

## CHAPTER V

### Specific Disaster Mitigation Measures:

#### *a) Flood Mitigation:*

The various measures adopted for flood mitigation is of two types

- .a. Structural
- .b. Non-structural

The Structural measures aims at preventing or reducing the flow rate of floodwaters from reaching the potential damage centres. The followings are some structural measures for flood control

- Dams and Reservoirs
- Embankments, flood walls, sea walls
- Natural detention basin
- Channel improvement
- Drainage improvement
- Diversion of flood waters
- Flood proofing and elevation (Flood proofing is the use of contingent or emergency techniques to either prevent flood water from entering into buildings by using water-tight seals, closures or barriers, using water resistant materials and temporary relocation of contents of the building. Elevating a structure implies raising it on fill, piers or pilling so that it is above expected flood levels.
- Channel alterations
- High flow diversions
- Storm water management
- Coastline protection
- Watershed management

The non-structural measurers, on the other hand, aim at reducing the susceptibility to flood damage as well as minimising the loss burden. The various non-structural measures to be implemented in the district are:

i) Reducing the susceptibility to flood damages through:

- Flood plain management
- Flood proofing including disaster preparedness, and response planning and
- Flood forecasting and warning.

ii) Minimising the flood loss burden through:

- Disaster Relief
- Flood fighting including Public Health Measures

#### **Instrumentation:**

Setting up of flood forecasting and warning services i.e. **installing automatic data collection system by means of sensors, transmission of data by latest techniques of**

**communication and formulation of forecast using computer based programme models** is one of the most cost-effective non-structural mitigation measures.

#### **Regulations:**

A major contributory factor to increasing damages by floods in the district is the increased encroachment of the flood plains. The flood plains are an integral part of the flood regime **and an unimpeded drainage without hindrance with its benign and life-supporting aspects is necessary for a permanent solution.** One of the mitigation measures include proper flood zoning with strict guidelines prescribing the land use in flood plains and other vulnerable areas will be carried out along with all the structural and non-structural measures. Priority should be given to tackle critical/more vulnerable areas as a part of the master plan for flood proofing, flood control and drainage.

The flood plain zoning will include demarcation of zones liable to flooding in different time

periods such as 5, 10, 25, & 100 years and the delineation of flood plain activities for each zone.

The other regulations would include

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

#### **Safe sitting in flood hazard areas**

- Low lying areas, close to the coast and flat lands in the river valley are prone to flooding
- Flash flooding generally occurs in geologically younger river valleys and rivers originating from mountains
- It is important to review the history of flooding in a particular area including mapping and assessing the extent of land flooded, assessing the height of flooding etc.

#### ***b) Drought Mitigation:***

##### **Rain guage stations**

Priority should be given to install at least one Rain guage Station in every GP headquarters to increase the reliability of the rainfall data. The data collected can be computerised at the Panchayat level and transmitted to district and state headquarters to facilitate early detection of drought.

##### **Information Sharing**

Collection and exchange of data between different departments is most crucial for drought management. There shall be a nodal agency to collect and evaluate rainfall data and pass on to the relevant departments. Systematic evaluation of the data should be carried out by a multi disciplinary Drought Watch Group consisting of representatives of the concerned line departments for correct assessment of the situation. One such small group at present exists in the Agriculture Department at the District Headquarters. It shall be made more broad-based encompassing all the departments and should serve as a nodal agency for drought.

##### **Augmentation of Irrigation facilities**

Providing irrigation is the surest way of preventing drought. A master plan for achieving irrigation potential is to be prepared (with emphasis on minor irrigation) by making use of the maps prepared by Irrigation department. A large number of private irrigation projects like tube wells, bore wells and river lift irrigation points can be taken up by utilising the subsidy available from different sources.

##### **Creation of rainwater harvesting Structures:**

Creation of rainwater harvesting structures covering all potential watersheds, tree plantation along with soil conservation measures shall constitute the most important measures for long-term drought proofing.

##### **Crop diversification:**

Adequate training for government staff, NGOs and farmers along with promotion of dry land farming, alternative crops, cropping pattern and promotion of alternative occupations shall receive topmost priorities. Efforts to promote non-paddy, low irrigation requirement crops

and promotion of other livelihood activities should be given priority in chronic drought prone areas as it has been proved that paddy will remain a low-yield and a uneconomic crop in these areas.

