



## Disasters : Background & Perspective

India is the worst-affected theatre of disaster in the South Asian region. Drought, floods, earthquakes and cyclones devastate the country with grim regularity. Ten thousand were killed in the Orissa supercyclone of 1999, and 16,000 died in the earthquake that hit Kutch in January 2001. Are these natural disasters caused by nature's fury? Or are they man-made in large measure? Is the country equipped to manage the disasters that affect 25 million people every year?

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### A country prone to natural calamities

The Asia-Pacific region experiences nearly 60 per cent of the world's natural disasters. India, on account of its geographical position, climate and geological setting, is **the worst-affected theatre of disaster in the South Asian region**. Drought and floods, earthquakes and cyclones devastate the country with grim regularity year after year. They are spiralling out of control, increasing in frequency, causing more and more injury, disability, disease and death, adding to the health, economic and social burden of an already impoverished nation.

### The statistics are alarming:

- Of the 32 states and union territories, 22 are disaster-prone.
- Between 1988 and 1997, **disasters claimed 5,116 lives and affected a colossal 24.79 million people every year**.
- In 1998, 9,846 people died and 34.11 million were affected by disasters.
- In the Orissa supercyclone of 1999, over 10,000 people were killed and thousands left homeless.
- In January 2001, over **16,000 lives were lost in the earthquake that struck Kutch** and other areas in the state of Gujarat. Thousands are still homeless. Thousands more have lost their precarious means of livelihood.

- Twenty-eight per cent of the country's total cultivable area is drought-prone.
- Fifty-seven per cent of India is earthquake-prone. The fragile Himalayan mountain ranges are extremely vulnerable to earthquakes (and landslides and avalanches). Western and central India are equally unsafe.
- Seventy-six lakh hectares of land are flooded every year. Over **1,300 lives are lost to floods every year**. Worse, the areas affected by flood are rapidly extending beyond the basins of the Himalayan rivers to other parts of the country as well.
- **India is the worst cyclone-affected part of the world.** Five to six tropical cyclones form in the Bay of Bengal and the Arabian Sea every year, of which two or three are severe and lash the densely-populated coastal areas of India, causing indescribable damage.

### **The cost and consequences of disasters**

The cost of natural disasters in India, in terms of human life, loss of property and assets and loss of shelter and livelihoods, is immense.

Between 1980 and 1999 the total number of people killed in disasters was 110,131. Between 1988-1997 disasters affected 24.79 million every year in India. In 1998, 9,846 people died and 34.11 million people were affected by disasters. Between 1985-95, disasters caused an annual economic loss of around US\$ 1,883.93 million.

Experience and studies show that the actual figures greatly exceed the documented ones.

The average damage to crop, houses and public utilities from floods during the period 1953-95 was estimated at Rs 972 crore every year, while the maximum damage was Rs 4,630 crore in 1988.

In 1998, floods inundated 37 per cent of the country.

In 1987, one of the worst droughts of the century affected 285 million people and 58-60 per cent of cropped area. In India, with its large tribal and rural population and people still engaged in traditional occupations such as agriculture, this is a major calamity.

In 2000, floods took a toll of 1,262 lives in West Bengal, 400 lives in Uttar Pradesh and 258 lives in Bihar. And drought affected 94 lakh people in Chattisgarh, 291 lakh in Gujarat, 127 lakh in Madhya Pradesh and 119 lakh in Orissa, where almost 30 starvation deaths have been reported since August 2001.

Most injuries such as lacerations in cyclones or fractures in earthquakes occur during or immediately after the catastrophe. In developing countries, the number of injured are

estimated only by the number admitted in hospital: but there are hundreds more who never get to a hospital, and many thousands more suffering psycho-social and post-traumatic stress disorders which go completely unrecorded and untreated.

Further, the death or disability of a family's earning member during a disaster could mean a lifetime of loss of income and possible destitution for the entire family. The death of a family's livestock or the loss of capital or the tools of trade can likewise lead to a complete devastation of earning capacity. During floods, salt-water contamination of land can lead to the loss of not one, but several, harvests. For an already malnourished people, this could mean a rise in mortality as a secondary result of disasters.

