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# Management Concepts invoke in Disasters

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1. **Abstract**

Disasters are unanticipated catastrophes that not only claim the lives of humans and animals, but also cause significant damage to natural and man-made assets. Natural disasters, man-made disasters, and environmental disasters can all be classified as the result of poverty, overpopulation, and environmental degradation. A disaster is an occurrence that occurs over a period of time and space in which a civilization suffers substantial natural resource losses and social resource losses. A disaster affects the vital functioning of a society that includes biological survival such as subsistence, shelter, health, reproduction, and social survival such as the system of meaning and values. Disaster situation always differs in the nature of precipitating agents in regard to, sources of origin, degree of predictability, probability, controllability, speed, scope and destructive effects on people and physical objects.

2. **Introduction**

India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been a recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year. The loss in terms of private, community and public assets has been Astronomical.

At the global level, there has been considerable concern over natural disasters. Even as substantial scientific and material progress is made, the loss of lives and property due to disasters has not decreased. In fact, the human toll and economic losses have mounted. It was in this background that the United Nations General Assembly, in 1989, declared the decade 1990-2000 as the International Decade for Natural Disaster Reduction with the objective to reduce loss of lives and property and restrict socio-economic damage through concerted international action, specially in developing countries.

The super cyclone in Orissa in October, 1999 and the Bhuj earthquake in Gujarat in January, 2001 underscored the need to adopt a multi dimensional endeavour involving diverse scientific, engineering, financial and social processes; the need to adopt multi disciplinary and multi sectoral approach and incorporation of risk reduction in the developmental plans and strategies. Over the past couple of years, the Government of India have brought about a paradigm shift in the approach to disaster management. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process. Another corner stone of the approach is that mitigation has to be multi-disciplinary spanning across all sectors of development. The new policy also emanates from the belief that investments in mitigation are much more cost effective than expenditure on relief and rehabilitation.

Disaster management occupies an important place in this country's policy framework as it is the poor and the under-privileged who are worst affected on account of calamities/disasters. The steps being taken by the Government emanate from the approach outlined above. The approach has been translated into a National Disaster Framework [a roadmap] covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness and response and human resource development.

The expected inputs, areas of intervention and agencies to be involved at the National, State and district levels have been identified and listed in the roadmap. This roadmap has been shared with all the State Governments and Union Territory Administrations. Ministries and Departments of Government of India, and the State Governments/UT Administrations have been advised to develop their respective roadmaps taking the national roadmap as a broad guideline. There is, therefore, now a common strategy underpinning the action being taken by all the participating organizations/stakeholders.

## 3 Safety Measure for Threats and Hazards

### Early Warning System

### Cyclone Forecasting

**3.1 Tropical Cyclones** are intense low pressure systems which develop over warm sea. They are capable of causing immense damage due to strong winds, heavy rains and storm surges. The frequency of the TC in the Bay of Bengal is 4 to 5 times more

than in the Arabian Sea. About 35% of initial disturbances in the north Indian Ocean reach TC stage of which 45% become severe.

**3.2 Indian Meteorological Department** (IMD) is mandated to monitor and give warnings regarding Tropical Cyclone (TC). Monitoring process has been revolutionized by the advent of remote sensing techniques. A TC intensity analysis and forecast scheme has been worked out using satellite image interpretation techniques which facilitate forecasting of storm surges.

**3.3 Data resources** are crucial to early forecasting of cyclones. Satellite based observations are being extensively utilized. Satellite integrated automated weather stations have been installed on islands, oilrigs and exposed coastal sites. Buoys for supplementing the surface data network in the tropical ocean have been deployed. The Government have also started a National Data Buoy Programme. A set of 12 moored buoys have been deployed in the northern Indian Ocean to provide meteorological and oceanographic data.

**3.4 Dynamic forecasting** of TCs requires knowledge of the vertical structure of both the Cyclone and the surrounding environment. The rawin sonde remains the principal equipment for sounding. The Doppler Radar wind profiler provides hourly soundings. A mesosphere, stratosphere, troposphere (MST) radar has also been installed at Thirupatti. Another profiler is being developed and will be 17 employed at IMD Pune. Another important source of upper level data is the ircraft reports. Increasing number of commercial jet aircraft are equipped with he Aircraft Meteorological Data Relay system. This data is being made available is also being used by the IMD for analysis and predictions.

**3.5 Radars have been used to observe TCs** since long. Surveillance of the piral rain bands and the eye of the TC is an important function of the coastal adars. 10 Cyclones Detection Radars have already been installed. These radars re providing useful estimates of storm centres upto a range 300-400 Km. oppler radars provide direct measurements of wind fields in TCs. Due to ange limitation, Doppler wind estimates are usually within a range of about 00 Km. IMD has deployed Doppler radars at 3 sites on the east coast. nother set of 3 Doppler radars are being deployed in Andhra Pradesh in near future.

