

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

5. Disaster Prevention & Mitigation

- 5.1 Basics
- 5.2 The Typical Effects : Earthquake
- 5.3 The Typical Effects : Floods
- 5.4 The Typical Effects : Drought
- 5.5 Prevention of Mitigation Measures
- 5.6 Man-Made Disasters
- 5.7 The Typical Effects : Epidemics
- 5.8 The Typical Effects : Traffic Accidents
- 5.9 The Typical Effects : Nuclear Hazards

6. Disaster Preparedness

- 6.1 Disaster Preparedness: Kind & Characteristics
- 6.2 Disaster Preparedness : Measures
- 6.3 Capacity Development
- 6.4 Networking

7. Sankalp Kendra

- 7.1 The Bedrock of the Concept
- 7.2 The Concept
- 7.3 Community Based Disaster Management

8. Awareness Generation, Capability Building etc.

- 8.1 Awareness Generation
 - 8.2 Capability Building
 - 8.3 Human Resource Development
-

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, on 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 Jamuna, 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 an 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 chauris, 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 boundry 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 theses 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 **Sapta-kaushiki**. 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 change 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 Kutcha 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 tress 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 -jhoppdis 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

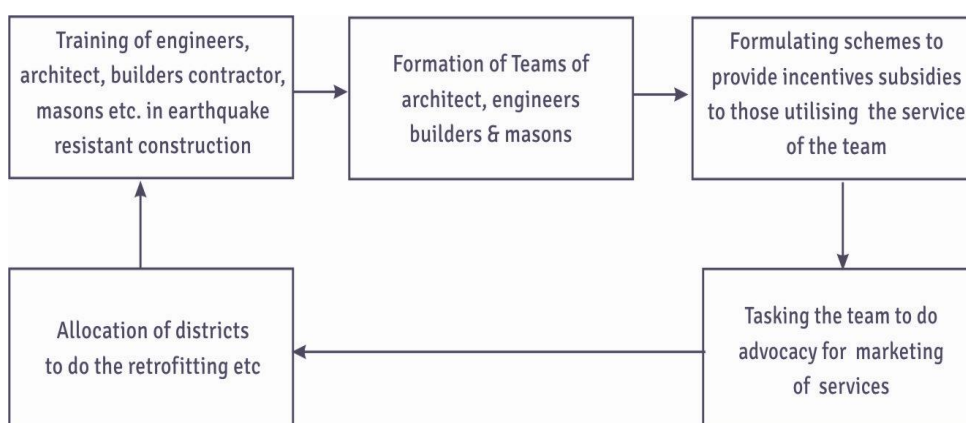
making use of equipment and material and training for team building and for being mutually supportive and self-supportive. Training and skill empowers functionaries and people with understanding and knowledge to act in a particular manner. Equipment and materials help in minimizing the loss of life and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

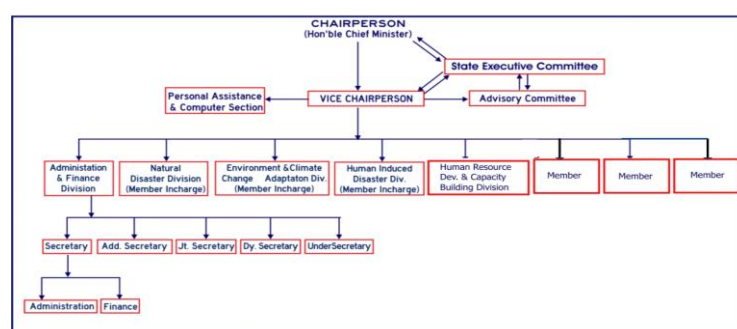
D. The Specially Created Institutions

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*



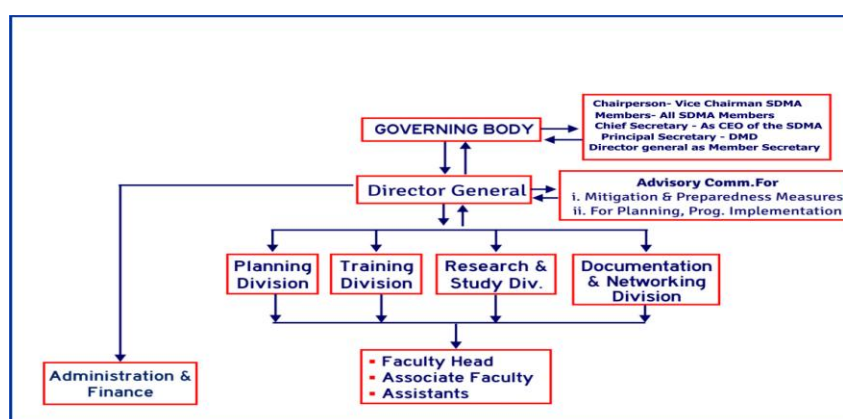
**The organizational structure has been drawn on the basis of provision made in the Disaster Management Act, 2005 on the*