Epidemics resulting from disasters are also a major worry in South Asia, where poor sanitation and the prevalence of many communicable diseases keep disease rates inordinately high. Typhoid, malaria and gastrointestinal diseases are constant threats in disaster-hit zones where even clean drinking water can become unavailable for days or even weeks, as was the case after the Orissa supercyclone. The sardine-can population density in urban areas and certain coastal regions multiplies the number of disaster victims.

### **The poor are worst-affected**

The worst-affected and vulnerable are the poor and marginalised sections and communities of India. They suffer the most in terms of human and property loss. Unfortunately, poverty is most widespread in areas that are more vulnerable to natural disasters - the flood-prone regions of north Bihar, east Uttar Pradesh and north Bengal, and the drought-prone regions of Rajasthan, Marathwada in Maharashtra and north Karnataka.

Not only are the poor the worst-hit, but their capacity to recover from a disaster is also limited by their social, economic and political situation. In India, the vulnerabilities are inextricably linked to certain processes of marginalisation that protect the interests of particular groups and areas at the cost of others. The nature and direction of economic development followed over the past 50 years has been unsuccessful in expanding, or even distributing, social opportunity across the country.

The basic needs of a large population are not satisfied. Nearly one-third of India's people live in poverty, one-third of adult males and two-thirds of adult females are illiterate and two-thirds of India's children aged 0-4 years are malnourished.

Women are particularly vulnerable by virtue of their lower economic, social and political status. Reports reveal that even when women have had access to cyclone (or community) shelters, men occupy these with self-centred alacrity while female

householders are slowed down by their responsibilities for essential cyclone preparedness activities. Their special health needs, especially those of pregnant and lactating women, are ignored.

During floods, an inordinately large number of drowning deaths tend to occur amongst women and children. During cyclones women are often put at risk when their long hair gets entangled in bushes and flotsam, and their sarees restrict their movements. A full 80 per cent of the deaths in the 1991 cyclone were those of women and children. In the Marathwada earthquake, more women than men died, largely because they, in line with patriarchal conventions, were sleeping indoors.

**The scale of disasters in India** Natural calamities have a more devastating impact in India because of inadequate policies relating to disaster management and no institutional support systems.

The 1993 Marathwada earthquake in Maharashtra, India, killed over 10,000 and destroyed the houses and properties of nearly 200,000 households. However, the much more powerful Los Angeles earthquake of 1971 killed just 55 people. The 1996 cyclone along the east coast of Andhra Pradesh in south India killed 1,077 people and damaged public buildings worth over US \$ 139 million. In contrast, the powerful Hurricane Andrew that struck Southern Florida in 1992 killed 41 people and caused damage worth \$ 20 million.

Effective rehabilitation is part of good disaster management. But in India while the Marathwada earthquake resulted in a rehabilitation policy, the same was not true of the Uttarkashi (Uttar Pradesh, 1991) or the Jabalpur (Madhya Pradesh, 1997) earthquakes. It showed up the dismal inadequacy of administrative response to a natural disaster.

In 1996, flashfloods intruded into the desert state of Rajasthan in western India. The floods killed about 100 people. But in subsequent months more than 1,000 lives were lost due to a malaria epidemic, as the flood-accumulated waters became an ideal breeding ground for mosquitoes. Amplified by a systemic failure, the epidemic took a heavy toll, far more than the flood itself, in a region not known for water-borne diseases.

The other major problem is the nature of development and development policies.

The actual reason for the flooding in Rajasthan was not the quantum of rainfall but the way in which civic structures had come up, violating basic laws, in the past two decades. Experts blamed the floods on faulty development planning.

In drought-affected pockets of Orissa, hunger deaths have occurred this year because

of acute food shortage and malnutrition despite a relatively good harvest and buffer stocks of 60 million tonnes of foodgrain in the Food Corporation of India godowns. The food shortages have a lot to do with the nature of people's interaction with the market, and exploitative work conditions. But perhaps it has a lot more to do with the inadequacies of the public distribution system, the corruption in the system, the exploitation of an illiterate population, political indifference and red-tapism.

### **Development and natural disasters**

'Natural' disasters are often described as the wrath of God. In fact, they are the wrath of nature. And increasingly, the wrath of nature that has been tampered with. Thus, 'natural' disasters are human-made to a startling degree.

