

The Indian sub-continent is prone to a large number of natural hazards namely floods, cyclones, earthquakes and landslides bringing in a huge loss to life, livelihood, property and infrastructure. In the class VIII textbook 'Together Towards a Safer India' Part I, you read about their causes and impact and the preparedness measures to be taken up to reduce the impact of these hazards. In this chapter, let us try to understand the various structural and non-structural measures that could be taken up by the community, Government and Non Governmental Organisations in pre, during and post disaster phases which would help in creating awareness and be better prepared.

Read the report...

Since 1975, Ralegaon Sidhi a village in Ahmednagar district of Maharashtra was affected by severe drought. Agriculture failed leaving people jobless. The per capita income was unbelievably low at Rupees 271 per annum. A revolution led by Anna Hazare helped the villagers to combat the recurrent drought that the community faced. Community effort and cooperation helped Ralegaon Sidhi to overcome its recurring problem. The villagers carried out mitigation activities like plantation of trees on the hill side, making terraces on the hills to check erosion, digging canals to retain water and stopping open grazing areas. Work began with the percolation tank constructed in the village. In 1975, the water tank of the village would not hold water. The embankment wall leaked. Hazare got people to voluntarily repair the embankment. The seven wells below it swelled with water, for the first time in the living memory of the people.

The above example of Ralegaon Sidhi village shows that community efforts and cooperation from the local government and Non-Governmental Organisations helped the people of Ralegaon Sidhi to prevent the recurring problem from becoming a disaster.

After reading the report mentioned above, we can say that awareness and preparedness can go a long way in minimising the impact of a hazard. Different hazards have different mitigation strategies. In this chapter let us try to analyse the various mitigation strategies adopted for different hazards.

Mitigation as we know refers to “Any measure taken to minimize the impact of a disaster or potential disaster. Mitigation can take place before, during or after a disaster, but the term is most often used to refer to actions taken against potential disasters.”

Significance of Mitigation

Mitigation efforts help the people by creating safer communities and reducing loss of life and property. Some mitigation measures include

Enforcing strict building codes, flood-proofing requirements, seismic design standards and wind-bracing requirements for new construction or repairing existing buildings.

Construction of houses away from hazardous areas.

Retrofitting public buildings to withstand strong winds or ground shaking.

Building community shelters to help protect people in areas which are prone to various hazards.

Mitigation's Value to Society

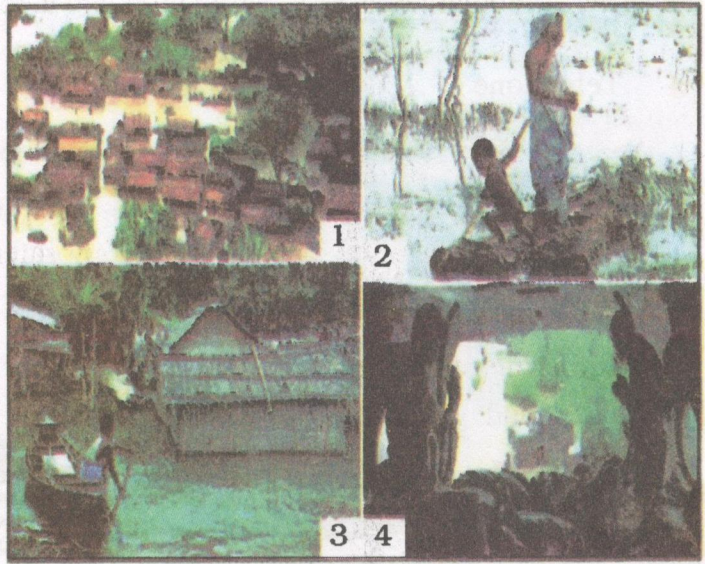
1. Mitigation creates safer communities by reducing losses of life and property.
2. Mitigation enables individuals and communities to recover more rapidly from disasters.
3. Mitigation lessens the financial impact of disasters on government and communities.

Mitigation efforts can be categorized as structural, such as construction of river embankments or strengthening existing buildings and non-structural, such as training in disaster management, regulating land-use, public education etc.

Let us now study the different mitigation measures for each of the hazards as mitigation measures vary with each *hazard*. While there are several common components which form the mitigation strategy for various disasters, there is need to know about the area, the cultural requirements, and the best possible ways in which the mitigation can become effective for that particular region.

Floods

FLOODS- are temporary inundation of large regions as a result of an increase in reservoir, or of rivers flooding their banks because of heavy rains, high winds, cyclones, storm surge along coast, tsunami, melting of snow or dam burst.



