

factors, there shall not be any chance of a disaster. Consequently, if there is a region free of all kinds of hazards then there is no question of any disaster risk. Similarly, if we have a region which has been so well-developed and the community living there is so well prepared that they can on their own tackle the hazards to which the particular region is susceptible, then in that case the vulnerability is zero and hence the disaster risk would also be zero. However, there is hardly any region in the world where no hazard strikes or there isn't any vulnerability.

2.3 Disaster Risk analysis

Disaster Risk analysis involves determining the probability of event happening and the level of vulnerability of the people that may be affected by the event. Disaster is the realization of a risk.

The threat that is posed by a potential hazard is specific to the hazard type. In other words the risk involved with one particular kind of hazard is different compared to another kind of hazard. The following table illustrates a number of potential threats and the elements at risk.

| HAZARD | WHAT IS AT RISK |
|--------------------|---|
| Floods | Everything located in flood plains. Crops, livestock, machinery, equipment, infrastructure, weak buildings, their contents, people, local economy. |
| Earthquakes | Weak buildings, their occupants and contents. Machinery, equipment, infrastructure, human lives etc. |
| Volcanic Eruptions | Anything close to volcano. Crops, livestock, people, combustible roofs, water supply. |
| Landslides | Anything located on or at the base of steep slopes or cliff tops. Roads and infrastructure, buildings on shallow foundations, human lives, crops and vegetation. |

This risk will however increase with the intensity of the hazard, provided the vulnerability factor remains same. Again, for an element having higher economic value, the vulnerability is generally higher and hence the risk involved will be higher. Thus depending upon the

characteristics and magnitude of the above factors, the disaster risk of the element or region concerned may be high or low.

Considering the vulnerability factor in some more detail it can be said that, physical vulnerability is as much a function of location and exposure to a hazard as to the physical performance of buildings and structures. Yet because of socioeconomic factors some sections of society have more choices as to where they live and what assistance they receive in a disaster. Thus it is often the case that the poorest are more vulnerable. However whilst poverty is not always linked to vulnerability, the latter is often related to capacity. The capacity to recover will depend on income levels, savings, social support systems etc. Higher the capacity of the community or the elements concerned to cope with the effects of the disaster, lower will be the risk of disaster.

So considering all the factors, the relationship for having a measure of disaster risk involved with any particular region, element or community can be expressed by the following equation:

$$\text{Disaster Risk} = \frac{\text{Hazard} \times \text{Vulnerability}}{\text{Capacity}}$$

The relationship shows that Disaster Risk is directly proportional to Vulnerability. It means that disaster risk of a social group exposed to a particular hazard can be reduced by minimizing their vulnerabilities and building high coping capacity. This is also known as Disaster Risk Reduction formula and is being widely used as a development framework.

However, the complex nature of many disasters can also go beyond secondary effects. In some cases the interaction of differing hazards and processes of change may set in a chain reaction culminating in disastrous political and economic consequences. An example of this can be seen in many African famines; a lack of rain and subsequent drought does not always turn into a famine. However, when combined with failed market systems, political discord and internal conflict, drought can easily become a famine, which in turn compounds the negative effects of these other factors.

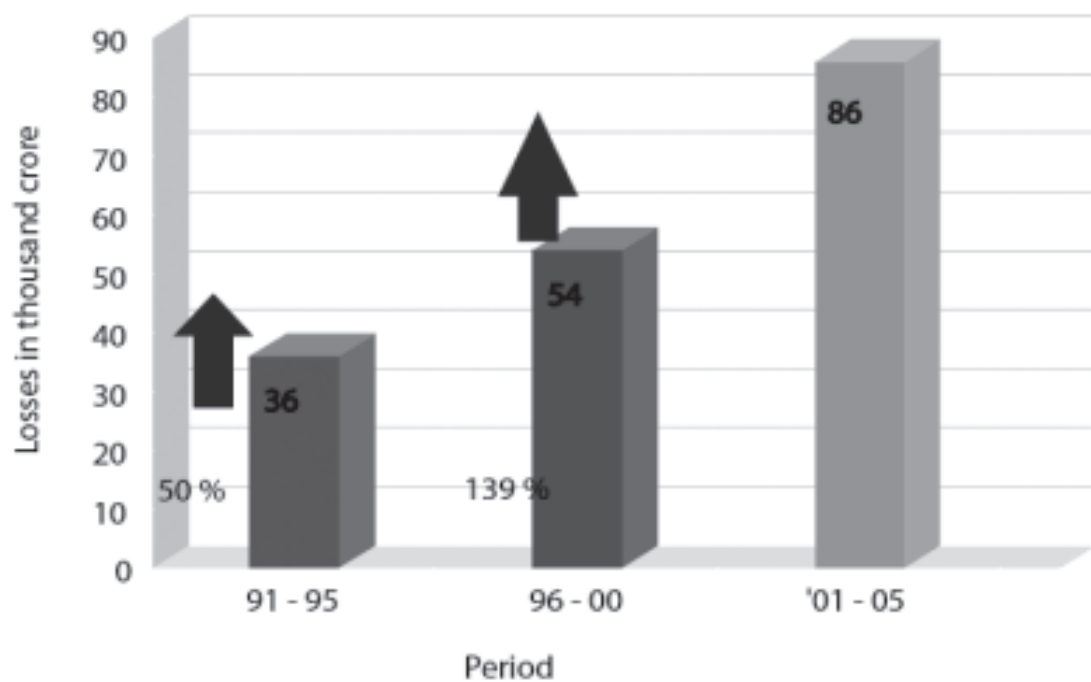
From the previous section on Hazard and Vulnerability the hazard-vulnerability profile of India must have become clear. That the whole country is disaster prone is evident from the disaster history of India. Moreover, 25 major disasters have occurred in the country in the last three decades (Figure-1).