**Recurring floods and droughts are precipitated by the unrestricted felling of forests**, serious damage to mountain ecology, overuse of groundwater and changing patterns of cultivation. When forests are destroyed, rainwater runs off, causing floods and diminishing the recharging of groundwater. The spate of landslides in the Himalayas in recent years can be directly traced to the rampant deforestation and network of roads that have been indiscriminately laid in the name of development.

It is by now a well-established fact that **human-made structures, including canals, dams and embankments, have worsened the flood situation in the country.**

**Big dams also pose a seismic threat.** Despite this, numerous dams, vulnerable to seismic activity, are being built in the Himalayan foothills. (The proposed Tehri dam is being opposed because of its seismic handicap which could cause havoc in Hardwar, Rishikesh and other mountain towns). India has learnt no lessons from the world's most devastating reservoir-induced earthquake on December 10, 1967, measuring 6.3 on the Richter scale, which struck Koynagar in Maharashtra, killing 200 people and injuring 1,500. The epicentre and aftershocks all occurred near the 103m-high dam or under its reservoir.

Land degradation, which today affects 175 million of India's 329 million hectares, is also increasing because of human intervention. Natural grasslands are disappearing because of overgrazing. Waterlogging, salinisation, overfertilisation and mining are degrading huge tracts of land. The effect of this on people's lives can be seen in western Orissa where deforestation, mining and the decline of traditional irrigation and agricultural systems have caused land degradation on a large scale, leading to one of the worst drought conditions in the country. This in turn leads to large-scale seasonal and permanent migration to urban slums. Adding to the 30 million people who have already been displaced by 'development projects' in India, a figure that is a third higher than the number of conflict-induced Internally Displaced People worldwide.

### **Natural disasters in India**

**Floods** Nearly 75 per cent of the total rainfall is concentrated over a short monsoon season of four months (June-September). As a result the rivers witness a heavy discharge during these months, leading to widespread floods.

Floods are a regular feature of Eastern India where the Himalayan rivers inundate large parts of its catchment areas, uprooting houses, disrupting livelihoods and damaging infrastructure. The fragility of the settlements in the Himalayan mountain ranges are a continuing source of concern for their high vulnerability to earthquakes, landslides, floods and avalanches. The flood hazard is compounded by the problems of sediment deposition, drainage congestion and synchronisation of river floods with storm surges in the coastal plains. The rivers originating in the Himalayas carry a lot of sediment and cause erosion of the banks in the upper reaches and over-topping in the lower segments. The most flood-prone areas are the Brahmaputra and Gangetic basins in the Indo- Gangetic plains. The other flood-prone areas are the north-west region with the rivers Narmada and Tapti, the Central India and Deccan region with rivers like Mahanadi, Krishna and Kauveri. While the area liable to floods is 40 million hectares, the average area affected by floods annually is about 8 million hectares. The annual average cropped area affected is approximately 3.7 million hectares.

Notwithstanding flood policy and flood control schemes, flood damage is increasing, with larger populations subjected to distress in increasing flood-prone areas. The locus has shifted away from the Gangetic belt. The distribution of damage is widespread, with the worst-hit being Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu in the south, Maharashtra, Gujarat, and Rajasthan in the west, Uttar Pradesh in the north, and Bihar and West Bengal in the east.

### **Drought**

The heavy concentration of rainfall within a span of three months in most areas causes heavy run-off and high floods. Non-availability of moisture over most parts of the year, particularly in the arid and semi-arid regions, renders 68 per cent of the land-mass vulnerable to drought.

In 2001, more than eight states suffered the impact of severe drought. Analysis of rainfall behaviour for the past 100 years reveals that the frequency of occurrence of below-normal rainfall in arid, semi-arid, and sub-humid areas is 54 to 57 per cent, while severe and rare droughts occur once every eight to nine years in arid and semi-arid zones. In semi-arid and arid zones, about 50 per cent of the severe droughts cover 76 per cent of the area. In this region, almost every third year was a drought year. The impact of drought varies from year to year in various parts of the country.

The 1987 drought, which was one of the worst droughts of the 20th century, with overall rainfall deficiency of 19 per cent, affected 58-60 per cent of cropped area and a

population of 285 million. Over 267 districts and 166 million people were recorded drought-affected.