Floods have been a recurrent phenomenon in India. With more than 12 per cent of the total land area prone to floods, it is necessary to take adequate structural and non-structural mitigation measures.

In the picture: 1. Floods in Bihar-2002: 2. and 3. Floods in Assam-2002: 4. Air Force dropping relief supplies to marooned villagers. West Bengal 2000. September 2000 floods in West Bengal washed away as many as 800,000 homes, causing some Rs. 295 Cr. in damages in the state.

Floods can happen both gradually, taking hours, or suddenly due to breach of the water control structures, spill over or heavy downpour caused in the region.

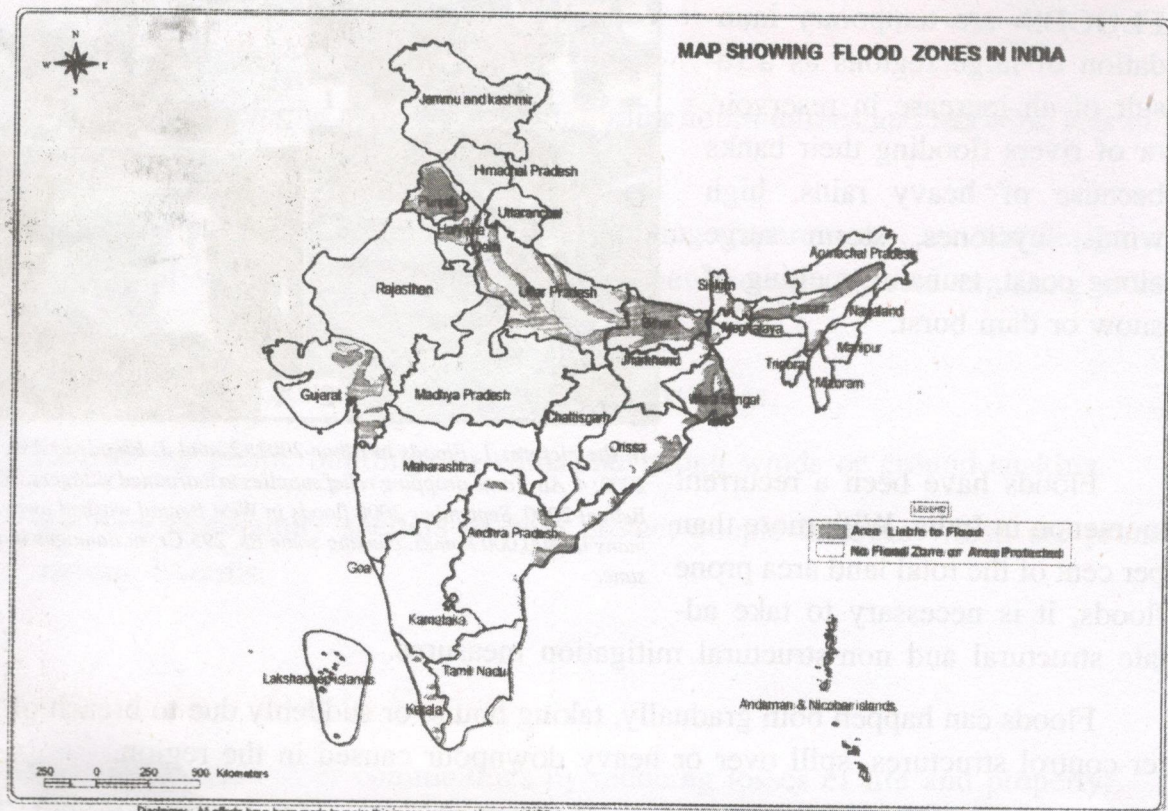
Warning : Except for flash floods there is usually a reasonable warning period. The Central Water Commission, Irrigation & Flood Control Department and Water Resources Department of Government of India are responsible for flood detecting, tracking, receiving warning and disseminating information.

Flood

Flood warning information is disseminated by the following means :

- Government Channels
- High Priority Telegrams
- Doordarshan and the local cable channels
- All India Radio
- Bulletins in the Press

- Satellite Based Disaster Warning Systems
- Fax
- Telephone



Activity 1 : Flood Quiz

1. What are floods that happen suddenly called ?
2. What is the difference between flood and flash flood ?
3. Identify 3 causes of floods in rural and urban India.
4. What is reducing disaster risk called ?
5. What percentage of our land areas is prone to floods ?
6. Name the Government department at the district level responsible for flood warning in remote areas.
7. What food would you store in a flood prone area ?
8. Name 3 rivers in India which are frequently affected by floods.