### **Soil & Water Conservation:**

Soil and water conservation and drainage line treatment measures like construction of vegetative barriers with indigenous materials like vetiver grass, contour bunding, check dams, gully plugging, off season tillage and deep tillage, ridge & furrow methods of cultivation, contour and strip cropping incorporating residues etc. shall be taken up on a large scale. Stall-feeding of animals is to be encouraged for controlling over grazing and protecting crops in the post monsoon season.

### **Rainwater harvesting:**

The key component in water management is storage. Rainfall received during the monsoon season is to be captured and stored by building hundreds of rainwater harvesting structures (through labour intensive work) through diversion structures constructed across medium and minor streams. Water harvesting and rational use of groundwater together can drought proof the district.

## **SUMMARY OF LONG-TERM SOLUTIONS**

- Rainwater harvesting & watershed management
- Soil Conservation and contour bunding including the need for legislation
- Plantation on a massive scale
- Use of vermin compost, other organic manure and adoption of various farming practices to increase the moisture retention capacity of the soil
- Different land use patterns to be enforced with a defined area under tree cover
- Promotion of dry land planning, different cropping pattern and crop species and more area specific R & D needed for alternative crops to ensure food security
- Need for an alternative drought management plan and a shift from the present focus on relief with an increasing emphasis on the long-term solution of drought proofing.
- Priority measures for promoting non-paddy based agriculture and other potential alternative livelihood opportunities like animal husbandry in chronic drought prone areas.

### ***d) Heat wave Mitigation:***

#### **Replacement of water**

Encouraging people working under conditions of high temperature and humidity to drink plenty of water.

#### **Regulation of work**

Cutting down continuous exposure to a hot and humid work environment. If signs, such as headache and dizziness are reported, the concerned person shall be removed from the place of work to cooler environment and necessary treatment given. Stock piling of medicines and ORS packets in workplaces.

#### **Clothing and Food habits**

- The clothing worn should be light, made of cotton, loose and of light colours.
- Intake of plenty of water and fluids.
- Avoidance of all drinks with alcohol or caffeine in them during the heat wave  
Eating small meals and eat more often. Avoidance of food those are high in protein. Avoiding use of extra salt and salt tablets unless directed to do so by a physician.

#### **Protective Devices.**

Use of protective goggles, umbrella, shoes etc. in hot days to avoid the extreme sun glare

and direct impact of the hot sun on the head and rest of the body.

### **Working Environment**

Controlling the temperature and humidity in the work environment through proper ventilation and air-cooling.

### **Acclimatisation**

Acclimatization is achieved by gradual exposure to the hot environment during a heat wave.

### **Public awareness**

Awareness of the public towards preventing loss of life during heat wave conditions.

### **Medical facility**

- Adequate stock piling of ORS and medicines for treatment of heat stress patients in all health centres
- Earmarking of beds in hospital for heat stress patients
- Ambulance with staff and mobile health units to be kept in readiness to shift the patients to hospitals and other referral centres within the shortest time period.

### **Information Education and Communication (IEC) Activities**

- Inter-sectoral coordination, group discussion, distribution of posters, leaflets, to make the public aware of the magnitude of the problem and how to prevent it.
- Publicity through electronic and print media will be ensured.

### ***d) Earthquake Mitigation***

#### **Zoning and building codes**

Considering the existing and extent of seismic zoning building codes that needs to be evolved and adopted for new constructions. Further, emphasis be given on enforcement of recommendations of building codes in all new constructions through local planning bodies and authorities. Additionally, compliance to building codes can be ensured by linking property insurance to such compliances.

#### **Regulations:**

Regulatory agencies like urban development authorities of each urban centre under the influence of earthquake should be pressed to action to ensure undertaking of adequate remedial measures to make good of structural and design inadequacy of the buildings in its purview, especially for public buildings and private multi-storeyed apartments and commercial structures.

#### **Retrofitting:**

It is essential to undertake studies of designs and materials used in existing conventional housing and other structures in each of the seismic zones and examine the same in the context of recommended building codes. This would enable identification of the retrofitting needs of the existing structures and dwellings. A specialised agency be commissioned to study the nature of buildings and other structures in each urban settlements / centre and make an assessment of possible damages that may occur in the event of earthquake striking such centres. This will lead to assessment of the population and structures that may be affected in the event of an earthquake.

#### **Mapping:**

Since early warning is not possible in case of earthquakes, the best choice is to ensure that seismicity is monitored and integrated with GIS. A micro-earthquake hazard zoning map for high population density urban centres for the areas falling in earthquake prone zones should be prepared with detailed data base of settlements, road and other infrastructure.