**Cyclone** The states most exposed to cyclone-related hazards, including strong winds, floods and storm surges, are West Bengal, Orissa, Andhra Pradesh and Tamil Nadu along the Bay of Bengal. Along the Arabian Sea on the wet coast, the Gujarat and Maharashtra coasts are most vulnerable.

On an average, about five to six tropical cyclones form in the Bay of Bengal and Arabian Sea every year, of which two to three may be severe. More cyclones form in the Bay of Bengal than in the Arabian Sea: the ratio is 4:1. Cyclones are most deadly when crossing the coastal areas of Andhra Pradesh, Orissa, West Bengal and Bangladesh, mainly because of the serious storm surge problem in this area.

The impact of these cyclones is confined to the coastal districts, the maximum destruction being within 100 km from the centre of the cyclones and on either side of the storm track.

The worst devastation takes place when and where the peak surge occurs at the time of the high tide.

Stretches along the Bay of Bengal coastline have the world's shallowest waters but the relatively dense population and poor economic condition complicate the situation. The population density in some of the coastal districts is as high as 670 persons per square km.

The Orissa supercyclone in October 1999 left the state virtually paralysed with its communication and infrastructure totally wrecked. The cyclone severely affected around 13 million people in 97 blocks and 28 urban areas in 12 districts, including the capital, Bhubaneshwar, and Cuttack. Sea waves reaching 7 metres rushed 15 kms inland. Ten thousand died, one-third of the total population of the state was affected.

### **Orissa Supercyclone -1999**

On October 18 and 19, 1999, Orissa, located on the eastern coast along the Bay of Bengal, was hit by a severe cyclonic storm. Wind speeds reached 180-200 kms per hour, accompanied by torrential rain measuring 400 mm.

The floods that followed devastated four coastal districts of Orissa -- namely Ganjam, Gajapati, Puri and Khurda. Ganjam was the worst-affected district. An estimated 205 people died, while more than 400 were injured. Standing crops on 3.32 lakh hectares of land were destroyed while 10,516 animal lives were lost. Extensive damage was caused to public infrastructure and buildings and private properties; 78,213 houses

were fully destroyed and 2,55,661 houses partly damaged.

A supercyclonic storm of much greater intensity followed the devastating cyclone of October 18-19. On October 29 and 30, it hit the Orissa coast, ravaging 12 coastal districts. The supercyclone had a wind velocity of 270-300 kmph. The cyclone was followed by torrential rains ranging from 447 to 995 mm leading to severe floods in the Baitarani, Budhabalanga and Salandi basins which severely affected the districts of Jajpur, Bhadrak, Balasore and Mayurbhanj. After hitting the Paradeep coast, the cyclonic storm with tidal waves of 5 to 7 metres in height ravaged the coastal districts of Jagatsinghpur, Kendrapara, Puri, Khurda and Cuttack.

A population of 1.26 crore in 14,000 villages and 28 urban areas across 12 districts -- namely Balasore, Bhadrak, Cuttack, Dhenkanal, Jagatsinghpur, Jajpur, Kendrapara, Keonjhar, Khurda, Mayurbhanj, Nayagarh and Puri -- was severely affected. Human casualties were estimated at 9,885, of which 8,119 lives were lost in Jagatsinghpur district alone. The loss of animal lives was also very high with 6.32 lakh animals and 18.83 lakh poultry perishing. A total of 17.33 lakh hectares of agricultural land were affected. As many as 16.50 lakh houses were damaged of which 0.23 lakh were washed away, 7.46 lakh fully collapsed and 8.80 lakh were partly damaged.

The two cyclones have had a devastating effect on the economy and lives of the people in the affected districts. A very large population in these districts has lost its source of livelihood. Public infrastructure suffered extensive damage. The economy of the state has suffered a serious setback. This has had an adverse impact on the development of the state.