Mitigation Strategies

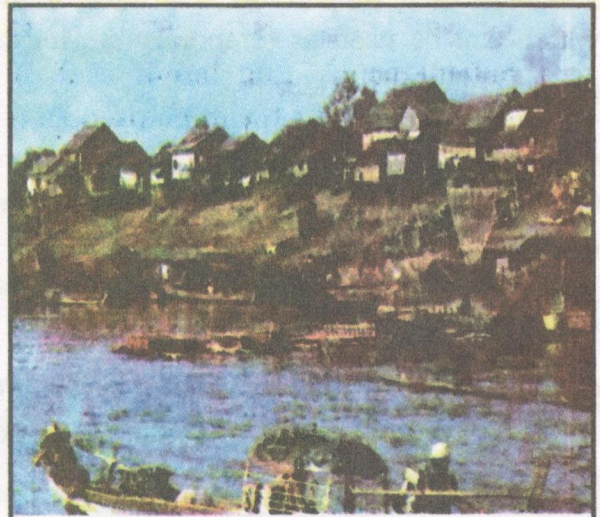
There are a large number of structural and non-structural mitigation measures that can be taken up to reduce the impact of floods in areas that are frequently battered by floods. Some of the mitigation strategies include :

I. Structural Mitigation :

a. Water Shed Management : Timely cleaning, de-silting and deepning of natural water reservoir and drainage channels (both urban and rural) must be taken up.

b. Reservoirs : The entire natural water storage place should be cleaned on a regular basis especially before the monsoon season. Encroachments on tanks and ponds or natural drainage channels to be removed well before the onset of monsoon.

c. Buildings on elevated area : The buildings in flood prone areas should be constructed on an elevated area and if necessary on stilts and platforms.

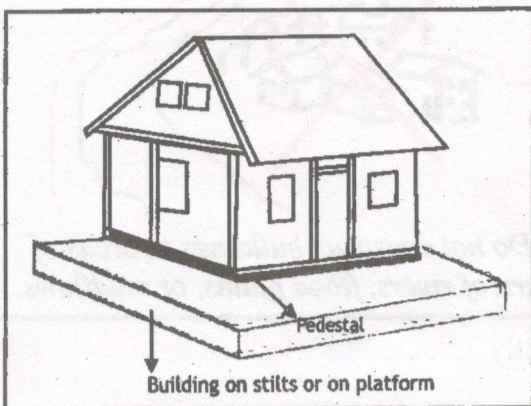


Houses in Assam close to river embankments constructed on stilts



Khash Dhalai Flood Shelter.

Flood shelters like this are just one example of how communities can protect themselves from the worst of the floods. Banks of earth are raised by up to 15 feet and cover an area of several kilometres. The people dig a huge pond in the middle and use this earth to raise the ground. Whenever the floods come, people can bring their livestock, possessions even their homes- to safety. The pond in the middle becomes an important source of food, as it is used to farm fish.



d. Natural water retention basins : Construction and protection of flood protection embankments, ring bunds and other bunds. Dams and levees can also be constructed which can be used as temporary storing space which will reduce the chances of lower plains getting flooded.

e. Implementing Flood Control measures to reduce flood damage: Measures can be taken to reduce the runoff by reforestation, protection of vegetation, cleaning of debris from streams etc.