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

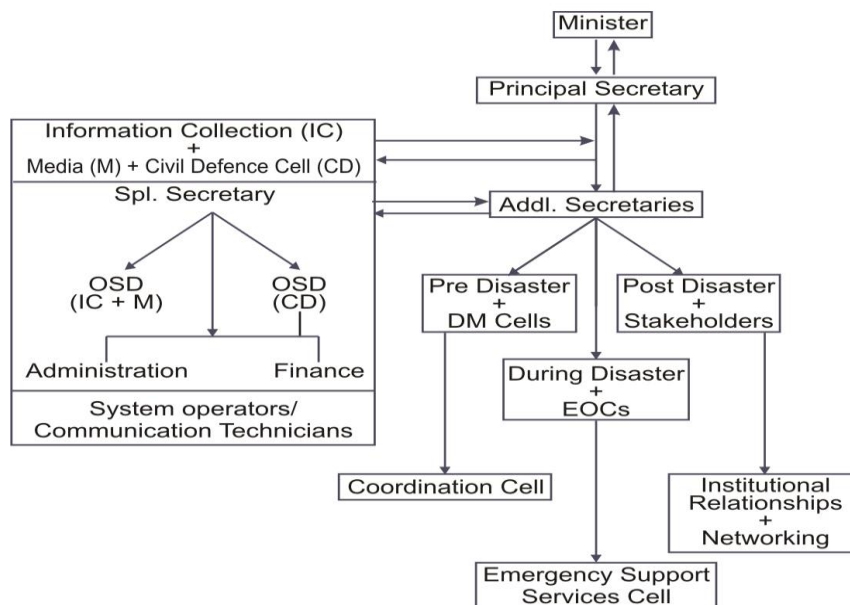


BSIDM shall be a dedicated institution to undertake research and study, need assessment, and formulation of modules of programme and activities. So it should have full time faculty with panel of resource persons who would be experts in the specific field of study.

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.

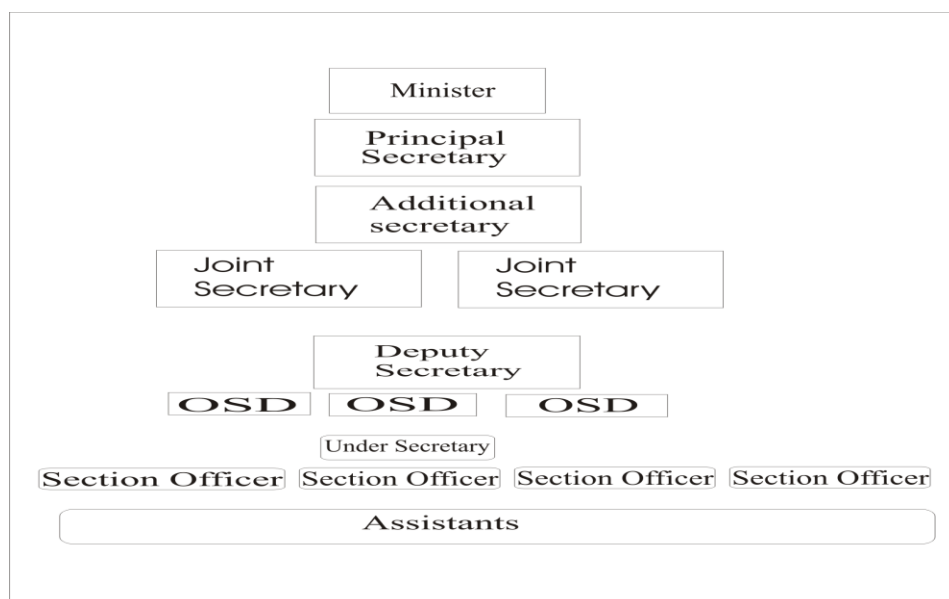
Disaster Management Department shall be strengthened by adding professional staff to make it run as a more efficient and professionally managed government Department.