These disasters have taken heavy tolls on the human civilisation. During the last two decades of the 20th century (1982-2001), natural disasters in India had claimed a total death toll of around 1, 07,813 people (on an average more than 5,390 death toll every

year). As mentioned above, India with its extended coast line is exposed to five to six tropical cyclones on an average, both from the Arabian Sea and Bay of Bengal.

So the disaster risk in India is quite high. This is because there is high probability of occurrence of hazardous events and the vulnerability is also quite high on account of the high population density and low capacity of a vast majority of the population (70% of the people live in rural India and depend on agriculture for livelihood. Agricultural productivity is too low compared to that of the more developed countries). A study by the World Bank shows that economic loss due to disasters is equivalent to approximately 2% of the GDP and it is rising. Losses due to disasters have been shown in Figure 3.

Figure 5: India - Losses due to Disasters



Economic loss - 2% of the GDP

Source: NDMA

(Source :World Bank)

Vulnerability due to disasters in India is still on the rise. The heightened vulnerabilities can be related to the expanding population, urbanization and industrialization, development

within high-risk zones, environmental degradation and climate change. The nature of socio-economic development in vogue in India is a lot to do with the increase in vulnerability. Currently, vulnerability to disasters or emergencies of Chemical, Biological and Radiological origin has been increasing. All these increasing vulnerabilities have compounded to escalate the Disaster Risk in India to alarming levels. Serious thoughts need to be given towards Disaster Risk reduction without any further loss of time.

2.4 Definition of Disaster Management

Traditionally, the term disaster management was restrictively used to address only post disaster operations. However, in recent times with more explorations and research in this field, the cause of disaster mitigation is increasingly becoming more important than post disaster activities. Disaster management is basically a range of activities designed to mitigate the effects of disaster and to provide a framework for helping people at risk to avoid or recover from the impact of the disaster. It involves steps to be taken prior to, during and after the disaster.

Having faced a series of major disasters in the 1990s like the Latur Earthquake (1993), Floods in Northern India (1993, 1996 and 1998), Cyclone at Kutchchh (1998), Earthquake at Uttarkashi (1999) and Orissa Super Cyclone(1999), the Government of India realized that some concerted efforts needed to be taken to mitigate the effects of these disasters. So a High Powered Committee (HPC) on Disaster Management was constituted in August'1999 to prepare the roadmap for the future course of action towards managing disasters. The HPC defined Disaster Management as "a collective term encompassing all aspects of planning for and responding to disasters, including both pre and post disaster activities. It may refer to the management of both the risks and consequences of disasters."

The Disaster Management Act 2005 gives a more elaborate definition. According to it, disaster management means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for (1) prevention of danger or threat of any disaster (2) mitigation or reduction of risk of any of its severity or consequences (3) capacity building (4) preparedness to deal with any disaster (5) prompt response to any threatening disaster situation or disaster (6) assessing severity or magnitude of effects of any disaster (7) evacuation rescue and relief and (8) rehabilitation and reconstruction.

These definitions clearly point out that disaster management encompasses a range of activities depending upon the different phases of a disaster. These activities however, keep changing with the nature and characteristics of the disasters. The term disaster management

has thus emerged as an umbrella term that encompasses the entire disaster cycle, including mitigation. The major activities that need to be done at various stages of the disaster cycle are discussed below.

2.5 Interventions for Disaster Management

Based upon its timeline, a disaster has various stages at each of which specific activities are needed to be performed to overcome its effects. These activities are arrayed in such a fashion that if one of these is not performed adequately, then the activities that follow it are likely to suffer considerably. This in turn will more often than not affect the quality of disaster management and may have a telling effect on its success. In order to achieve the objectives of disaster management, it is necessary that each intervention be carefully planned and executed. The following paragraphs give a description of the interventions.

1. **Search and Rescue:** As soon as a disaster strikes the first thing that needs to be done is to search and rescue the victims of the disaster. During this stage shifting the disaster affected people to safe shelters is the main job. It assumes paramount importance as well as urgency because the rate of casualty is highest at this stage. So all available resources for the purpose of search and rescue should be employed optimally with proper time management to minimize loss of lives. First-aid may invariably form an intricate part of this intervention.

2. **Relief:** Next comes 'Relief' which refers to the period immediately after the occurrence of disaster and involves steps to be taken to meet the immediate needs of survivors with respect to shelter, water, food, sanitation and medical care. This intervention is necessary to help the disaster affected people survive in the face of widespread losses and damages. Any laxity in this phase too may aggravate the losses due to the disaster.