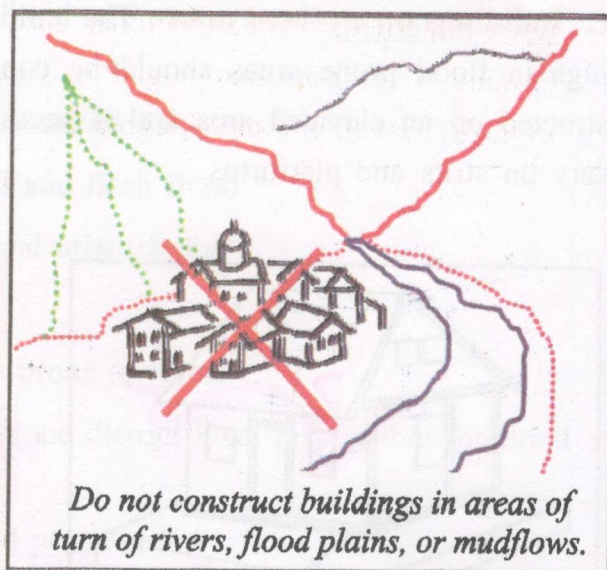
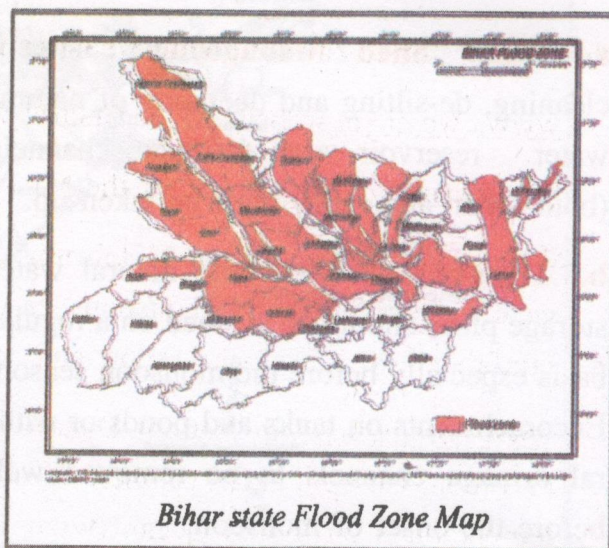
II. Non-Structural Mitigation :

a. Mapping of flood plains is the first step involved in reducing risk of floods.

b. Land use Control will reduce the danger to life and property when water inundates the flood plains and the coastal areas. No major development should be permitted in areas which are subjected to flooding. Important facilities like hospitals should be located in safer and elevated areas.

c. Flood Forecasting and Warning
Better facilities would help in reducing the impact of floods.

Activity 2 : We have now learnt some of the mitigation strategies that can be adopted to minimise the risk for floods. In the recent past there have been a number of incidents/events of flash floods in urban areas of India. Look for more information on this and write a short summary of their causes and impact. List mitigation measures that could be taken up to reduce the impact.



FIND FURTHER INFORMATION ON

- Types of flood control measures.
- The beneficial effect of flooding.
- Flood forecasting and warning.
- Soil conservation practices to preserve the top soil of areas prone to floods.

Web Resources :

You may refer to the following websites for more information.

www.cwc.nic.in website of the Central Water Commission of India, (CWC) of India.

<http://wrmin.nic.in> website of the Ministry of Water Resources, Govt.

www.imd.ernet.in Indian Meteorological Department (IMD) provides all India weather report, end of monsoon season report, weather charts, satellite images, rainfall maps, earthquake report and severe weather warnings.

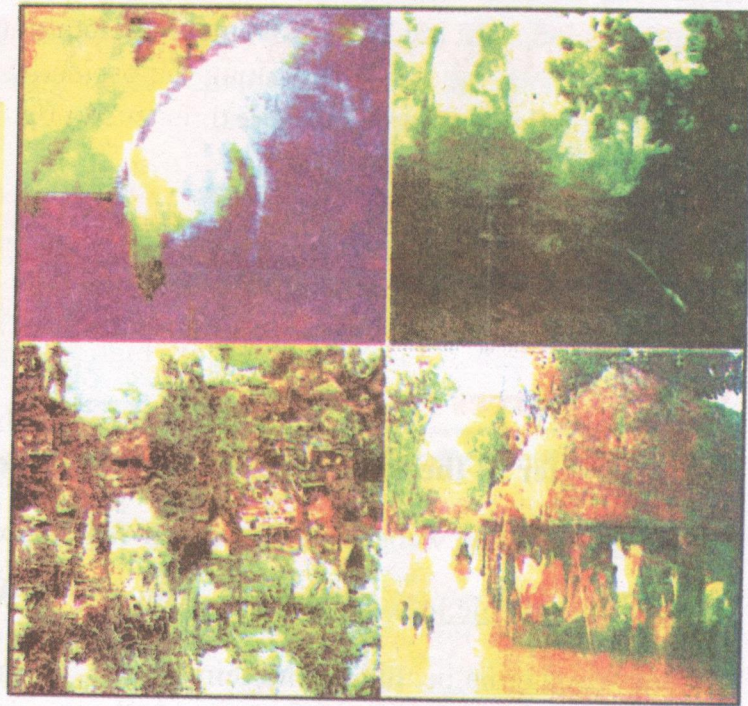
www.ndmindia.nic.in Natural Disaster Management India. Provides current news on Flood, Drought and Cyclones, Weather Links from NIC and weather conditions/temperatures on Indian Ocean (www.weather.nic.in)

www.nih.ernet.in India National Institute of Hydrology perform tasks such as Ground water zone mapping. Flood plain mapping, land use, salinity, sedimentation, Soil erosion, water-logging etc.

