,L₂ & L₃ Period
- iii. Guidelines for Shift Incharge State Emergency Centre
- iv. Standard Operating Procedure : Early Warning
- v. Standard Operating Procedure : Evacuation
- vi. Standard Operating Procedure : Police Department
- vii. Standard Operating Procedure : Public Works Department
- viii. Standard Operating Procedure : Railways
- ix. Standard Operating Procedure : Airport
- x. Standard Operating Procedure : Water Resources Department
- xi. Check List : Gadgets & Equipments for Capability Building
- xii. Check List : Sanitation Equipment
- xiii. Training Modules : Suggestive Outline
- xiv. Do's & Don'ts

Check List
For
Health & Family Welfare Department, Govt. of Bihar

The Guidelines have been formulated on the following assumptions:

- The department is aware about Disaster Management and the preparedness required for the same.
- The department has a Disaster Management Plan of its own.
- The department has created a special cell for handling Disaster related issues, and.
- The department has duly trained functionaries to run the cell and attend to the support services needs during Lo, L₁, L₂, L₃ period.

If these four basic inputs are not there, the output of the department in the form of services and support is bound to go haywire. As such, these four essentials shall be acquired by each department in order to play its designated roles in disaster management.

The guidelines are about

- The Department
- The Infrastructure
- The Human Resource Development

The Department

The Department shall have a Disaster Management Plan of its own with focus on infrastructure, facilities, services as a part of preparedness in medical college and hospitals, district level hospital, primary health centers, immunization services health camp services, and ambulance services. It shall organize First Aid training, medical supplies, essential medicines, networking with medical research and development institutions, private practitioners, nursing homes, district wise para-medical support services available etc.

The Infrastructure

Apart from destruction of life, livestock and property, disaster brings about an acute paucity of space: within a limited space thousands have to be provided shelter facilities for nature's call, daily chores etc. This crowding and congestion create health and sanitation problems that have to be attended to on immediate basis. For that, the department shall have

- Medical Vans
- Ambulance
- Sufficient space in hospitals to accommodate extra beds
- Medical Kits for emergency needs
- Stock of emergency medicines
- Transportation facilities for medical staff
- Emergency power support facility
- Refrigeration units for vaccines

The Human Resource Development

It is an irony of situation that the health department has to prepare to deal largely with sick persons or with those who deal with them. This necessity of dealing with health wise unwholesome persons, characters in all sorts of pain, make it necessary for the health department to have a pool of manpower fully trained in planning, organizing and attending to the victims of disaster who have suffered all sorts of loss and are both physically and mentally in abnormal state of being.

The three main objectives with which the Health Departments shall plan and prepare for Disaster Management are :

- i. On site health service to the victims
- ii. Inward specialized health services
- iii. Prevention of the outbreak of epidemics

During Lo period the Department shall look into the infrastructure and materials requirements for the above and during L₁, L₂, L₃ period translate those preparations into action. The activities to be undertaken during Lo period shall be :

- i. Enlistment of medical college & hospitals, District Medical Hospitals, Sub-Divisional Hospitals and Primary Health Centres with the following details-
 - Location, Address, Phone/Fax number, Email-Id, Number of Doctors, Nurses, Beds, Specialization if any, the scope for increasing the number of beds, number of disaster related trained staff, facilities for surgery, immunization, stocks of specialized medicines etc.
 - District wise list of Nursing homes, facilities available, medical staff members, beds.

- District wise list of medical practitioners, medicine shops.
 - District wise list of personnel trained in Para-medical.
 - District wise list of NGOs + Civil Societies having interest/ experience in rendering/supporting medical services.
- ii. Setting up of "Disaster Management Cell" in the department, in District hospitals, getting at least three functionaries trained in providing hazard wise medical support services.
 - iii. Creating stock of medicines/injections commonly required during disaster and putting the same at the disposal of the CELL.
 - iv. Creating stock of chemicals required for maintaining sanitation and hygiene and putting the same at the disposal of the CELL.
 - v. Acquiring Mobile Medical Vans and properly maintaining them for use during disaster days.
 - vi. Acquiring sufficient number of Ambulance and keeping them in readiness.
 - vii. Monitoring of the working of the cell and the facilities created for emergencies.
 - viii. Sufficient stock of First-Aid kits, candles, torches, matchbox, lanterns, solar lamps etc. both at the department and district level.
 - ix. Tie-up with institutions like Red-Cross, Indian Medical Association, Medical Research & Development.
 - x. Making available the entire list prepared to the State Emergency Operation Centre.

During L₁, L₂, & L₃ period

- i. Mobilization of all medical personnel in the affected district(s) advising them to report to District Magistrate/Medical Superintendent/Civil Surgeon.
- ii. In case of larger requirement of medical personnel, mobilizing them from neighboring districts.
- iii. Cancellation of leave of medical personnel with direction to report to DM/MS/CS.
- iv. Communication to State Emergency Operation Centre and the District Emergency Operation Centre about the action taken/number of functionaries reporting/ the department of medical van/ambulance etc.

- v. Inform SEOC/DEOC/DM about the person(s) overall unchanged of medical personnel her/his name, phone number/email id if possible a snapshot.
- vi. Check the arrival and availability of all the personnel deployed, medical vans, and ambulances positioned.
- vii. Enquire about the availability of emergency medical equipment and medicines and further specific requirements.
- viii. Organize the supply, if required.
- ix. Line up with local hospitals/nursing homes/doctors for their readiness to receive the victims with briefings about the victims on way.
- x. Keep monitoring on site situation developing and about victims sent to hospitals etc.

In House Priorities

- i. All electrical equipments should be unplugged when disaster warning received.
- ii. Emergency electrical generator started and stock of sufficient fuel arranged.
- iii. All fracture treatment related equipment should be kept in readiness, staff members alert and in attendance.
- iv. Arrangements for emergency operations, sufficient supply of anesthetic gases etc. checked and kept in readiness.
- v. Drugs for treatment of cuts and burns and fractures such as tetanus oxide, analgesics and antibiotics etc. kept in stock in sufficient quantity.
- vi. Drugs used for the treatment of water-borne diseases such as diarrhea etc. are kept in readiness.
- vii. Check and replenish the medical supplies of –
 - Fissure materials
 - Splints
 - Plaster rolls
 - Surgical dressings
 - Disposable needles and syringes
 - Antidote for snakebites, dog bites etc.
- viii. Arrange for water supplies.