These two interventions are often together called the 'Response' mechanism to the disaster event.

3. **Rehabilitation:** Includes activities that are undertaken to support the victims' return to 'normal' life and re-integration into regular community functions. Relief works can but go on for only a limited period of time. The disaster affected people need to be resettled in their original habitat as soon as possible. This is the first step towards bringing back normalcy after the disaster. The affected people are assisted in resuming their normal course of life by helping them rebuild their damaged or destroyed houses, providing them the basic amenities and help revive their source of livelihood.

4. **Reconstruction:** There are generally widespread damages to infrastructure and amenities when a disaster occurs. Soon after the rehabilitation works have proceeded to a considerable extent, the focus shifts towards reconstruction. Repair and reconstruction of

all the infrastructures, basic amenities and resources damaged in the disaster is taken up during this stage to ensure that the society starts functioning normally, as before.

Often the above two interventions of 'rehabilitation' and 'reconstruction' are combined together and termed as 'recovery'.

5. **Mitigation:** It is a collective term used to encompass all activities undertaken in anticipation of the occurrence of a potentially disastrous event with a view to bring about preparedness and long-term risk reduction (UNDP, 1994). It also includes steps undertaken to minimize the losses and sufferings in a disaster situation. Thus 'mitigation' involves reduction of the actual or probable effects of disasters on man and his environment.

'Mitigation' is often not given the same level of priority as 'recovery'. This is because there is a tendency to view disasters and development in terms of "trade-offs" with needed resources being diverted from development towards disaster mitigation. Yet disasters often undermine development efforts and fritter away resources, which have been allocated to these other sectors. They interrupt ongoing programmes and divert resources from their intended use and beneficiaries.

6. **Prevention:** It refers to activities which either reduce or modify the scale and intensity of the hazard or improve the elements at risk. An example of this may be the strengthening of river embankments to prevent flooding of adjoining areas.

7. **Preparedness:** It refers to measures that enable the Government, community and individuals to respond rapidly to disaster situations so as to cope with them effectively.

Disaster Preparedness has been defined by the United Nations Disaster Relief Office (UNDRO) as "... (a series of) measures designed to organise and facilitate timely and effective rescue, relief and rehabilitation operations in cases of disaster... Measures of preparedness include among others, setting up disaster relief machinery, formulation of emergency relief plans, training of specific groups (and vulnerable communities) to undertake rescue and relief, stockpiling supplies and earmarking funds for relief operations".

All the above interventions together constitute disaster management. Hence, 'Disaster Management (DM)' can also be expressed as the following function:

$DM=f(D1, D2, D3, \dots, D9)$ where,

- o D1 - Pre disaster preparedness
- o D2 - Warning
- o D3 - Impact phase
- o D4 - Rescue
- o D5 - Relief
- o D6 - Rehabilitation
- o D7 - Reconstruction
- o D8 - Vulnerability Reduction

- o D9 - Other variables

In any given disaster situation, the Disaster Manager has to apply an appropriate combination of the above interventions to manage the disaster effectively. The choice of such a combination is what is known as planning for disaster management. Proper planning is very important for overall success of disaster management attempts. This will be discussed in detail subsequently in this course.

2.6 Crisis Management & Risk Management

Hitherto, the approach towards coping with the effects of natural disasters has been post-disaster management involving mainly actions like evacuation and warnings, communications, search and rescue, fire-fighting, medical and psychiatric assistance, provision of relief and sheltering, etc. After the initial trauma of the natural disaster occurrence is over within the first few days or weeks, the phase of reconstruction and economic rehabilitation is taken up by the people themselves and by the government authorities. Very often the occurrence of the disaster used to be relegated to history till the next one occurred again either in the same area or in some other part of the country. This approach to disaster management is termed 'Crisis Management'.

From the very nomenclature of this approach it is clear that the emphasis is on overcoming a crisis. Here the occurrence of a disaster event is a crisis. Normal life is jeopardised during the disaster and the society has to overcome the crisis to start functioning as before. Thus it becomes necessary to undertake interventions of 'search and rescue', 'relief', 'rehabilitation' and 'reconstruction' to wade through the crisis and establish normalcy in the society. If the disaster event had not occurred, none of these interventions would have been needed. Consequently, these interventions are collectively called 'crisis management'.

It is not possible to eradicate natural hazards completely. However, experience has shown that the damage from natural hazards can be minimised by way of a comprehensive Preparedness Plan which includes an early warning system, combined with preparedness on part of the vulnerable community as two of its essential components. Warning systems and preparedness measures considerably reduces and modifies the impact of disasters. A community that is duly prepared to face an eventuality, and has taken the necessary precautionary and mitigation measures, is far better equipped to deal with the situation and resume normal functioning at a much faster pace.

It may seem paradoxical but true that recipients of both disaster and development are increasingly becoming one and the same - usually the poorest and weakest groups within

the developing countries. These groups are those people most likely to be affected by disaster phenomena and also those most likely to be helped by long-term development programmes. Disaster preparedness accordingly assumes much greater urgency.