**3.6 The meteorological satellite** has made a tremendous impact on the analysis f cyclones. All developing cloud clusters are routinely observed through satellite cloud imagery & those showing signs of organisation are closely onitored for signs of intensification. TC forecasters everywhere use the Dvorak technique to estimate storm

location and intensity. It has been found to provide realistic estimates for TCs in the Bay of Bengal as well as Arabian Sea. INSAT data has also been used to study the structures of different TCs in theBay of Bengal. IMD is also producing Cloud Motion Vectors (CMVs). Very High Resolution Radiometer (VHRR) payload onboard INSAT –2E which have been improved upon to provide water vapor channel data in addition to VIS & IRonboard INSAT – 2E. A separate payload known as Charged Couple Device CCD) has also been deployed onboard this satellite.

**3.7 The goal of any warning system** is to maximize the number of people who take appropriate and timely action for the safety of life and property. All warning systems start with detection of the event and with people getting out of harm's ay. Such warning systems encompass three equally important elements namely: Detection and Warning; Communication; and Response.

**3.8 The two stage warning system has been in existence since long in IMD.** Recently it has been improved upon by introducing two more stages - the 'Pre-Cyclone watch' and the 'post-landfall Scenario'. This four stage warning system meets the requirements of Public Administrators and Crisis Managers. The 'Pre-Cyclone Watch' stage, contains early warning about the development of a cyclonic disturbance in the form of monsoon depression which has a potential to threaten the coast with cyclone force winds. The coastal stretch likely to be affected is identified. This early warning bulletin is issued by the IMD before the Cyclone-Alert Stage. This provides enough lead time for the crisis managers to undertake preparedness actions.

**3.9 After the early warning on the 'Pre-Cyclone Watch' the Collectors of coastal** and few immediate interior districts and the Chief Secretary of the concerned maritime State are warned in two stages, whenever any coastal belt is expected to experience adverse weather (heavy rain/gales/tidal wave) in association with a cyclonic storm or a depression likely to intensify into a cyclonic storm.

**3.10 The second stage of "Cyclone Alert" is sounded 48 hours** in advance of the expected commencement of adverse weather over the coastal areas. Forecasts of commencement of strong winds, heavy precipitation along the coast in association with arrival of cyclone are issued at the alert stage. Landfall point is usually not identified at this stage. The third stage warning known as19"Cyclone Warning" is issued 24 hours in advance. Landfall point is forecast in this stage of cyclone warning. In addition to the forecasts for heavy rains and throng winds, the storm surge forecast is also issued. Since the storm surge is the biggest killer so far as the devastating attributes of a storm are concerned, information in this regard is most critical for

taking follow up action for evacuation from the low lying areas likely to be affected by the storm.

**3.11 After the landfall of the cyclone** the strong winds with gale force speeds continue over certain interior districts of the maritime States hit by the cyclone. To take cognizance of that, a fourth stage known as 'Post-landfall Scenario Stage' is now identified usually as a part of the 'Cyclone Warning Stage' either at the time of landfall of the disturbance or about twelve hour in advance of it. It includes warnings of strong winds and heavy rains likely to be encountered in the interior districts.

**3.12 For communications,** the IMD makes use of 97 point-to-point tele-printer links connecting different field offices. Switching computers have been provided at 5 Regional Centres. These computers are linked to the central Regional Telecom Hub Computer at New Delhi. In addition, 69 centres have been provided with 85 telex connections. Besides, 27 field offices have been provided with Radio Teletype facility. IMD also utilizes VSAT technology which has been installed at field offices. In addition, there are a number of HF/RT and VHF links.

**3.13 Cyclone warnings** are communicated to Crisis Managers and other concerned organizations by high priority telegrams, telex, telephones and Police wireless. Cyclone warning are provided by the IMD from the Area Cyclone Warning Centres (ACWCs) at Calcutta, Chennai and Mumbai and Cyclone Warning Centers (CWCs) at Vishakhapatnam, Bhubaneswar and Ahmedabad.20There is also a Satellite based communication system called the Cyclone Warning Dissemination Systems (CWDS) for transmission of warnings. There are 250 such cyclone-warning sets installed in the cylone prone areas of east and west coast. The general public, the coastal residents and fishermen, are also warned through the Government machinery and broadcast of warnings through AIR and Television.

**3.17 Flooding** is caused by the inadequate capacity within the banks of the rivers to contain the high flow brought down from the upper catchments due to heavy rainfall. It is also caused by accumulation of water resulting from heavy spells of rainfall over areas, which have got poor drainage characteristics.

**3.18 Flooding** is accentuated by erosion and silting leading to meandering of the rivers in plains and reduction in carrying capacity of the river channel. It is also aggravated by earthquakes and land slides, leading to changes in river course and obstructions to flow. Synchronization of floods in the main rivers and tributaries and retardation of flow due to tidal effects lead to major floods.
Cyclones bring in their wake considerable loss of life and property.

**3.19 The flood forecasting** and warning system is used for alerting the likely damage centers well in advance of the actual arrival of floods, to enable the people to move and also to remove the moveable property to safer places or to raised platforms specially constructed for the purpose.