- ix. Prepare an area of the hospital for receiving a large number of casualties.
- x. Keep emergency admission procedures in readiness with adequate tagging of patients arrangement.
- xi. Organize in house emergency medical teams to ensure availability of adequate staff at all times to attend to the emergency casualties.

Field Office Operational Procedure

- i. Transfer of seriously injured victims shall be reported to the DM/on site operation incharge.
- ii. Before transferring proper tagging of victims name, address etc. shall be done.
- iii. Proper transport facility, preferably an ambulance is used.
- iv. An advance communication to the hospital shall be made with adequate details about the injury and the victims.
- v. Send a copy of the transfer form/tag to the enquiry counter/public information centre so that those looking for victims may be given to know about her/his whereabouts.
- vi. Adequate arrangement for sanitation shall be made to prevent the breaking of any epidemic.
- vii. Health check-up of those in camps be done on a regular basis.
- viii. Proper boarding & lodging facilities shall be made for medical and other staff members so that they remain in shape to serve.
- ix. The incharge of field level medical operation shall remain in regular contact with Health Department to report about the operation as well as further support and supplies required.

Tagging/ Flagging

Tagging/Flagging is a practice through which medical officers indicate their assessment about the kind of attention the victim/patient requires for the needed treatment.

Red Tag - signifies first priority in shifting to hospitals for immediate care and treatment.

Green Tag – indicates second priority for evacuating to hospitals. Such victims require attention but the injuries are not supposed to be life threatening.

Yellow Tag- indicates third priority for shifting to hospitals and suggests minor injuries/fractures/burns that require treatment but are not fatal.

Black Tag- is placed on the dead and deceased.

Vector Control Standards

Vector control programmes shall be followed to cope with the following two situations:

- The initial phase immediately following the disaster.
- The period after the disaster has subsided

The vector surveillance equipment and supplies suggested are:

- Collecting bag
- Collecting forms
- Mouth or battery powered aspirators
- Tea strainer
- Flashlight and spare batteries
- Grease pencil
- Memo pad
- Sweep net
- Pencil
- Tweezers
- White enameled dipper
- Keys and other references
- Labels
- COC light traps (optional)
- Collecting vials
- Aedes aegypti ovitraps (optional)
- Bulb syringe or medicine dropper
- Fly grill
- Mirror
- Teaching aids
- Transfer bags
- Plastic bags
- Plastic cups
- Alcohol
- Rubber bands

- Forceps
- Scissors
- Insecticide dusting pan
- Snap Traps
- Formaldehyde
- Live traps
- Acute rodenticides
- Gloves
- Anticoagulant rodenticides
- Flashlights and batteries

Materials and Equipment

In the absence of clear indication from the field, a minimum kit comprising the following materials and equipment should be carried by the advance party to the disaster Site. (This is only a sample list and should be updated to suit the specific conditions prevailing in the area after careful assessment).

- (1) Equipment for pediatric intravenous use
- (2) Tensiometers for children and adults
- (3) Assorted ferrules
- (4) Tracheal cannulae
- (5) Set of laryngoscopes for infants, children, and adults
- (6) Endotracheal tubes, No.7 Murphy
- (7) Endotracheal tubes. No.8
- (8) Nasogastric probes
- (9) Oxygen masks, for adults and children
- (10) Large scissors for cutting bandages
- (11) Plastic linings
- (12) Phonendoscopes

Sterilization Unit Supplies

- (1) Tracheotomy set
- (2) Thoracotomy set
- (3) Venous dissection set

- (4) Set for small sutures
- (5) Bottles for drainage of thorax
- (6) Hand scissors, No.4
- (7) Syringes (disposable) x 2 cc
- (8) Syringes (disposable) x 10 cc
- (9) Syringes (disposable) x 50 cc

Ambulance Fleet

The ambulances will carry the following equipment:

- (1) Oxygen, oxygen mask, and manometer.
- (2) Stretchers and blankets.
- (3) Emergency first aid kit.
- (4) Suction equipment.
- (5) Supplies for immobilizing fractures.
- (6) Venoclysis equipment.
- (7) Drugs for emergency use.
- (8) Minimal equipment for resuscitation maneuvers.

Each ambulance should be staffed by at least a physician, a nurse, a stretcher bearer, and a driver. The medical and paramedical personnel should be experienced in procedures for the management of patients in intensive care units.

Equipment and Supplies required for Vermin control for a population of 10000 (this may be decided according to local conditions)

- Power sprayers
- Hand-pressured sprayers. capacity' 20-30 litres
- Dusters (hand-operated. plunger type)
- Dusters, power-operated
- Space sprayer

Adequate supply of accessories and spare parts for the above equipment
Insecticides:

- DDT. powder

- DDT, 75 % water wettable
- DDT, 10 % powder
- Dieldrin 0.625-1 .25 % emulsifiable concentrate or wettable powder
- Lindane, 0.5% emulsifiable concentrate or wettable powder
- Chlordane, 2 % emulsifiable concentrate or wettable powder
- Malathion. 1 % emulsifiable concentrate or wettable powder
- Dichlorovos emulsion
- Rodenticides, anticoagulant type (warfarin, etc.)
- Rodent traps Screen, for fly control
- Screen, for fly control
- Garbage cans, capacity 50-100 litres

The Quantity depends on availability and on the number of distribution points.

Preparedness Checklist
for
Health & Family Welfare Department

(to be filled in by the Civil Surgeon and District Health Officer and submitted to the District Collector)

Preparedness Measures taken	Details/Remarks
The department is familiar with disaster response plan and disaster response procedures are clearly defined.	
A hospital plan for the facilities, equipment and staff of that particular hospital based on "The Guide to Health Management in Disaster" has been developed	
Orientation and training for disaster response plan and procedures undertaken	
Special skills required during disaster situations are imparted to the officials and the staff	
Hospital staff are aware of damage - proof hospital rooms/buildings	
Reviewed and updated <ul style="list-style-type: none"> • Precautionary measures and procedures • Precautions that have to be taken to protect equipment • the post-disaster procedures to be followed 	
All hospital staff have been informed about the possible disasters in the district, likely damages and effects, and information about ways to protect life, equipment and property	
An area of the hospital has been identified for receiving large number of casualties	
Emergency admission procedures with adequate record keeping developed	
Field staff oriented about <ul style="list-style-type: none"> • EMRP • Standards of services • Procedures for tagging 	
An officer has been designated as Nodal Officer for Disaster Management	
Sources of materials required for response operations have been identified	