It is becoming increasingly evident now that a relatively smaller investment in disaster preparedness can save thousands of lives and vital economic assets, as well as reduce the cost of overall relief assistance. In other words, this approach to disaster management with emphasis on 'preparedness', 'mitigation' and 'prevention' measures considerably reduces the risk of disasters. This approach to disaster management is known as 'Risk Management'.

Recognizing the rapidly rising worldwide toll of human and economic losses due to natural disasters, the UN General Assembly 1989 decided to launch a far reaching global understanding to save human lives and reduce the impact of natural disasters. The UN General Assembly Resolution 236 of 1989 launched the International Decade for Natural Disaster Reduction (IDNDR, 1990-2000) that effectively set the trend in shifting the focus of attention from rescue and relief to preparedness and mitigation. The main objective of IDNDR was to reduce loss of life, property and social and economic disruptions caused by natural disasters, especially in the developing countries through a concerted International Action.

The IDNDR workshop in Yokohama in May'1994 called for a shift in the focus of the Disaster Management towards disaster prevention, mitigation and preparedness. The international community having realised the importance of 'risk management', there has been a 'paradigm shift' in the approach to disaster management from 'crisis management' to 'risk management'. Taking a 'risk management' approach to 'disaster management' it is possible to minimize the losses due to disasters to a large extent. It is therefore increasingly important for the global community to lay greater emphasis on ways and means of preventing and preparing for disasters. There is a need to examine the relationship between environmental degradation and vulnerability to disasters, and their combined effects on both natural and man-made habitats. While preventive measures will not halt earthquakes or cyclones, they will certainly minimise the impact of such disasters on human life, public/private properties and the environment.

2.7 The Disaster Management Cycle

As discussed earlier, there are three key stages of activity within disaster management:

1. **Before a disaster (Pre-disaster):** to reduce the potential for human, material, or environmental losses caused by hazards and to ensure that these losses are minimised when the disaster actually strikes

2. **During a disaster:** to ensure that the needs and provisions of victims are met to alleviate and minimise suffering.

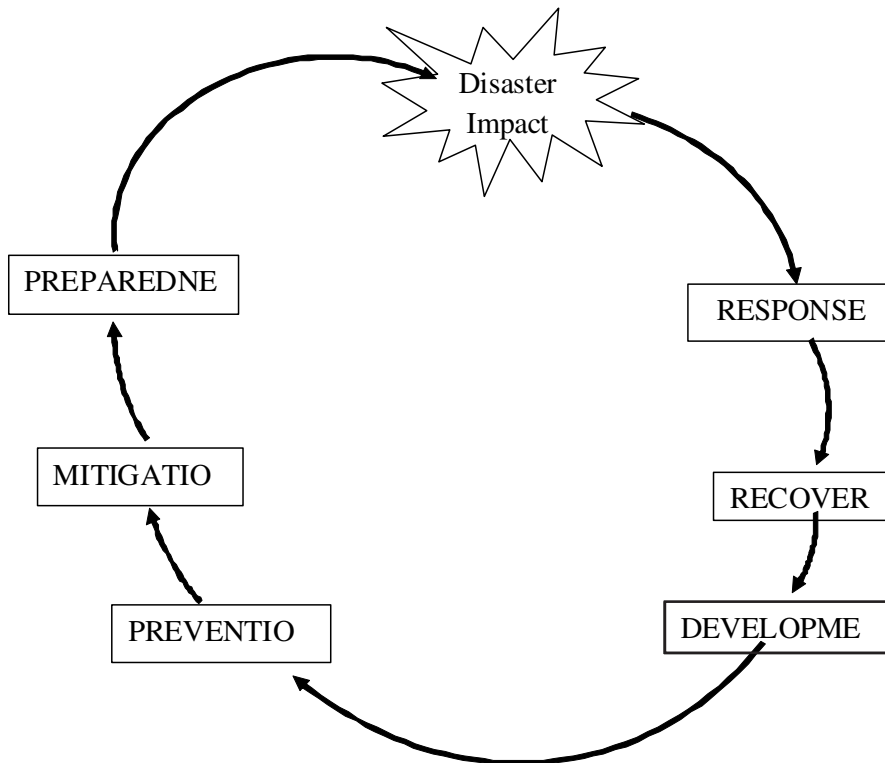
3. **After a disaster (Post-disaster):** to achieve rapid and durable recovery which does not reproduce the original vulnerable conditions.

Traditionally people think of disaster management only in terms of the emergency relief period and post disaster rehabilitation. This bias occurs since these two elements are by far the strongest in terms of high profile visibility, political support and funding provisions. Instead of allocating funds before an event to ensure prevention and preparedness, action normally only takes place after the event has occurred.

Whilst emergency relief and rehabilitation are vital activities, successful disaster management planning must encompass the complete realm of activities and situations that occur before, during and after disasters. These phases can best be represented as a cycle or continuum, which, if circumstances allow, reduce the negative effects of future disasters.

The different phases of disaster management can best be visualised as a disaster management cycle as indicated in the ensuing diagram:

DISASTER MANAGEMENT CYCLE



The Disaster Management cycle consists of the following broad stages:-

1. The disaster event

This refers to the "real-time" event of a hazard occurring and affecting elements at risk. The duration of the event will depend on the type of threat; ground shaking may only occur for a matter of seconds during an earthquake while flooding may take place over a longer sustained period.