## **Public awareness**

Publicity materials for distribution to the public in respect of community awareness and preparedness for earthquake is essential to mitigate earthquake impact. Publicity materials should also be prepared on low-cost and high resistant buildings using local materials for distribution to the public, especially in rural areas.

### ***e) Mitigation of Industrial and Chemical disasters:***

Accidents involving transportation of hazardous chemicals in the district and possibility of accidents/disasters shall be mitigated through the following measures:

- Awareness of the industry and community regarding safety measures and identification of hazards
- Awareness and training of drivers, operators, consignors regarding safety measures
- Awareness and training of regulatory bodies regarding regulatory provisions and development of a methodology for compliance of the same.
- Hospitals located near the hazardous industries should have facility for de-toxication
- The risk of transport accidents involving hazardous substances shall be taken into consideration in emergency planning relating to hazardous substances.
- The government authorities shall develop guidelines for offsite and onsite emergency preparedness plans and ensure the development, implementation, testing and updating of offsite and onsite emergency preparedness
- Detail emergency plan shall be drawn for the identified potential hazard areas.
- The concerned regulatory organisations shall be strengthened for better enforcement of the acts and rules related to safe handling of hazardous chemicals and chemical accident response.

The other points that should be known to drivers having additional permits required for carrying hazardous materials are:

- Carrying Transport Emergency Card
- Correct technical information about the hazardous substances
- Fixing of labels on the vehicle
- Details of dangerous goods
- Details of emergency services in the emergency panel

### ***f) Mitigation of Road accidents:***

- Offloading excess goods from the goods carriages and impose penalty for the
- Removal of the humps with out any indication.
- Due to poor maintenance of roads, there are increasing number of potholes on both National and State Highways. These potholes are becoming the causes of increasing accidents also.

### **Engineering measures:**

The critical requirements from the engineering angle are:

- Geometric improvements of hazardous alignment sections
- Proper junction designs and signal timings
- Planning of footpaths for pedestrians, cycle tracks for cyclists and facilities for their crossing heavily trafficked roads in urban areas and other segregation measures.
- Provision of bus bays, way side amenities, parking complexes at suitable locations
- Installation of road signs, speed limit posts and other traffic control devices including delineators.
- Road pavement markings
- Provision of guard rails where necessary.

**Encroachment:** The district shall draw up plans for constructing parallel service roads and

full development of cross sections in the available right of way but more lasting solution shall be implemented through effective land use policy and traffic management measures. Such plans will prescribe a minimum green buffer and critical corridors near urban areas.

**Checking of vehicles:** Checking will preferably be conducted at spacious places so that minimum disturbance is caused to the flow of traffic.

**Road Safety Education:** Road safety education will be introduced in the syllabus from the primary school level and before the issue of driving licence, road safety training will be given to the drivers. There shall be concerted campaign against driving under the influence of alcohol and drugs and ensuring wearing of helmets in two wheelers and use of safety belt in vehicles.

**First Aid and Trauma Care Centre:** At each 15-20 Km of the N.H. and S.H., there will be provisions for first aid and ambulance for treatment of the accident victims and also there should be cranes to clear the roads.

**Roadside Dhabas:** Government will provide earmarked areas with parking place for the opening of Dhabas and such Dhabas where accidents and traffic jams take place shall be demolished and suggested to move to the next suitable place.

The followings are certain remedial measures for enhance road safety that would minimise accidents

- .a. The roads having curves should be properly banked.
- .b. The road shall have the same level, at the junctions as well as on the approaches of the culverts & bridges.
- .c. There should be well-maintained proper conventional signboards and road furniture. These shall be insured against theft and damage.
- .d. Minimise curves on the roads
- .e. Provision of guard posts at closer intervals on high banking roads with reflecting point on top.
- .f. When road is passing through a congested area – i) Grade separator on road i.e. flyovers should be built, if by-pass roads are not possible at the road junctions. ii) Metallic fencing needs to be provided on both sides of road to separate the footpaths from main road.
- .g. Sudden elevation or depression on the roads will be removed.
- .h. Roadside plantation on the first row shall start from 3.0m distance of formation edge. The plants of lower height will be selected for plantation nearest to the road and taller trees the furthest so that it will not obstruct the road if felled during cyclones or storms.
- .i. Plantation of fruit bearing trees on the highways should be avoided as it might lead to accidents.
- .j. No construction shall be allowed to exist within the road formation, such as electric or telephone poles or any other structure. Excavation of any zone within the road formation for laying public utility lines such as electric/telephone/water supply lines etc. and subsequent filling by loose earth should be avoided.
- .k. Roads should be provided with wider shoulders and, if possible, with paved shoulders, which will help in reducing the number of accidents.
- .l. Roads shall be provided with medians, particularly in high-density corridors, with improved safety by physically separating the opposing traffic streams, reducing head light glare and providing positive delineation of the right edge of the carriageway.
- .m. Narrow bridges and culverts should be widened to maintain proper width of the roads, on both sides to minimise accidents.
- .n. Special attention will be paid for lighting the road junctions and intersections in urban and semi-urban areas.
- .o. For proper access and control of traffic in reducing conflicting movements, provision/construction of parallel service roads, guard rails, truck bays, way-side amenities, bus lay-byes, unified check barriers etc. shall be taken up. Private initiatives to set up such facilities will be encouraged by the government.
- .p. Pedestrians shall be treated as an independent traffic unit in itself. Pedestrian signals are essential at signalised intersections with exclusive pedestrian intervals. Wide Footpaths in urban areas will be provided for pedestrian safety.
- .q. Advertisement shall not be placed near junctions or at such other places that may distract the attention of the drivers leading to accidents.