Checklist For Hospitals

(to be filled in by the OFFICER-IN-CHARGE and submitted to district control room and the Department Head)

Action Taken	Y/N	Details/Remarks
Radio communications established with <ul style="list-style-type: none"> • Emergency operations centre • Divisional commissioner / Magistrate • District control room • Hospitals • Private hospitals 		
The Civil surgeon designated as 'OFFICER-IN-CHARGE - Health Services.		
The following emergency medical equipment are stocked <ul style="list-style-type: none"> • Drugs used in treatment of cuts and fractures, such as tetanus toxoid, analgesics and antibiotics • Drugs used for the treatment of diarrhoea, water-borne diseases and flu (including oral rehydrating supplies) • Drugs required to treat burns and fight infections • Drugs needed for detoxication including breathing equipments 		
Discharge of all ambulatory patients whose release does not pose a health risk to them.		
Non-ambulatory patients relocated within the hospital to safest areas		
Equipment supplies such as candles, matches, lanterns and extra clothing provided for the comfort of the patients		
Adequate supplies of anesthetic gases for surgery cases available		
The hospital water storage tanks were filled		
An area of the hospital designated for receiving large number of casualties. <ul style="list-style-type: none"> • Emergency admissions • Procedures developed • Records maintained • Work schedules to ensure availability of adequate staff 		
In-house emergency medical team to ensure that adequate staff available at all times to handle emergency' casualties		
Emergency accommodation provided for medical personnel from outside the area		
Public information center established at the hospital		
The local police, rescue groups, and ambulance teams were made aware of the resources of each hospital		

Check List
for
Incident Commander/Incident Management Team
During L₀ Period

1. For an efficient handling of emergencies, keeping abreast of related development on disaster management front holds the key. As such, the morning shall start by calling SEOC, enquire about the team at work, the functioning of the Centre, equipments in order, schedule for the day, functioning of the DEOCs etc. preparedness, mitigation and capacity building programme in progress etc. Ask about the next team coming in to take charge or even the reinforcement needed in the field.
2. Call for the written brief of previous days working of SEOC. Contact DMD for further information on any point of shortcomings in the briefings received from SEOC.
3. Contact the department concerned and ask for further details.
4. Contact, on random basis, the DM/Adhyaksha, ZP of the district where the preparedness, mitigation measures and capacity building programmes are going on. Enquire about the implementation details.
5. Call back Principal Secretary, DMD for details, if any required.
6. For surprise checking on random basis call one or two GPEOC in a fortnight.

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During L₂ Period

1. Arrive at SEOC immediately after the information about the incident is received.
2. Whosoever of the Incident Management Team arrives first takes charge of the Incident Commander and remains incharge till the Chief Secretary arrives or deposes somebody.
3. Take brief from the communication team leader about the incident, about the early warning given, and who have been already informed/who are yet to be informed. Give instructions accordingly.
4. Do video conferencing with the DEOC where the incident has occurred; take brief on further development/action being taken/team on site/officer incharge onsite.
5. Talk to officer incharge, have the first hand report of measures taken/being taken/required to be taken/support needed.
6. Give direction to SEOC communication incharge in the above light for onward transmission.
7. Go for media-briefing if required/pressed for.
8. Know who else were present at the Centre.
9. Give instruction, if required for the composition of Incident Management Team for each shift.
10. Get brief on the damage. Instruct onsite incharge to send a damage assessment report.
11. Get in touch with DM concerned. Get brief on the arrangements made for search & rescue, relief distribution, drinking water, shelter, health & sanitation. Enquire about the facilities created for the team members on job.
12. Get brief on the stakeholders present, donations received and local team of social workers.

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During L₃ Period

1. Rush to SEOC.
2. On way to SEOC call PS, DMD to be at SEOC if he/she is not already there. Advise him to call other Members of Incident Management Team, if they have not been informed or are at SEOC, SDRF about ES groups readiness to move.
3. At SEOC take brief from the Communication Room Incharge :
 - about the incident
 - who at the National level, State level have been informed
4. Do Video conferencing with DC/DM if possible or Communicate on satellite phone
5. Dispatch posse of Emergency Support Groups
6. Depute one OSD to organize and manage hospitality services food, snacks, drinks etc.
7. Request for Central assistance and help in the light of status of above development.
8. Media briefing putting the incident in right perspective
9. Depute team to make arrangements at the Airport
10. Depute team to find out emergency landing arrangement nearest to the site of the Incident and make arrangements.
11. Depute team to organize relief donations receiving, packaging and dispatch arrangements.
12. Depute a team to get support from UN agencies and neighboring states.
13. Get back to Divisional Commissioner/District Magistrate/onsite incharge for latest development.
14. Call meeting of PSs of key department, and Air/Army base chiefs, NDRF, SDRF for interactions and concretizing line of action with delegation of responsibilities.

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Check List
For
Shift Incharge
State Emergency Centre

1. Overall Incharge of State Emergency Centre will be the Principal Secretary, Disaster Management Department. But a Jt. Secretary level officer will be the Shift Incharge.
2. Enter your arrival and departure time in the logbook kept at the entrance of the Communication Enclave.
3. See that each of the shift team members has entered their arrival and departure time.
4. The three compartments of Communication Enclave viz Institutional Monitoring, Data Collection and Information Channelizing will be manned by one of the three team members The Shift Incharge will keep rotating their compartment so that each one becomes proficient in all the three segments of communication activity.
5. First enquire whether equipments were in order and if any problem with anyone found call the service and maintenance agency to attend to that on immediate basis.
6. Ask for hourly report from each and maintain a file of the report for future reference.
7. Go to the video conferencing room and interact with DEOC and GPEOC on random basis. Record your interaction and report to DM if any lapses found.
8. Speak to DM/CEO, DDMA concerned whose mitigation, preparedness and capacity development programmes are scheduled. Take feedback.
9. Check whether documents and list are in order or require updation.
10. Brief Principal Secretary, DMD about the report highlighting any point worth mentioning.

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Standard Operating Procedure

EARLY WARNING

Dependable and accurate forecasting and relevant early warning is a sensitive Act. Any inaccurate forecast, if appearing a number of times may lose its relevance.

On the other hand, an accurate and dependable forecast if not disseminated in reasonably advance time, it may be of no use or limited use. As such the forecast is to be disseminated in quickest possible time through pre-fixed authorized channel.

If the event and management structure with scheme to address is already well rehearsed, practiced codes in communication shall be used in regard to impending disaster.