**3.20 A beginning in scientific flood** forecasting was made in November, 1958 by Central Water Commission (then known as Central Water & Power Commission) when a Flood Forecasting Centre was set up at its Headquarters, at Delhi, for21giving timely Forecasts and Warnings of the incoming floods to the villages located in the river areas around the National Capital, Delhi. The network hasbeen expanding and by now the Flood Forecasting Network of the Central Water Commission(CWC) covers all the major flood prone inter-State river basins in the country.

**3.21 The Flood Forecasting involves the following four main activities :-**

(i) Observation and collection of hydrological and hydro-meteorological data;
(ii) Transmission of Data to Forecasting Centres;
(iii) Analysis of data and formulation of forecast; and
(iv) Dissemination of forecast.

**3.22 On an average, 6000 forecasts** at various places in the country are issued during the monsoon season every year. The analysis of the forecasts issued during the last 25 years (1978 to 2002) indicates that accuracy of forecasts has consistently increased from around 81% to 98%. Forecast is considered accurate if forecast water level is within ± 15 cm. of actual water level of the inflow forecast (i.e. discharge) is with in ± 20% of actual discharge.

**3.23 In monitoring the floods**, severity of floods are placed in the following four categories by the central Water Commissions.

(i) Low flood stage:
It is that flood situation when the water level of the river is flowing between warning level and danger level of the forecasting stations.
(ii) Medium flood stage:
The river is called in medium floods when its water level is at or above the danger level of the forecasting station but below 0.50 of its highest flood level (HFL).
(iii) High flood stage:
When the water level of the river is below the HFL but within 0.50 m. of the HFL of the forecasting stations.

(iv) Unprecedented flood stage:
The river is called in unprecedented floods when it attains water level equal to or above its previous HFL at any forecasting station.

**3.24 A computerized monitoring system** has been developed under which daily water levels as observed at 0800 hrs. and forecasts issued by field units aretransmitted to CWC headquarters in New Delhi. Based on the compilation of all such data received from field divisions, daily water level and flood forecast bulletins in two parts for stage and for inflow forecasting stations respectively.

**3.25 Special Yellow Bulletins** are issued whenever the river stage at the forecasting site attains a level within 0.50 m of its previous HFL. Red Bulletins highlighting security of the problem are also issued whenever the water level at the forecasting stations equals or exceeds previous HFL.

**Planning for Safe National Development**

Development programmes that go into promoting development at the local level have been left to the general exercise of planning. Measures need also to betaken to integrate disaster mitigation efforts at the local level with the general exercise of planning, and a more supportive environment created for initiatives towards managing of disasters at all levels: national, state, district and local. The future blue-print for disaster management in India rests on the premise that in today's society while hazards, both natural or otherwise, are inevitable, the disasters that follow need not be so and the society can be prepared to cope withthem effectively whenever they occur. The need of the hour is to chalk out a multipronged rategy for total risk management, comprising prevention, preparedness, response and recovery on the one hand, and initiate development efforts aimed towards risk reduction and mitigation, on the other Only then can we look forward to "sustainable development." Disaster Prevention And Preparedness Measures Information and Research Network.

Disaster prevention is intrinsically linked to preventive planning. Some of the important steps in this regard are:

(a) Introduction of a comprehensive process of vulnerability analysis and objective risk assessment.
(b) Building a robust and sound information database: A comprehensive database the land use, demography, infrastructure developed at the national, state and local levels along with current information on climate, weather and man-made structures is crucial in planning, warning and assessment of disasters. In addition, resource inventories of

governmental and non-governmental systems including personnel and equipment help in efficient mobilization and optimization of response measures.

(c) Creating state-of-the-art infrastructure: The entire disaster mitigation game plan must necessarily be anchored to frontline research and development in a holistic mode. State-of-the art technologies available worldwide need to be made available in India for up gradation of the disaster management system; at the sometime, dedicated research activities should be encouraged, in all frontier areas related to disasters like biological, space applications, information technology, nuclear radiation etc., for a continuous flow of high quality basic information for sound disaster management planning,

(d) Establishing Linkages between all knowledge- based institutions: A National Disaster Knowledge Network, tuned to the felt needs of a multitude of users like disaster managers, decision makers, community etc., must be developed as the network of networks to cover natural, manmade and biological disasters in all their varied dimensions,

## 4. Recommendations and Conclusion

At the global level, there has been considerable concern over natural disasters. Even as substantial scientific and material progress is made, the loss of lives and property due to disasters has not decreased. In fact, the human toll and economic losses have mounted. It was in this background that the United Nations General Assembly, in 1989, declared the decade 1990-2000 as the International Decade for Natural Disaster Reduction with the objective to reduce loss of lives and property and restrict socio-economic damage through concerted international action, specially in developing countries. So in order to reduce the level of impact or the vulnerability of the disaster it’s better to cultivate the mitigation plans in all the hazardous areas and into the mindsets of each individuals so as to leverage the safety management plans for an threat free environment.

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