2. Response and Relief

This refers to the first stage response to any calamity, which include setting up control rooms, putting the contingency plan in action, issue warning, action for evacuation, taking people to safer areas, rendering medical aid to the needy etc., simultaneously rendering relief to the homeless, food, drinking water, clothing etc to the needy, restoration of communication, disbursement of assistance in cash or kind.

3. Recovery

Recovery is used to describe the activities that encompass the three overlapping phases of emergency relief, rehabilitation and reconstruction.

- ❖ emergency relief: Activities undertaken during and immediately following a disaster, which include immediate relief, rescue, damage and needs assessment and debris clearance
- ❖ rehabilitation: Rehabilitation includes the provision of temporary public utilities and housing as interim measures to assist longer term recovery
- ❖ reconstruction: Reconstruction attempts to return communities to improved pre-disaster functioning. It includes the replacement of buildings, infrastructure and lifeline facilities so that long-term development prospects are enhanced rather than reproducing the same conditions which made an area or population vulnerable in the first place.

4. Development

In an evolving economy, development process is an ongoing activity. Long- term prevention/disaster reduction measures like construction of embankments against flooding, irrigation facilities as drought proofing measures, increasing plant cover to reduce the occurrences of landslides, land use planning, construction of houses capable of withstanding the onslaught of heavy rains/wind speed and shocks of earthquakes are some of the activities that can be taken up as part of development plans.

5. Prevention and mitigation

Reducing the risk of disasters involves activities, which either reduce or modify the scale and intensity of the threat faced or by improving the conditions of elements at risk.

Although the term 'prevention' is often used to embrace the wide diversity of measures to protect persons and property its use is not recommended since it is misleading in its implicit suggestion that natural disasters are preventable. The use of the term reduction to describe protective or preventive actions that lessen the scale of impact is therefore preferred. Mitigation embraces all measures taken to reduce both the effect of the hazard itself and the vulnerable conditions to it in order to reduce the scale of a future disaster

In addition to these physical measures, mitigation should also be aimed at reducing the physical, economic and social vulnerability to threats and the underlying causes for this vulnerability. Therefore, mitigation may incorporate addressing issues such as land ownership, tenancy rights, wealth distribution, etc.

6. Preparedness

This brings us to the all-important issue of disaster preparedness. The process embraces measures that enable governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Preparedness includes the formulation of viable emergency plans, the development of warning systems, the maintenance of inventories and the training of personnel. It may also embrace search and rescue measures as well as evacuation plans for areas that may be 'at risk' from a recurring disaster. All preparedness planning needs to be supported by appropriate rules and regulations with clear allocation of responsibilities and budgetary provisions.

Case Study:

Swift response will not come only by capacity development and training. It will require capacity to anticipate problems and judicious decision making and people's participation in real time. One-way would be to revisit some of the well studied disasters to project future possible disaster scenario based on current state of knowledge about the area. The following case-study of a future earthquake scenario projected for the Kawasaki City of Japan for which it is preparing today is a great example India should emulate.

"Kawasaki is a highly industrial coastal city in Japan with a population of about 1.2 million. It is located south-west of Tokyo across the Tamagawa River, bordered on the south-west side of Yokohama city. The city covers a 30 km long stretch of land, 5 km wide, from the south-east to the north-west with its south-east edge forming a coastal area along Tokyo bay. An earthquake of magnitude of 7.9 strikes Sagami bay on a winter weekday evening at 5 p.m. The Urgent Earthquake Detection and Alarm System (UrEDAS) of the Railway Technical Research Institute (RTRI) detects the arrival of P-wave from its own observation network and determines the magnitude and location of the earthquake instantly. Using the information it stops the bullet trains (shinkansen) which travel at around

250 km or above on the Tokyo, Osaka line. Simultaneously, RTRI's Hazard Estimation and Restoration Aid System (HERAS) go into operation to collect damage estimations relating to railway system. The HERAS system is capable of providing damage informations on railways and associated facilities in about 5 min after an event. This information will be used in the recovery and restoration operations to the railway systems. At the same time the Seismic Information Gathering and Network Alert System (SIGNAL) of Tokyo Gas company goes in operation shutting off gas supply automatically in areas where ground shaking exceeded a prescribed threshold, in order to prevent fires from secondary damage such as gas leaks.

On the government side, the damage assessment and support system of Kawasaki City, which became operational in 1994, is activated. The system gathers real time earthquake information from a dense observation network, calculates ground motion estimates with the information from a Geographic Information System (GIS) consisting of soil, land cover, infrastructure, population distribution, housing condition and lifeline information. The estimated damage due to this earthquake will be on the order of 1.3 trillion yen, with about 91% of the 33 thousand wooden buildings predicted to be destroyed by fire at the prevailing wind speed of 6m/s from NNW direction. Fatalities will be up to 3120, road damages would be up to about 250 locations. There would also be widespread destruction to lifeline systems such as water supply and gas supply, which would require more than a month for complete recovery.