### **Train Accidents**

- Regular inspection of railway tracks and trains

- Modernisation of signal and traffic management systems
- Strict adherence to prescribed safety standards
- Proper manning of level crossings

### **Boat Capsizing**

The Management for mitigating disasters from boat capsizing will be as follows:

- i) The Ferry Ghats, which are under operation both during fair-weather and during rains will be identified and notified by the local bodies or Revenue department from time to time in newspapers and sign boards.
- ii) The ferries shall be supervised by responsible staff/contractors of local Panchayats, Municipality Block etc. to enforce all safety measures required to be followed by the boat/motor launch crew/operators.
- iii) The over-crowding of country boats, Motor Launches, steam ships will not be allowed at any time. Carrying capacity of the boat will be conspicuously displayed.
- iv) The concerned department/organisation shall ensure that safety measures like life jackets are kept in all passenger boats and such safety measures and the enforcement of the availability of such life saving devices and their upgradation will be made mandatory by law.
- v) The crew of the boats/vessels shall be identified and trained in rescue operations so that in case of drowning or mishaps on water, they can help the affected people. The boat crew shall carry life jackets/tubes in sufficient numbers for use during any mishap.
- vi) The boats/motor launches/steam ships should be tested and approved for use by the Inland waterways organisation.

### **Major Building Collapse and Fire hazards in multi-storied buildings.**

- a) The district Fire Services shall be equipped to handle building collapse and fire hazards in high rises. Snorkel ladders that can reach the highest floor will be positioned at to handle building collapse/ fire hazards. All Municipalities / Development Authorities shall strictly enforce the latest building codes to prevent future collapses and ensure that fire escapes are a part of the construction design in all buildings.
- b) For each ward, the Fire Services will have contingency plans ready for rescue and treatment including location of routes, nearest hospitals and other material needs during such emergencies.
- c) The Fire Services at district will organise regular drills and train their personnel in this respect. Their efforts will be augmented with the assistance of Civil Defence Personnel. The occupants of high-rise buildings shall be encouraged to participate in such drills.
- d) For ensuring better coordination and proper discharge of all functions by all related agencies like Police, Hospitals, Fire Services, Home Guards, Civil Defence and Local Bodies will hold annual joint rehearsals and updating of the Disaster Management Plan.

### **Fire Accidents**

- Increasing awareness on the Dos & Don'ts to prevent fire accidents
- Strict adherence to fire safety standards in urban areas, especially in high-rises, and ensuring that building plans are also passed by the Fire Services
- Modernisation of fire fighting equipments and training of personnel
- Fire fighting drills involving the communities
- More fire service units at the lower levels to assist in controlling rural fires

### **Electric Accidents**

- Strict adherence and compliance to minimum safety standards for electric gadgets, equipment and wiring
- Regular maintenance & replacement of old equipments and check against overloads
- Training & better equipments for electricians
- Awareness building regarding Do's & Don'ts regarding electric hazards

### **Festival Related Disasters**

In Hassan a number of major religious festivals are observed that attract a large number of pilgrims and tourists, the biggest one being the Mahamasthabhishkha Festival. To prevent any disasters during such gatherings, the local administration prepares a contingency plan for ensuring human and vehicular traffic control, safe place for stay, drinking water and sanitation, first aid and stocking of medicines to prevent outbreak of epidemics. The local administration, because of their experience over the years, update the plans if required based on the experiences of the previous years. Area and situation specific action plans for management of traffic, crowd, epidemic, sanitation, first-aid, etc. will be made.