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, CBOs & 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.

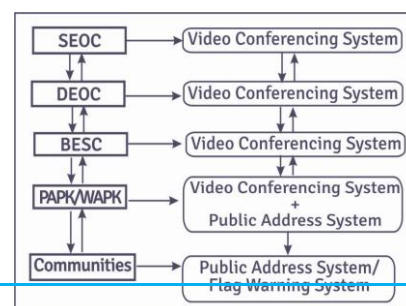
For service sector, networking with the following institutions:

- ❖ 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.

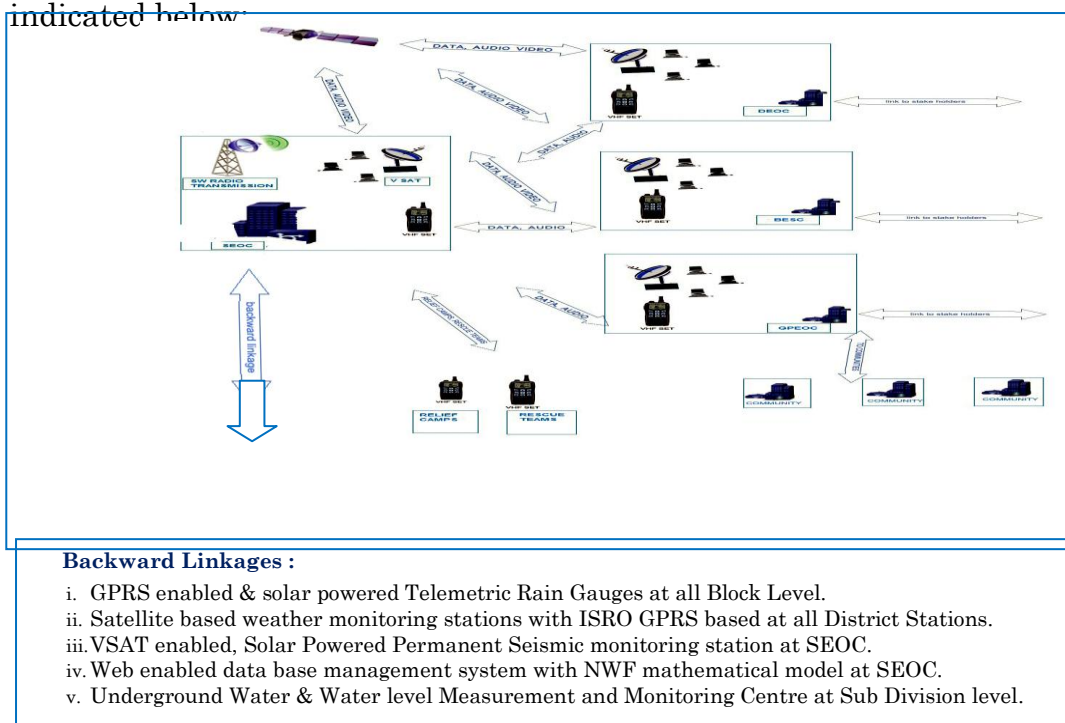
6.5 Early Warning System

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

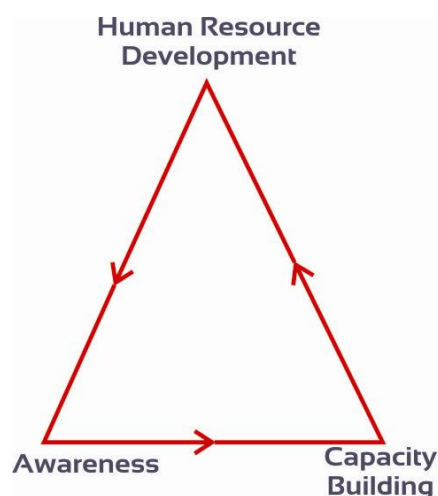
- Putting people, PRIs, local bodies, Block & District and state level institutions and bodies on alert about the situations, keeping in touch with DEOC and SEOC on a regular basis and disseminate the instructions, advise, directions among those concerned and the communities affected.
- Providing support 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, ladder 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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