The only authority to permit issue of early warning, approve the wordings, and its frequency, is the Incident Commander that is, the Chief Secretary for L₂ & L₃ level disaster and the District Magistrate for the L₁ level disaster.

All authorization to issue for the issuance of warning shall be given in writing and a proper record of the same be maintained mentioning the date, time and the person to whom the instructions were given.

A For giving early warning well in time SEOC/DEOC have to keep in touch with

For Earthquake : Indian Meteorological Department (IMD), State Earthquake Research Institute (SERI), Geological Survey of India (GSI).

For Flood : Indian Meteorological Department (IMD), Water Resources Department, Local Flood Forecasting Unit of CWC, Disaster Management Department.

For Cyclones : Indian Meteorological Department (IMD), Disaster Management Department.

For Epidemics : Public Health Department.

For Industrial Chemical Accidents:

Industry Mutual Aid and Response Group (MARG)
Departments of Industry, Police, Bhabha Atomic Research Centre (BARC).

For Drought : Indian Meteorological Department (IMD), Agricultural Deptt. WRD, Public Health Department.

B The SEOC/DEOC Technical Staff Members Have To Make Sure

- 1** All Early Warning Systems and technologies are in working condition and checked regularly.
- 2** Communities in disaster prone areas shall be made aware of the Early Warning System especially through field indications.
- 3** Alternate Early Warning Systems shall be kept in readiness in case of technical failures of water retaining structure and power failure.
- 4** Only the designated agencies /officers shall issue the Early Warning Systems.
- 5** All available Early Warning Systems shall be used & informations so gathered to be disseminated as quickly as possible through laid down channels/methods.
- 6** The early warning shall to the extent possible, be clear about its spread with risk area, its severity, duration, and likely damages it may cause.
- 7** Warning statements should be conveyed in simple, local language in order that it is understood. Along with today's messages, relevant continued background scenario along with likely development in few days ahead may also if possible to be incorporated.
- 8** Do's and don'ts should be clearly communicated to the community and motivated to ensure desired responses.
- 9** Warning statements must not evoke panic behavior it should be direct and devoid of emotions.
- 10** Rumour should not be encouraged.
- 11** State of alert should precede actual occurrence if possible. This may cover all relevant agencies and organizations also.
- 12** Wherever possible, assistance of community leaders and organised groups should be sought in managing the threat to the people.
- 13** Once issue of early warning has been started, it shall be followed-up by subsequent warnings till it is over in order to keep people informed of the latest situation.
- 14** In the event of the disaster threat dissipating, an all-clear signal shall be given.

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Standard Operating Procedures

EVACUATION

Disaster means damages, or probably even destruction and then displacement. In order to prepare to mitigate effect of such hazards like floods, probable annual drought and cyclone etc. it provides ample opportunity to prepare well in advance, rehearse on these counts and plan to address such events effectively. Earthquake, Fire etc. on the other hand are infrequent events which require long term planning.

Evacuation is displacement of communities for a short period of time to a safe place. Since it touches human dwellings and their assets created evacuation is a highly sensitive measure and requires careful and controlled handling for which, to the extent possible, person familiar with the communities shall be preferred.

All involved in evacuation shall have

- i) Fully aware of the nature of the threat and the steps to be adopted after receiving warning.
- ii) Clear understanding of their roles and responsibilities.
- iii) All evacuation shall be planned and supervised by the Incident Commander or the functionary authorized by him/her.
- iv) Assistance from community based disaster management committees if any, shall be taken.
- v) The place of Shelter where the communities are to be evacuated and the route, mode of transport, maintenance kit to keep the exercise running etc. shall be known to all concerned.
- vi) All basic amenities, i.e. drinking water, food, camps and medical support and toilets are to be in place at the shelter site and its readiness to receive the evacuees.
- vii) Arrangement for security and law & order at both locations. i.e. villages and shelter places shall be organized so that evacuation exercise go unhindered.

Planned evacuation can prevent stampedes and confusion. The amount of time needed for evacuation will depend on the type of disaster and population and area affected & time span available after warning received. After earthquake,

industrial disasters, and severe floods, evacuation is mostly on emergency basis. In case of cyclones and droughts, evacuation may safely take a reasonable time .

- ❖ Shelter sites shall be as close as possible from dwellings but at a safer place/elevation.
- ❖ Evacuation routes shall be well defined and free from intermittent obstacles.
- ❖ Evacuation routes shall not be disrupted during the exercises and if there is any chance, alternative route to be earmarked in advance.
- ❖ Ensure proper evacuation by seeking community participation & assistance from Community Based Organizations (CBOs) along the following lines.
- ❖ Care shall be taken to see that evacuation routes are not blocked
- ❖ It is always preferable to encourage the entire family and necessary belongings to evacuate together as a unit
- ❖ In case of inadequate transport or limited time, encourage the community for emergency evacuation in the following order:
 - Seriously injured and sick
 - Children, women and handicapped
 - The Aged
 - Able-bodied &
 - Live stock etc.

In case of Emergency Evacuations

Families shall be encouraged to take along adequate supplies of water, food, clothing and emergency supplies Families shall be encouraged to assemble the following disaster supplies kit. Important family documents including ration card, passport, bank passbook, addresses and telephone book (of relatives), certificates, driving license, property documents, insurance documents etc shall be kept in safe place in a bag for easy pick up and going

- ❖ Adequate supply of water in closed unbreakable containers
- ❖ Adequate supply of non-perishable packaged food and dry rations
- ❖ Some necessary clothing and rain gear
- ❖ Blanket, plates, glasses, mugs made of plastic

- ❖ Soap, toothbrushes, toothpaste
- ❖ Battery-powered radio, torch, lantern, matches
- ❖ Cash and jewellery
- ❖ Personal medicines
- ❖ Special items including food for infants, elderly or disabled family members

In case of Evacuation of marooned persons people are advised to take the following steps:

- ❖ Evacuation shall be carried out within the shortest possible time
- ❖ Marooned people shall be transferred to transit camps

Within a shortest possible time, marooned people shall be provided with:

- ❖ Water
- ❖ Medicines
- ❖ First-aid
- ❖ Cooked food

Emergency transport shall be arranged for the seriously injured people through speedboats & viable in case of flood; air lifting in case of flood, earthquake and industrial disasters; four-wheelers in case of drought, and epidemics etc.