## **Earthquakes**

Fifty-six per cent of the country is prone to seismic activity. During the International Decade of Natural Disaster Reduction (IDNDR), India suffered the adverse impact of several earthquakes, the most significant being in Uttarkashi, Latur and Jabalpur. Some of the most devastating earthquakes which India has faced in the past include the Kutch earthquakes of 2001 and 1819, the Shillong earthquake of 1897, the Kangra earthquake of 1905, the Bihar-Nepal earthquake of 1934, the North-East and Assam earthquake of 1950, the Anjar earthquake in Gujarat of 1956, etc. The Seismic Zonation Map of India shows the north-eastern states, Kutch region of Gujarat and Uttaranchal as most vulnerable.

The Kutch earthquake on 26th January 2001 once again underlined the lack of preparedness to respond to a natural disaster of such severity, in spite of the best efforts of the government, voluntary organisations, local communities, neighbouring states, corporate sector, etc.



## **Gujarat earthquake (January 2001)**

On 26th January 2001 around 8.45 am an earthquake of a great intensity hit the state of Gujarat in Western India. The earthquake was one of the worst to hit India in recent years. It was estimated that around 250 villages and a population of approximately 40 lakh people were affected. Among the worst hit was the Kutch region.

The district of Kutch occupies 50,000 sq km with a population of 12.85 lakhs (1991 census). It was, however, in the urban centres of Bhuj , the district headquarters of Kutch (population 1.35 lakh), Bhachau (population 70,000), Anjar (population 65,000) and Rapar (population 25,000) that the intensity and concentration of devastation of homes, commercial property and life was the greatest.

The number of deaths reported for Kutch was 15,000 while the official figure for the whole state was 16,488.

What made the earthquake more tragic was that many parts of the state than was reeling under a drought for the second successive year. The district was facing drinking water and fodder scarcity. Men had migrated for work leaving women and children behind. Thus it was the poorest and most vulnerable that were affected.

The region has a history of earthquakes. Between 1845 and 1956 Kutch experienced 66 moderate earthquakes. There are no records of lives lost. Five of the earthquakes were severe and one very severe earthquake occurred on June 19, 1845. In this quake the northern town of Lakhpur was ruined. During its occurrence 66 shocks were counted over a week.

There was, however, one earthquake, which was even more devastating in magnitude. It occurred on June 6, 1819. Its magnitude was estimated 7.7 on the Richter scale and it killed 2,000 people. According to experts this earthquake shaped the future of Kutch. The region's desert-like conditions owe its origin to that earthquake. It also threw up a 100 km ridge and created what is known as the Allah Bund, now in Sind (Pakistan). The bund effectively diverted the course of the Sindhu River, which till then flowed into Kutch.

The economic loss from January 2001 earthquake has been huge. According to estimates of the industry and business bodies Confederation of Indian Industries (CII) and Federation of Indian Chambers of Commerce and Industry (FICCI), the damage to buildings and construction and related cost was Rs 120, 000 to 150,000 million. The loss of infrastructure amounted to Rs 30,000 million. The damage to big factories was valued at Rs 15,000 million.

In the immediate aftermath of the quake most economic activity came to a virtual standstill and production was affected. The loss due to absence of workers at Kandla Port came to Rs 15 million every day. Overall industrial production loss due to lack of workers and thin attendance amounted to Rs 6,000 to 10,000 million every day. Among the prominent industries affected were diamond trade and gem cutting, salt, handicrafts, jewellery and agro-based units. Entire communities of zari and jewellery workers left their workplace.

The Himalayas are considered the world's youngest fold mountain ranges. The subterranean Himalayas are, therefore, geologically very active. Four earthquakes exceeding magnitude 8 have occurred in this region in the last 95 years: the Assam earthquakes of 1987 and 1950, the Kangra earthquake of 1905 and the Bihar-Nepal earthquake of 1935.

The peninsular part of India comprises continental crust regions, which are considered stable as they are far from the tectonic activity of the boundaries. Although these regions were considered seismically least active, an earthquake that occurred in Latur in Maharashtra on September 30, 1993 of magnitude 6.4 on the Richter scale, caused substantial loss of life and damage to infrastructure.

### **Disaster management in India**

Many international organisations, voluntary agencies and national governments have been working towards reducing the impact of disasters and minimising the loss of life and property on account of man-made and natural disasters. These efforts have been directed at identifying the vulnerability of areas and local communities and developing organisational systems and institutional capacity for risk reduction and disaster response programmes.