Learning point: A state of the art disaster detection and warning dissemination system is of utmost importance for 'disaster preparedness'.

2.8 Impact of Disaster on Development

Various studies have indicated that loss of lives and livelihoods due to natural disasters is higher in the developing countries. It is estimated that more than 90 percent of disaster deaths take place in developing countries.

It can be inferred that disasters are closely linked with the development pattern of the region. Let us understand the disaster and development relationship with the help of the following diagram (see figure below). It shows both the positive and negative dimensions of development and disaster.

Development can reduce vulnerability: Development programs if designed properly help to reduce vulnerability of the people. For example, Public buildings like schools, hospitals and housing built with strict enforcement of building codes and quality standards helps to develop a safe living environment for the people. Similarly, Investment in transport

like improvement in road capacity will help in quicker evacuation. Also, better connectivity would mean speedy delivery of relief services. Investment in communication services will help to provide early warnings to all.

Here are few points highlighting means through which development programs can reduce vulnerability:

- ❖ Strengthening of utility systems
- ❖ Ensuring hazard resistant building techniques
- ❖ Institutional strengthening and capacity building of local authorities
- ❖ Social welfare programs

Disasters can provide development opportunities: Disasters provide opportunity to initiate development programs. For example, urban development programs initiated after the earthquake have enhanced infrastructure facilities in the affected towns of Gujarat. Also various skill development programs initiated by the NGOs have provided livelihood security to many affected people.

Following are few points which reflect how disasters can provide development opportunities:

- ❖ By creating a social and political atmosphere of change
- ❖ By highlighting the general level of underdevelopment that caused disaster
- ❖ By focusing international attention and aid on the disaster area

Development can increase vulnerability: Development programs can also increase an area's susceptibility to disasters. Such as development policies of urban growth are leading to migration in cities. However, due to poor management policies and practices there is high demand but shortage in supply of affordable land. This is leading to growth of informal settlements and slums. These settlements are often located on unsuitable locations like steep slopes, along flood plains or adjacent to noxious or dangerous industrial or transport facilities making the people vulnerable to hazards.

Setting up industries will lead to population concentration around the plant. However, in absence of proper environmental management, it can lead to increase in air and water pollution around the industry. Also, depending on the type of industry there is possibility of toxic exposure for the people living in vicinity.

In India, Bhopal Gas tragedy of 1984 is the biggest industrial disaster. On December 2, there was leakage of Methyl Isocyanate from the Union Carbide India Limited factory killing more than 2000 people instantly. About 10,000 people have died over the years and about 2,00,000 have been affected because of the gas leakage. This factory was setup in 1969 by Union Carbide, as a development initiative to meet the challenges of food shortage

in the country. The green revolution involved major changes in agricultural practices and was adopted to increase the agriculture productivity through provision of chemical fertilizers, pesticides and irrigation network.

Following are some points which reflect how development can increase vulnerability:

- ❖ Development of hazardous sites
- ❖ Environmental degradation
- ❖ Increased technological failures or accidents
- ❖ Imbalance of pre-existing natural or social systems

Disasters can set back development level and destroy years of development. For example,

Mumbai floods of 2005 or the recent floods of Bihar in 2007 have destroyed various utility services and affected properties and livelihoods. These disasters have seriously affected the development initiatives being taken up in the region.

Following points reflect how disasters can set back development level:

- ❖ by increasing loss of resources
- ❖ by shifting of resources to emergency response
- ❖ by depressing the investment climate
- ❖ by affecting the non-formal sector

2.9 Components of Disaster Management

Disaster management can be divided into pre and post disaster contexts. This sequence embraces pre and post- disaster actions that are concerned with the six components of disaster management. These 'components' are envisaged as the different stages in disaster management and are laid down below:

1. inception of disaster planning
2. risk assessment
3. defining levels of acceptable risk
4. preparedness and mitigation planning
5. testing the plan
6. feedback from lessons learnt

Each grows out of the stage before it and leads to further action. Together the sequence can build up a planning and implementation system, which can become a powerful risk reduction tool. If disaster planning is restricted only to a preparedness plan, then the full benefits of disaster planning are unlikely to be realised. A wide range of tasks needs to be addressed in the following planning sequence for disaster management.

Stage one: inception of disaster management

The starting point would ideally comprise the following1:

- ❖ Political commitment at all levels of national and local government;
- ❖ A governmental structure with clearly defined authority and an appropriate budgetary commitment to maintain effective disaster planning;
- ❖ Up-to-date, well rehearsed preparedness plans that are comprehensive in scope and operational at all levels (central, provincial and community). These include an emergency management system, ideally the responsibility of a nominated national co-ordination body;
- ❖ Mitigation plans to reduce the hazard threats and vulnerability to them;
- ❖ Knowledge of disaster management and specific knowledge of local situations subject to disaster threats.