- ❖ A senior medical officer shall accompany the rescue team
- ❖ Water supplied shall meet standards of potable water
- ❖ Attaching a tag to each injured individual simplifies identification of patients This is usually done using colour codes, to indicate the degree of injury and the priority for evacuation

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**Standard Operating Procedure
for
POLICE DEPARTMENT**

- 1) The police department shall have a Disaster Response Plan in which the disaster response procedures must be clearly defined in order to avoid confusion to cut short time and improve overall efficiency including cost and time.
- 2) Orientation and training for the disaster response plan shall be accompanied by relevant exercises to keep the department prepared for such eventualities. Special skills required during emergency operations need to be imparted to officials and staff. Selected personnel can be deputed for training as nodal officers and officers-in-charge-police at the state and district level respectively. Trained personnel shall not be transferred without a substitute from chronic disaster prone areas.
- 3) Normal time activity.
- 4) Preparedness level shall be continuously assessed and the same reported in a specifically designed format, to the district control room every six months but necessarily pre & post disaster which are occurring annually i.e. flood, drought in some part/form or the other in a state either singly or even together.
- 5) A list of disaster prone areas with their degree of severity in the district shall be maintained.
- 6) Police officers shall be trained to handle accidents involving hazardous material.
- 7) An area shall be designated within the police station to be used as a Public Information Centre.
- 8) Maintain law and order.
- 9) All personnel of disaster management shall work under the overall supervision and guidance of the Incident Commander, District Magistrate.
- 10) Radio communication shall be established with:
 - Emergency disaster-operation centre
 - Divisional commissioner
 - District Control Room
 - Departmental offices within the division

- 11) All district level officials of the department must report to the Collector.
- 12) If necessary, the District Collector shall provide an officer-in-charge-police or field staff, with all needed authorisations with respect to: recruiting casual labour procuring locally needed emergency tools, equipment and material.
- 13) The officer-in-charge-police shall ensure that all field staff and other officers submit the necessary reports and statement of expenditure in a format as required by the District Collector.
- 14) Precautionary measures and procedures shall be reviewed with staff to protect equipment, and post-disaster procedures must be followed.
- 15) All department vehicles shall be refueled and parked in a protected/safe area.
- 16) Guards shall be provided for supply depots such as co-operative food stores and distribution centres.
- 17) Police convoys shall be made available for relief material.
- 18) Anti-social elements shall be identified and precautionary measures taken.
- 19) At the onset of the disaster, officers shall be dispatched to identify and assist people and communities in life-threatening situations.
- 20) Seriously injured people shall be identified and the community assisted in organizing emergency transport to medical treatment centres
- 21) The community shall be assisted and encouraged in road-clearing operations.
- 22) Immediately after the disaster, it shall be ensured that all police stations are functional at all the required locations and law and order is maintained properly.
- 23) Security shall be provided in transit and relief camps, affected villages, hospitals, medical centres, and the identified areas should be cordoned off.
- 24) Transport carrying transit passengers (ie passengers travelling through trains, buses- passing through the district) shall be diverted away from the disaster areas.
- 25) Security arrangements for visiting VIPs shall be provided.
- 26) District authorities shall be assisted in taking necessary action against hoarders, black marketer and that manipulating relief material in conjunction with other government offices.

- 27)** Public Information Centre shall be set up to:
- Latest status of effect of disaster in the affected area.
 - respond to personal inquiries about the safety of relatives in the affected areas
 - compile statistics about affected communities, deaths, complaints and needs
 - respond to the many specific needs that will be presented
 - serve as a rumour control centre
 - reassure the public
- 28)** Officers shall be made available to inquire and record deaths Normally there is neither time nor personnel available to carry out the standard post-mortem procedures
- 29)** Welfare of people sheltered in relief camps shall be monitored
- 30)** The police shall co-ordinate with the military service personnel in the area

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Standard Operating Procedure
for
PUBLIC WORKS DEPARTMENT

Following procedures are recommended for Public Works Department (PWD)

1. All personnel required for disaster management shall work under the overall supervision and guidance of the Incident Manager.
2. Special skills required during emergency operations shall be imparted to officials and the staff. Selected personnel can be trained as nodal officers and officers-in-charge at the state and district level respectively.
3. All PWD officials shall be notified to meet to review emergency procedures with the relevant staff.
4. Vehicles shall be inspected, fuel tanks filled and batteries and electrical wiring covered at the outbreak of disaster.
5. Extra transport vehicles shall be dispatched from headquarters to be stationed at safe strategic spots along routes likely to be affected.
6. Heavy equipment such as front-end loaders shall be moved from areas likely to be affected and stationed at a safe place.
7. A senior engineer shall inspect all buildings and construction structures. Structures endangered by the impending disaster should be identified.
8. The design of roads and routes shall be in close co-ordination with police and the district control room.
9. A priority listing of roads to be opened first shall be established. The most important roads are those leading to hospitals, main trunk routes and highways.
10. Priority shall be given to urgent repair work that needs to be undertaken in disaster-affected areas.
11. Locations for setting up transit and relief camps, feeding centres, cattle centres etc shall be identified.
12. A two-way communication link shall be issued to all work teams.
13. To guide and assist drivers, adequate road signs shall be installed.
14. Roads shall be cleared. Casual labour shall be assembled to work with experienced staff, and divided into work gangs.

15. Co-ordinate with the construction and building department of the concerned zilla parishad.
16. Community organisations shall be contacted to mobilise community assistance for road clearing .
17. Cleaning ditches, grass cutting, burning or removal of debris, and cutting of dangerous trees along the roads shall be undertaken
18. Repairs of all paved and unpaved road surfaces including edge metalling and pothole patching shall be undertaken and monitored in the affected areas by maintenance staff.
19. Temporary roads shall be constructed to access transit relief camps and medical facilities for disaster victims.
20. Relief camps, feeding centres, medical facilities and cattle camps shall be organized.
21. Up-to-date report of all damage and repair shall be kept in all district office report books and the same should be sent to the district control room
22. Depending on the nature of the disaster, a work team with the relevant emergency tool kit shall be provided.
23. Each work team shall mobilise a farm tractor with chain, cables and a buffer stock of fuel.
24. If possible, an aerial review of the extent and intensity of the damages shall be organised by helicopter in order to efficiently dispatch road-clearing crews, as well as determine the requirement of equipment. These can also be used to deliver relief material.