CYCLONES

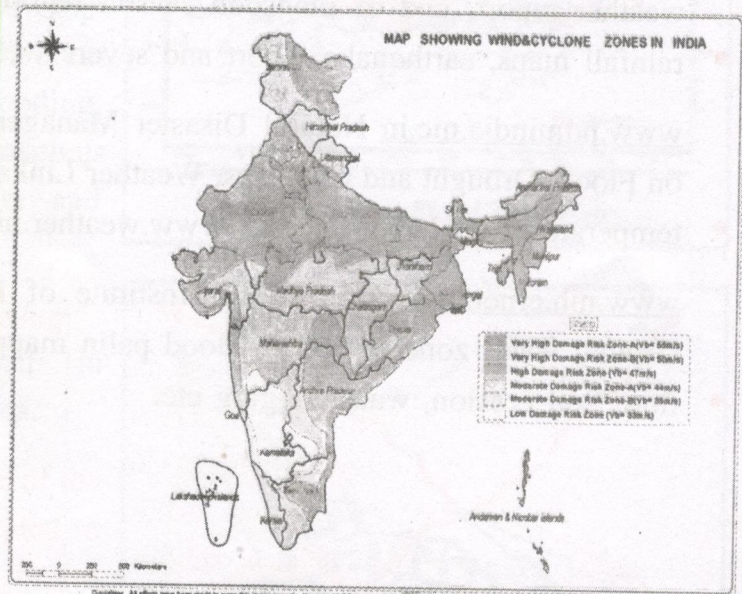
CYCLONES

are violent storms, often of vast extent, characterized by high winds rotating about a calm center of low atmospheric pressure. This center moves onward, often with a velocity of 50km an hour



29th October, 1999, super cyclones, with wind speed 260-300 km/hrs hit the 90 mile coast of Orissa with storm surge that was created in Bay-of-Bengal with water levels more than 30 feet higher than normal. The super storm travelled more than 250 km inland and within a period of 36 hrs. ravaged more than 200 lakh hectared of land, devouring trees and vegetation, leaving behind a huge trail of destruction. The violent cyclone was merciless and killed thousands and devastated millions.

In the picture: Destruction caused by the 1999 Orissa super cyclone.



Cyclones have been recurrent phenomena in the coastal parts of India. In the Class VIII textbook of Disaster Management you read about the areas that are normally affected by cyclones in India.

Activity 1 : List some of the coastal states of India that are affected by cyclones frequently and analyze their impact.

Warning : Cyclones strike suddenly, although it takes time for a cyclone to build up. Satellite tracking can track the movement, the build up and the likely path of the cyclone. Warning and evacuation is done along the projected path. However, landfall predictions can give only a few hours' notice to threatened populations as it is difficult to predict its landfall with total accuracy.

The Indian Meteorological Department issues warning against severe weather phenomena like tropical cyclones, heavy rains and snow, cold and heat waves, etc. Cyclone warning is disseminated by several means such as satellite based disaster warning systems, radio, television, telephone, fax, high priority telegrams, public announcements and bulletins in press.

14th November 2007 a cyclone warning was issued to the people living in the coastal areas of Orissa and West Bengal as there was a likelihood to cyclone 'Sidr' making a landfall in these states. The exact area of landfall couldn't be predicted. The Indian Meteorological Department and the administrative set up of the Government like the Department of Relief & Rehabilitation and the District administration took adequate steps to relocate the people to safe cyclone shelters that were mostly constructed after the state faced a severe super cyclone in 1999. Even though the cyclone didn't affect the people, adequate warning helped the people living in the coastal areas of these states to be better prepared.

Mitigation Strategies

I. Structural Mitigation :

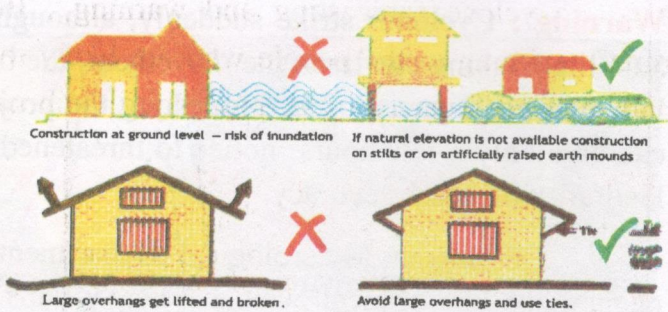
a. Multi-purpose Cyclone shelters

with suitable designs need to be constructed in appropriate locations in coastal areas. These multi-purpose cyclone shelters can be used as shelter when the cyclone strikes and at normal times can be used as schools or community centres. The picture of the cyclone shelters on the right shows the multiple use of the shelter at times when cyclone hits that area. The ground floor is used as a shelter for the livestock and the first floor for the community members.