Stage two: risk assessment

The aim of risk assessment is to balance known risks against available resources. This process starts with the assessment of potential disaster risks through a combination of hazard mapping and vulnerability analysis. Risk assessment is ideally a three-part process that has to be undertaken in the following sequence:

- ❖ Hazard mapping Hazard mapping is the process of establishing geographically the areas that are particularly susceptible to hazards. Hazard information to be gathered includes location, frequency, duration and severity (i.e. wind speeds, water flow data etc.).
- ❖ Vulnerability analysis: This involves the process of estimating the vulnerability to potential disaster hazards of specified elements at risk. These include social, economic, natural and physical environmental factors. Vulnerability analysis is always a 'site-specific' process with a concern for unique characteristics of a local situation.
- ❖ Resource assessment: When potential losses have been estimated, a further assessment is needed of the resources or "capacities" existing to improve disaster planning. Resource assessment fulfils two purposes towards risk reduction:
- ❖ It provides a further indication of areas more at risk than others. If a location or entity has more capacity to withstand a shock the effects will be less than those in a similar location with a lower capacity or resource base
- ❖ The process of assessing the different capacities of those vulnerable to and those responsible for disaster management planning illustrate areas needing improvement. These may include increased training, better building regulations, land use planning etc.

Stage three: defining levels of acceptable risk

- ❖ The information gathered through the various processes of resource assessment is then analysed to enable a responsible course of action.

Stage four: preparedness and mitigation planning

Once the scale of the problem to be faced is known, the resources available to meet threat plans can be decided upon to reduce risk and future impacts. These actions include measures that are aimed to reduce disaster events in three ways.

- ❖ Through methods to reduce hazard impact, e.g. building flood protective embankments or walls, creating and managing dam storage, community grain stores, etc.
- ❖ Through preparedness measures that emphasise short-term activities focused on the emergency period, e.g. emergency regulation of water reservoirs in a drought situation. Properly done they can reduce loss of life and property whilst assisting the relief and rehabilitation
- ❖ Through longer term mitigation measures aimed at the reduction of physical vulnerability, socio-economic vulnerability and its underlying causes.

Stage five: testing the plans

One way is through simulation exercises and public drills. This approach is obviously a time and resource method to determine whether a preparedness plan or mitigation plan will work or not. However the value of such testing should not be minimised since it is often a vital element in raising public awareness.

The real test of protective measures of course will be an actual disaster situation. Following such events there is a requirement for accurate information to be collected, analysed and disseminated on the impact of the event in terms of deaths, injuries and damage to property as well as the specific needs of the surviving population. Such impact data must include knowledge of the developing disaster event, including any new threats that may be emerging as secondary impacts or hazard types. Data is also needed on the character, scale, location, timing and impact of assistance. Such information has to be gathered ideally in precise terms, e.g. scale of injury, level of building damage etc.

Stage six: feedback from lessons learned

Information on changes needed in preparedness and mitigation planning as well as on risk assessment will need to be continuously passed back to an appropriate stage in the cyclical planning process. This is essential to not only assess the success of measures

implemented but also so that constantly changing conditions of vulnerability and even the likelihood of hazard occurrence are taken into consideration.

2.10 Hyogo Framework of Action

Representatives from 168 countries participated in the global conference on Disaster Risk Reduction in January 2005 in Kobe, Japan. The Hyogo Framework of Action (HFA) 2005-2015 was adopted to work globally towards sustainable reduction of disaster losses in lives and in the social, economic and environmental assets of communities and countries. The framework set three strategic goals and five priority action areas given as under:-

Three Strategic Goals: Following are the goals as agreed to under the HFA-

- (i) The more effective integration of disaster risk reduction into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.
- (ii) The development and strengthening of institutions, mechanisms and capacities at all levels in particular at the community level that can systematically contribute to building resilience to hazards.
- (iii) The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of the affected communities.

Five Priority Action Areas: Under the HFA the following priority areas have been identified for the countries to concentrate in their efforts for making the countries disaster resilient.

- (i) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation,
- (ii) Identify, assess and monitor disaster risks and enhance early warning,
- (iii) Use knowledge, innovation and education to build a culture of safety and resilience at all levels,
- (iv) Reduce the underlying risk factors,
- (v) Strengthen disaster preparedness for effective response at all levels.

Key Activities: Following key activities are envisaged under this framework

1. Promote socio-economic development practices,
2. Land-use planning and other technical measures,
3. Strengthening of institutional and technical capacities,
4. Review and implement preparedness and contingency plans,
5. Promote voluntarism and community participation,

6. Creation of provision of emergency funds,
7. Dialogue, coordination and exchange of information between disaster managers and development sectors.

India is one of the participating countries and works closely with the UN-ISDR to implement the Priority Areas of HFA for DRR. There is a Biennial Monitoring Framework developed by UNISDR and a National Progress Report submitted accordingly with UN-ISDR. To implement the framework's activities, a Working Group has been constituted under the Chairmanship of Joint Secretary (DM), MHA. The group comprises representatives from Ministries of Rural Development, Panchayati Raj, Urban Development, Health and Family Welfare, Environment and Forests, Women and Child Development, Earth Sciences, Science and Technology and also from Planning Commission, NIDM and NDMA.