Essential equipment for work teams:

Every railway work gang shall have:

- 1) Crosscut saws
- 2) Axes
- 3) Ropes
- 4) Chain saws
- 5) Raincoats, caps and gumboots should be made available to work gangs in an emergency situation
- 6) Tractor shovel
- 7) Tripper
- 8) Auxiliary jeep

- 9) First aid box
- 10) Polythene, tarpaulins
- 11) Fishplates
- 12) Masonry articles
- 13) Hand gloves
- 14) Telecommunications

Emergency tool kits at each exchange shall include:

- 1) Cable
- 2) Cable cutter
- 3) Cutting pliers
- 4) Spanners
- 5) Ropes
- 6) Ratchet tension
- 7) Crosscut saws
- 8) Pulley blocks with ropes
- 9) Hand gloves
- 10) Tarpaulins
- 11) Standby generators for recharging of batteries
- 12) Poles

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Standard Operating Procedure for RAILWAYS

- 1) Following steps are recommended for railway personnel:
 - ❖ Restore rail lines.
 - ❖ Ensure smooth rail movement for passengers and relief materials.
 - ❖ Establish radio communications with emergency operations centre, divisional commissioner, district control room and railway officials within the division.
 - ❖ Appoint one 'Nodal officer-Railway,' at the state level and one 'Officer-in-Charge-Railway,' at the district level.
 - ❖ Officers shall ensure that all staff is well aware of precautions to be taken to protect their own lives and personal property.
 - ❖ Fill department vehicles with fuel and park them in a protected/safe area.
- 2) A plan shall be finalized for sending auxiliary staff and repairmen into affected areas to assist local people.
- 3) Maintenance and repairmen shall be instructed to assemble and check the repair equipment.
- 4) Rail schedules shall be revised and special trains be instituted to the area, to assist the increased volume of traffic.
- 5) A schedule for the trains shall be developed by the stationmaster and broadcast over the radio, cable network, DOC.
- 6) Contingency plans shall be established for providing food and emergency shelter for local staff, auxiliary staffs and affected population.
- 7) Effort shall be made for more number of trains to operate in an emergency situation.
- 8) Emergency train operating procedures and pilot working system shall be developed.
- 9) All staff shall be well trained to implement the emergency system.

- 10) Stationmaster should be given the authority to dispatch or hold the train, take other emergency decisions in a disaster-threatening situation.
- 11) Systems shall be developed for increasing capacity to carry increased number of passengers in an emergency situation.
- 12) Arrangements for alternate means of transport shall be made for visiting relatives, medical staff and other people.
- 13) Availability of adequate food supplies shall be ensured.
- 14) All new construction and repair activities shall be halted and the work secured with sandbags and tarpaulins.
- 15) All perishable and breakable items shall be loaded into goods wagons and padlocked.
- 16) In any coach remains in the area, shutters shall be pulled down and doors closed.
- 17) Reserve stocks of fuel shall be checked.
- 18) Inspection of all railway bridges, by a bridge engineer including an underwater survey of foundations, piers and abutments.
- 19) The maintenance engineer's staff shall carry out regular weeding, cleaning of ditches, burning and removal of debris.
- 20) Continuous inspection and repair by maintenance engineer of all:
 - ❖ Railroad tracks
 - ❖ Ball casting
 - ❖ Cess damage
 - ❖ Fishplates
 - ❖ Holding down bolts
- 21) Relief goods may be considered for exemption from freight charges.
- 22) Railway stations, particularly terminal and junction station shall be equipped with emergency communication equipment.

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Standard Operating Procedure for AIRPORT

1. Following procedures for airport officials in a district are recommended:
 - ❖ Co-ordinate with the District Collector in regard to specific requirements of the disaster situation.
 - ❖ Establish radio communications with Emergency Operations Centre, divisional commissioner, district control room and other airports.
 - ❖ Review and update flight schedules Arrange additional flights for the relatives, relief materials and medical aids.
2. Inspect the following:
 - ❖ Runways
 - ❖ Drainage system inside the airport perimeter
 - ❖ Culverts
 - ❖ Ditches
 - ❖ Wind falls
 - ❖ Foundations
 - ❖ Radio tower
 - ❖ Communication equipment
 - ❖ Lightening rods
3. Inspect and repair all buildings, stores, hangers, fuel pumps, with special attention to the disaster consequences.
4. Remove all serviceable aircraft from the disaster area.
5. Auxiliary equipment, pumps, wagons etc should be moved indoors.
6. Wind direction indicators shall be removed.
7. Aviation fuel shall be checked and auxiliary fuel stock brought in.
8. Contingency plans shall be prepared for post-disaster use of airport, including:
 - ❖ Need for emergency control tower equipment

- ❖ Need for emergency control tower staff
- ❖ Need for emergency linemen for fueling
- ❖ Emergency fuel supplies
- ❖ Temporary storage facilities

9. Large glass windows shall be taped to prevent the shattering of glass.

10. Priority clearance arrangements for relief material shall be provided.

11. Priority travel facility to relief personnel shall be provided.

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**Standard Operating Procedure
for
WATER RESOURCES DEPARTMENT**

1) To improve capacity to respond to disaster, the following preventive measures are recommended:

- Identify flood prone rivers and areas – Deptt., duration & intensity of flood and its likely impact in the flood affected area.
- Activate flood-monitoring mechanism in all flood prone areas from the 1st of June every year
- Mark water level gauges for rivers, dams and minor tank structures.
- Flood forecasting and early warning- dissemination of latest status of flood connected informations.
- Monitor and protect irrigation infrastructure
- Restore damaged infrastructure

2) Organise round the clock inspection and repair of:

- Water Resources Structures
- Embankments
- Irrigation channels
- Bridges
- Culverts
- Sluice gates
- Overflow channels

Arrange, organise and repair (Round the Clock):

- Water pumps
- Generators
- Motor equipment
- Station buildings

3) Establish radio communications with the Emergency Operations Centre, Divisional commissioner, District Emergency Operation Centre and relevant departmental offices within the affected division.