Under the Indian Constitution, disaster management is the responsibility of state governments. However, there is a National Crisis Management Group headed by the cabinet secretary to assess the impact of major disasters. This Group consists of various nodal ministries. For natural disasters, the ministry of agriculture is the nodal ministry and the other ministries play a supportive role. In the event of a disaster, a multi-disciplinary central government team, at the invitation of the affected state, carries out disaster assessment and makes the recommendation for assistance from the National Fund for Calamity Reduction and the Prime Minister's Relief Fund.

Schemes for financing expenditure on relief and rehabilitation in the wake of natural calamities are governed by the recommendations of Finance Commissions appointed by the Government of India after every five years. Under the Tenth Finance Commission, in operation for the period 1995-2000, each state has a corpus of funds

called the Calamity Relief Fund (CRF), administered by a state level committee, headed by the chief secretary of the state government. The size of the corpus is determined on the basis of the vulnerability of the state to different natural calamities and the magnitude of expenditure normally incurred by the state on relief operations. The corpus is built by annual contributions of the union government and the state governments concerned in the ratio 3:1. The Eleventh Finance Commission has modified the existing financial arrangements and recommended the setting up of a National Calamity Contingency Fund (NCCF).

The India Meteorological Department (IMD) is responsible for cyclone tracking and warning to the concerned user agencies. Cyclone tracking is done through the INSAT satellite and 10 cyclone detection radars. Warnings are issued to ports, fisheries and aviation departments. The warning system provides for a cyclone alert of 48 hours, and a cyclone warning of 24 hours. There is a special Disaster Warning System (DWS) for the dissemination of cyclone warning in local languages through INSAT to designated addresses in isolated places in coastal areas.

A comparison of the Andhra Pradesh cyclones in 1977 and 1990 will illustrate the progress made in the dissemination of cyclone warning. The number of deaths in 1977 was over 10,000 whereas the loss of human lives in 1990 was less than 1,000. Timely warnings issued by the IMD enabled the district administration in the coastal areas of Andhra Pradesh to evacuate over half a million people.

To monitor the possibility of floods, the Central Water Commission (CWC) has a flood forecasting system covering 62 major rivers in 13 states. There are 55 hydro-meteorological stations also in the 62 river basins. The CWC monitors the water levels of 60 major reservoirs with weekly reports of reservoir levels and the corresponding capacity for the previous year and the average of the previous 10 years. Similar monitoring of smaller reservoirs by the irrigation departments of state governments give advance warnings of hydrological droughts with below-average stream flows, cessation of stream flows and decrease in soil moisture and groundwater levels.

Based on inputs from the IMD and CWC on the rainfall behaviour and water levels in the reservoirs and the crop situation, the National Crop Weather Watch Group monitors drought conditions. Remote sensing techniques are also used to monitor drought conditions based on vegetative and moisture index status. In the event of severe drought, state governments introduce appropriate policy packages to support vulnerable populations through food for work programmes and other employment-generation and income-generation activities. Most of the food for work programmes will be undertaken to desilt the existing water tanks, deepen the tanks, and carry out the construction of water harvesting structures. Sometimes, the state governments may

also include the restoration of public utilities and creation of social infrastructure in such food for work programmes in drought-affected districts.

Multi-purpose dams and reservoirs have been built to reduce the impact of floods. Control of premature siltation of multi-purpose reservoirs and checking degradation of catchment areas is attempted through a scheme of soil conservation and river valley projects in the catchments of major rivers. The scheme covers 581 watersheds in 27 catchments spread over 17 states.

During 1960s to 1980s there has been a greater reliance on structural measures. As structural measures alone have not yielded the desired results and flood damage continues to increase, non-structural measures such as flood forecasting, flood plain zoning, flood proofing of the civic amenities of the affected villages, changing the cropping pattern and public participation in flood management works are being given greater emphasis.

The Drought Prone Areas Programme (DPAP) is under implementation since 1973 in 149 districts in 14 states and the Desert Development Programme (DDP) is implemented in 36 districts in seven states. Seventy per cent of India's cultivated land is in the rainfed areas, which often suffer a decline in agricultural production in years with low rainfall and face drought conditions.