2.11 Response of India to changes in international policy on Disaster Management

In response to the declaration of IDNDR by the UN General Assembly, India took the following steps:

1. A Disaster Management Cell was first formed under the Ministry of Agriculture.
2. National Committee on Disaster Management was formed under the Chairmanship of the Prime Minister to give due importance to disaster management. Recommendations of the NCDM formed the basis of National Disaster Risk Management.
3. Following a number of major disasters like the Latur earthquake (1993), Super Cyclone of Orissa (1999), etc. a High Powered Committee (HPC) on Disaster Management Plans was constituted in August'1999 for drawing up a systematic, comprehensive and holistic approach towards disasters. The HPC Report recommended the establishment of a separate institutional structure for addressing disasters and enactment of a suitable law for institutionalizing disaster management in the country.
4. The Ministry of Home Affairs in the National Government was made the new nodal ministry for Disaster Management. However, Ministry of Agriculture remained the nodal ministry for Drought Management.
5. The Disaster Management Act was passed by the Parliament in 2005.

Disaster Management Act, 2005: This Act provides for the effective management of

disaster and for matters connected therewith or incidental thereto. It provides institutional mechanisms for drawing up and monitoring the implementation of disaster management in the whole country. The Act also ensures measures by the various wings of the Government for prevention and mitigation of disasters and also for prompt response to any disaster situation.

The Act provides for setting up of a National Disaster Management Authority (NDMA) under the Chairmanship of the Prime Minister, State Disaster Management Authorities (SDMAs) under the Chairmanship of the Chief Ministers, District Disaster Management Authorities (DDMAs) under the Chairmanship of Collectors/District Magistrates/Deputy Commissioners. The Act further provides for the constitution of different Executive Committee at national and state levels.

Under its aegis, the National Institute of Disaster Management (NIDM) for capacity building and National Disaster Response Force (NDRF) for response purpose have been set up. It also mandates the concerned Ministries and Departments to draw up their own plans in accordance with the National Plan. The Act further contains the provisions for financial mechanisms such as creation of funds for response, National Disaster Mitigation Fund and similar funds at the state and district levels for the purpose of disaster management. The Act also provides specific roles to local bodies in disaster management.

2.12 India's engagement with external agencies on Disaster Risk Reduction:

India is engaged with UNDP and US Aid for building the capacity of its response mechanism, mapping the vulnerabilities to different kinds of disasters, besides strengthening the various institutions engaged in disaster management. It has entered into a MOU with the few countries in the field of disaster management and has been working closely with the several countries in the exchange of ideas and expertise developed to meet the challenges of several natural disasters. The efforts undertaken towards the aforesaid activities are given in the subsequent Paras.

United Nations Development Programme: UNDP established on 22nd November 1965 is the UN's global development network, with headquarters at New York to advocate for change and to connect countries through knowledge, experiences and resources to help people build a better life. In India, it works closely with the Government of India through its designated nodal department for different welfare programmes and the Department of Economic Affairs (DEA) in the Ministry of Finance.

After the successful implementation of this DRM Programme, the Government of India together with UNDP, has launched a new programme for Disaster Risk Reduction (DRR) with an outlay of \$20 million. At present the DRR Programme is being implemented in 26 states and 58 cities across the country under the overall supervision of Programme Management Board headed by Secretary (Border Management).

The GOI-UNDP DRR Programme (2009-2012): This programme has two components:

- (i) Institutional Strengthening and Capacity Building for Disaster Risk Reduction (DRR)
- (ii) Urban Risk Reduction (URR).

DRR project is being implemented by NDMA with an outlay of USD 12.6 million and URR project is being implemented by Disaster Management Division, MHA with an outlay of USD 7.4 million. The Joint Secretary, MHA is the National Programme Director for URR component. The Joint Secretary, NDMA is the National Programme Director for DRR component.

The objective and major activities undertaken in the programme are as follows:

Objective: To strengthen the institutional structure to undertake disaster risk reduction activities at various levels (state, district, city, urban local body) including the risks due to climate change, and to develop preparedness for recovery.

Major Activities:

1. Strengthening the State and District Disaster Management Authorities to fulfil their responsibilities as stipulated in the Disaster Management Act, 2005
2. Developing methodologies and modalities for ensuring risk reduction through integration in development programmes of all partners at national, state and community levels
3. Enhancing the capacity for urban risk reduction by addressing planning capacity building, and ensuring suitable legislative and regulatory mechanisms to promote safe built environment
4. To strengthen the recovery framework, through which the people affected by disasters (especially the most vulnerable) are able to access resources for rebuilding their lives and reviving their livelihoods, and
5. To strengthen the knowledge and information sharing platform in disaster management.

United States Agency for International Development (USAID) - Assisted Disaster Management (DMS) Support Project:

USAID with its headquarters in Washington, D.C is a governmental agency of USA

providing economic, development and humanitarian assistance around the world in support of the foreign policy goals of the United States of America. A bilateral agreement was signed between USAID and the Government of India in September 2003 with the objectives to reduce vulnerability to disasters and build capacity of key Indian institutions. However a final agreement (in the nature of second amendatory agreement) was signed on 4th April 2007. The period of the original Agreement ended on 31st March, 2010. The scope of this bilateral agreement broadly includes three activities viz., Incident Response System (IRS), procurement of equipment and capacity building.