- 4) All personnel required for disaster management, shall work under the overall supervision and guidance of the Incident Commander (DM).
- 5) Fill department vehicles with fuel and park them in a safe/protected area
- 6) The officer assigned a task shall be designated as the 'Emergency Officer' He shall be aware about the disaster, its effects and understand appropriate emergency procedures.
- 7) Officers shall ensure that all staff are aware of precautions to be taken to protect their own lives and personal property.
- 8) Each technical assistant shall know basic instructions and operating procedures for disaster conditions.
- 9) During the disaster, irrigation engineers shall, along with the technical assistants review water storage systems.
- 10) Emergency tool kits shall be prepared for all technical assistants in disaster prone areas Tool kits shall be checked regularly.
- 11) If heavy rains are expected, the level of improvement in the water resources structure shall be maintained as per reservoir operation schedule. The same shall be co-ordinated with officers on other water resources sites and the district control room.
- 12) The inlet and outlet in the impoundment shall be inspected to ensure that waterways are unobstructed by falling trees/debris/vegetation.
- 13) The repair/ construction activity shall be well secured with sandbags, rock fills, etc.
- 14) Office records etc shall be covered in plastic bags and well secured, even though stored inside.
- 15) In case of possibility of flooding downstream, settlements there shall be forewarned, and necessary warning for evacuation shall be given to adjoining districts and to districts beyond state borders.
- 16) Information formats and monitoring checklists shall be used for programme monitoring, development and for reporting to the Emergency Operations Centre.
- 17) Co-ordinate with other states about release of water through the water resource structures and dissemination of warning in case the released discharged is quite high.
- 18) Provide for sending additional support along with food, bedding, medicines and tents.

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**Check-List
of
Gadgets & Equipments Required
for
CAPABILITY BUILDING**

1. At the Community Level

- Public Address System for Early Warning
- First- Aid kits with SHG leaders
- Emergency light/torches with community leaders/workers
- Life Saving Rings (Ten Nos)

2. At the District Level

- Communication System (Satellite +)
- Audio-Video Conferencing System
- Data Processing Facilities
- Emergency Power Supply Facilities
- Relief Camp Materials (2000 persons)
- Relief Distribution materials (2000 persons)
- Motor Boats
- Fire Engines (3) & Fire Extinguishers (10)
- Ambulance (5)
- Emergency Health Service Facilities
- Gas Cutters etc
- Infrastructure Repairing & Maintenance Services
- Small Craft/Helicopter landing Facilities
- Sufficient Stock of grains properly stored
- Stock of Fast & Dry Food Stuffs : distribution ready

3. At the State Level

- Communication System (Satellite +)

- Data Processing Facilities
- Information Dissemination System
- Fully Equipped Hazard Based Forces
- Relief Material Receiving, Sorting Packing & Transportation Facilities at the Airport
- Stock of food grains/clothing's etc properly stored
- Resource Networking within & outside the state

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**Check-List
for
SANITATION EQUIPMENT**

1. Mobile chlorinator, mounted on truck or trailer with liquid chlorine cylinder
2. Mobile hypo chlorinator with solution tanks, hose and accessories
3. Mobile water purification unit with a capacity of 200-250 litres/min
4. Tank trucks for water, capacity of 7 m³
5. Portable elevated storage tanks with supporting tanks with supporting elements and accessories
6. Well-driving equipment and well points
7. Hand operated pumps for water capacity of 15-20 litres/min
8. Electric or diesel driven pumps, capacity of 200-250 litres/min
9. Pipes (cast iron, galvanised, asbestos cement) diameter 125-10 cm, with valves & fittings
10. Chlorinated lime (25-30%), stored in a cool, dry place and renewed every 6 months
11. Calcium hypo chlorite (60-70%), in powder or granule form, stored in a cool, dry place and renewed every 2 years
12. Alum, ferric chloride, and other chemicals for water treatment
13. Masonry tools
14. Carpentry tools
15. Truck mounted generators

For waste water, sewage and excreta disposal

16. Mobile mud pump
17. Sludge pump (non-clogging diaphragm or other type)
18. Sludge tank trucks, capacity of 7 ML
19. Mobile repair shop with necessary tools and equipment, masks, boots, working gloves, excavation tools, etc
20. Pipes with joining materials, diameter of 10-30 cm
21. Moulds (iron / wood) for concrete pipes and slabs
22. Timber, bamboo mats, nails, etc

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1. Training Module *for* Legislatures

Duration : 2 days of 2 hours each

Batch Size: 50

First Day – 1st Hour :

1 Orientation in Disaster Management

1. Briefing on State Disaster Management Plan

Question— Answer

2nd Hour :

2. Policy decisions to be taken for the implementation of the Plan

3. Special Institutions to be setup for Disaster Management

Question— Answer

Second Day – 1st Hour :

4. New measures suggested in the Plan

5. Funding of the Plan implementation

Question— Answer

6. People's participation and the role of the legislature in the same

Resource Materials : Handouts on Policy Decisions to be taken

Handouts on funding arrangements to be made

Instruments : Power -Point Presentation

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2. Training Module *for* Senior Executives

Duration : 2 days of 2 hours each

Batch Size: 30

First Day – 1st Hour :

1. Brief on Disaster Management Plan
2. Role of Senior Executives in Plan Implementation

2nd Hour :

3. Special Institutions to be Set-up
4. Organizational development and Human Resource Development for Disaster Management

Second Day – 1st Hour :

5. Role of Departments in Disaster Management
6. Wedding of Developmental Schemes with disaster mitigation measures

2nd Hour :

7. Training of departmental functionaries

Resource Materials : Handouts on Organizational Development
Handouts on Human Resource Development

Instruments : Power -Point Presentation

BBB

**3. Training Module
for
Functionaries
of
State Level Govt. Depts.**

Duration : 3 days of 3 hours each

Batch Size: 35

First Day – 1st Hour :

1. Disaster Management as a strategy

2nd Hour :

2. Disaster Management Plan

3rd Hour :

3. The Role of Govt Depts in Disaster Management

Second Day – 1st Hour :

4. Mitigation Measures

2nd Hour :

5. Preparedness Measures

3rd Hour :

6. Response Mechanism

Third Day – 1st Hour :

7. Small Group Discussions about developmental schemes & mitigation measures of respective departments

8. Presentation

9. Discussion & Summing Up

Resource Materials : How to club development with disaster mitigation measures

Homework: Updation of Departmental DM Plan
Refresher Course every six month

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**4. Orientation Module
for
State Level Stakeholders
Other than the Government**

Duration : 1 day of 3 hours

Batch Size: 20-25

1. About the State Disaster Management Plan and the Set-ups for Plan implementation
2. The Space available for various stakeholders in Disaster Management: its implications and the expectations of the government from them
3. Participation of the stakeholders to express their views and suggestions
4. Summing –Up

Resource Materials : A copy of the Plan

Hard copy of the Power Point Presentation

BBB

5. The Training Module for District Level Functionaries

Duration : 4 days of 4 hours each

Batch Size: 25-30

First Day – 1st Hour :