A programme titled National Watershed Development Project for Rainfed Areas (NWDPR) is under implementation in drought-prone areas. This programme adopts development measures for all the spatial components of watersheds i.e. arable land, non-arable land and drainage lines as one organic geo-hydrological entity. The objective is to achieve conservation of rain water, control of soil erosion, regeneration of green cover and promotion of dryland farming systems including horticulture, agro-forestry, pasture development and livestock management as well as household production systems.

There are large areas of degraded land of over 100 million hectares in the country which could be reclaimed. Most of the land needs only basic water and soil conservation measures and some amount of plantation and protection work. By protecting, regenerating and restoring the degraded land the pressure on remaining land, forests and pastures can be reduced. A National Wasteland Development Board has been constituted to promote integrated wasteland development.

Natural disasters, particularly droughts, result in huge unemployment and under-employment problems in the rural areas. Providing wage employment to the rural poor has been an integral part of rural development efforts. The Jawahar Rozgar Yojana (JRY) envisaged for this purpose is the largest such programme in the country. The

Employment Assurance Schemes (EAS) are implemented to provide employment opportunities mostly in drought-prone areas.

Measures such as building cyclone shelters, afforestation in coastal areas etc have been undertaken to respond to cyclones. Reconstruction projects have been taken up in areas affected by major calamities by designing structural mitigation schemes. The activities consist mainly of housing and public infrastructure, drainage and rural water supply, expansion of road and communication networks, and shelter belt plantations.

Since much loss of life during the past earthquakes in various parts of the country has occurred due to the collapse of non-engineered traditional buildings of clay, stones and bricks, special emphasis is being placed on the repair and strengthening of such buildings through retrofitting etc in seismically active regions.

India is committed to the goals and objectives of the International Decade for Natural Disaster Reduction (IDNDR) which was observed from 1990 to 2000. After the completion of the IDNDR decade, the Government of India is continuing the spirit of the decade. The ministry of agriculture set up a High power Committee (HPC) under the chairmanship of J C Pant, to prepare disaster management plans at the national, state and district levels.

Despite these measures, the task is very complex in a country of India's size and diversity. Population pressure, environmental degradation, migration, poverty, illiteracy and unplanned urbanisation are some of the major factors contributing to increased risk and vulnerability. Non-structural disaster mitigation efforts need to be accelerated in the country. It is necessary to emphasise the links between disaster mitigation and development plans, the development of effective communication systems, the application of latest information technology, risk reduction and risk transfer options like insurance, extensive public awareness and education campaigns in vulnerability reduction, legal and legislative support, the involvement of the private sector, the strengthening of the institutional framework for disaster response at the national, state and district levels, the applications of remote sensing, geographical information system, etc. Above all, it is important that civil society initiatives be strengthened and supported to ensure that the existing institutional mechanisms deliver the services they are expected to deliver effectively and efficiently.

The losses due to natural disasters reduce the pace of sustained economic development in the already resource-scarce states and often lead to a heavy drain on available resources, diverting them from development activities. It is necessary to move away from the relief mode after a disaster to preparedness, prevention and mitigation, as this will be more cost-effective and sustainable. This will have to be

implemented through a massive campaign by mobilising the participation of local communities, voluntary organisations, community-based organisations and the private sector.

<b>Sources of information:</b>		
?	Indian Meteorological Department	<a href="http://www.imd.ernet.in">http://www.imd.ernet.in</a>
?	International Federation of Red Cross and Red Crescent Societies	<a href="http://www.ifrc.org">http://www.ifrc.org</a>
?	UN Office of the Co-ordination of Humanitarian Affairs	<a href="http://www.reliefweb.int">http://www.reliefweb.int</a>
?	Alertnet	<a href="http://www.alertnet.org">http://www.alertnet.org</a>
?	Federal Emergency Management Organisation	<a href="http://www.fema.gov">http://www.fema.gov</a>
?	Disaster Relief	<a href="http://www.disasterrelief.org">http://www.disasterrelief.org</a>
?	CARE India	<a href="http://www.careindia.org">http://www.careindia.org</a>
?	Natural Hazards Information Center, Colorado	<a href="http://www.colorado.edu/hazards">http://www.colorado.edu/hazards</a>