1. Disaster Management
2. Disaster Management Plan, State+ District level

2nd Hour :

3. The Role of Govt. functionaries
4. The State level support

3rd Hour :

5. The local bodies & their roles in plan implantation

4th Hour :

6. Small group discussions

Second Day – 1st Hour :

7. Presentation

2nd Hour :

8. Question + Answer Session

3rd Hour :

9. Other district level stakeholders

4th Hour :

10. Monitoring & Evaluation

Third Day – 1st Hour :

11. Damage Assessment

2nd Hour :

12. Disaster Response

3rd Hour :

13. Inventory Management

4th Hour :

14. Relief Management

Fourth Day – 1st Hour :

15. Wedding of Development & Disaster Mitigation

2nd Hour :

16. Question + Answer Session

3rd Hour :

17. Working of Disaster Management Plan by line Depts

4th Hour :

18. Presentations & Valedictory Function

Instruments : Power-Point Presentation–Lecture–Small group discussion

BBB

**6. Training Module
for
District Level Other Stakeholders**

Duration : 2 days of 4 hours each

Batch Size: 25-30

First Day – 1st Hour :

1. Disaster Management
2. Disaster Management Plan (State + District)

2nd Hour :

3. Space for Role-play for Stakeholders other than the govt
4. Small group discussions

3rd Hour :

5. Small group discussions
6. Presentations

4th Hour :

7. Question + Answer session

Second Day – 1st Hour :

8. Administration +NGOs+ Civil Society Partnership

2nd Hour :

9. Presentations by district level govt depts

3rd Hour :

10. Presentations by NGOs + Civil Society

4th Hour :

11. Partnership Plan & Summing Up

Instruments : Lectures, Small group discussion–Presentation–
Question + Answer

BBB

7. Training Module for Local Bodies

Duration : 2 days of 3 hours each

Batch Size: 25-30

First Day – 1st Hour :

1. Disaster Management
2. Disaster Management Plan

2nd Hour :

3. Mitigation measure in the state + district plan
4. Preparedness measures in the state + district plan

3rd Hour :

5. Implementation of Programme & Activities

Second Day – 1st Hour :

6. Presentation by Local Bodies

2nd Hour :

7. Question + Answer

3rd Hour :

8. Summing Up

Instruments : Power Point Presentation

Lecture

Question + Answer

BBB

8. Training Module for PRI Representatives

Duration : 2 days of 4 hours each

Batch Size: 35-40

First Day – 1st Hour :

1. Disaster Management
2. Disaster Management Plan
3. Role of PRI in Disaster Management as per Panchayati Raj Act

2nd Hour :

4. Mitigation & Preparedness
5. Role of PRI Representatives in Mitigation & Preparedness
6. Role of PRI in Disaster Response

3rd Hour :

7. Question + Answer

4th Hour :

8. Making of Panchayat level mitigation & preparedness plan

Second Day – 1st Hour :

9. Drawing of Mitigation & Preparedness Plan by each Panchayat

2nd Hour :

- 10.—Do—

3rd Hour :

11. Presentation of the Plan

4th Hour :

12. Discussion & Summing Up

Instruments : Lecture /Role Exercise /Question + Answer

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Community Level Awareness + Training

Awareness :

- Campaign Mode
- Demonstration Mode : Puppet Shows, Street Plays
- Learning Mode : Small group discussions

Training :

- First Aid, Emergency Kits, Emergency Food Packet
- Hazard wise : Disaster Mitigation & Preparedness Plan
 - Response mechanism
 - Early Warning System
 - Role of GPEOC
 - Role of PRI
 - Sankalp Kendra

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**Do's & Don't
For the Communities
During**

EARTHQUAKE

Do'S	Don'ts
1. Be attentive enough to listen the announcements on Public Address System / Radio / TV	1. Do not run out of your house if wide, open space is not nearby
2. Share with your family members the information received, knowledge gathered and skill developed about how to react during disaster	2. Do not use the lift for getting down
3. Protect yourself by taking refuge in the corner of a room or under a table or bed	3. Do not rush to the door or exist or run down the stairs
4. Stay away from old buildings, electric poles, trees that are liable to fall	4. Do not remain on a bridge or embankment
5. Stop your vehicle get out of it and stand in an open place and away from cable wires etc	5. Earthquake is always a short duration a minute or two-affair But it is liable to occur suddenly Therefore, don't panic For, if death and destruction is going to happen it will happen
6. Keep your water container, dry food items, torch, medicines at one place preferably in a bag in an accessible place	

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Do's & Don't
For the Communities
During
FLOOD

Do'S	Don'ts
1. Remain attentive to listen to the announcements on Public Address System / Radio / TV	1. Don't enter flood water on foot if it can be avoidable
2. Switch off the electric supply	2. Don't let your children and other family members wander in flooded areas
3. Gather all the family members, livestock & valuables etc. at one high ground for convenience	3. Don't drive on roads submerged in floodwater
4. Collect and keep household goods at a higher place which floodwater may damage or destroy	4. Don't drink water contaminated by flood water
5. Keep your remaining emergent necessary items stacked at a place so that in case of emergencies you could carry the same with you	5. Don't eat cooked food kept in the open for long Try to have dry and ready food items
6. Take your vehicle to the highest ground nearby	6. Avoid coming back to your house again & again during high flood unless the official permission is given
7. Lock doors & windows of your house while evacuating	7. Don't try to over load the boat
8. Always take help of a boat for moving in sailable water from one place to another avoiding deep & fast river current	8. Avoid night travel during floods
9. First Aid and emergency kit if available must be carried on the boat	9. Avoid remaining near a tree for long especially during night which could be temporary shelter of snakes etc.

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**Do's & Don't
For the Communities
During
CYCLONE**

Do'S	Don'ts
1. Be attentive to announcement on Public Address System / TV/ Radio	1. Don't remain outside in the open
2. Remain attentive for further announcement about the change in direction, speed or intensity of cyclone	2. Don't remain in thatched hutments of houses with corrugated sheets etc.
3. Move to nearest shelter or a pucca house till the cyclone has blown away	3. Don't go near fallen & electric poles, damaged bridges and structures
4. Stay away from trees, electric poles, hutments having loose roofs etc	4. Don't drive vehicle or stand near by a vehicle when the cyclone is with high intensity
5. Open window on the sheltered side if the roof begins to shatter.	5. Don't get out of the shelter unless the cyclone has receded

BBB