Multi-purpose Cyclone Shelters of suitable designs have been constructed in vulnerable locations of coastal Orissa.

b. Engineered structures that can withstand wind forces - need to be built. Majority of the buildings in coastal areas are built with locally available materials and have no engineering inputs. Good construction practice should be adopted such as :

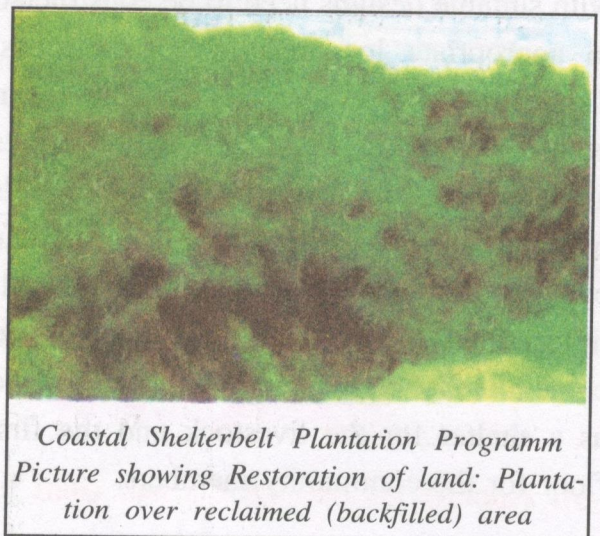


- Cyclonic wind storms inundate the coastal areas. It is advised to construct on stilts or on earth mounds. Buildings should be wind and water resistant.
 - Houses can be strengthened to resist wind and food damage. All elements holding the structures need to be properly anchored to resist the uplift or flying off of the objects. For eg: large overhangs for roofs should be avoided and projections should be tied down.
- c. Protection against wind :** Construction of houses either behind a mound or hill-ock and not right on the coast. This will act as a protection against strong cyclonic winds. Fishermen are normally affected as they stay very close to the coastline.
- d. Coastal belt plantation :** Shelterbelt plantation along the coastline will mitigate the impact of strong winds. It will also check soil erosion and inward sand drift, thereby protecting cultivation fields and houses which are located in the coastal areas.
- e. Construction of roads** which are elevated. The East coast road from Kolkata to Kanyakumari is one such example.

II. Non-Structural Mitigation measures :

a. Hazard mapping - a hazard map will illustrate the areas vulnerable to the cyclone in any given year. It is an effective mitigation tool.

b. Land use control designed so that least critical activities are placed in vulnerable areas. Location of settlements in the flood plains is of utmost risk. Vulnerable areas should be kept for parks, grazing or play grounds.



c. Cyclone forecasting and warning : Better forecasting of cyclones, early and timely warning to the people who are likely to be affected leads to better preparedness and reduced impact to life, property, livelihood and infrastructure.

FIND FURTHER INFORMATION

- General characteristics of the tropical cyclone
- Cyclone season and its effects
- Predictability of tropical cyclones and use of warning systems
- Cyclone resistant buildings
- Case Study on the impact of 1999 Orissa super cyclone (1999) and Myanmar (2008)

Web Resources :

You may refer to the following websites for more information

- www.imd.ernet.in: Website of Indian Meteorological Department, Government of India
- www.ndmindia.nic.in : Website of NDM Division, Ministry of Home Affairs.
- www.weather.nic.in : Website of National Informatics Center
- www.bmtpc.org/disaster.htm : Website of Building Material Technology Promotion Council
- www.gsdma.org/cycpre.htm : Website of Gujarat State Disaster Management Authority
- www.osdma.org: Website of Orissa State Disaster Mitigation Authority
- www.tropmet.res.in : Website of Indian Institute of Tropical Meteorology India
- www.colorado.edu/hazards : Website of Natural Hazard Center, University of Colorado
- www.wmo.ch : Website of World Meteorological Organization

Earthquakes

AN EARTHQUAKE

is a sudden release of energy accumulated in deformed rocks causing the ground to tremble or shake.

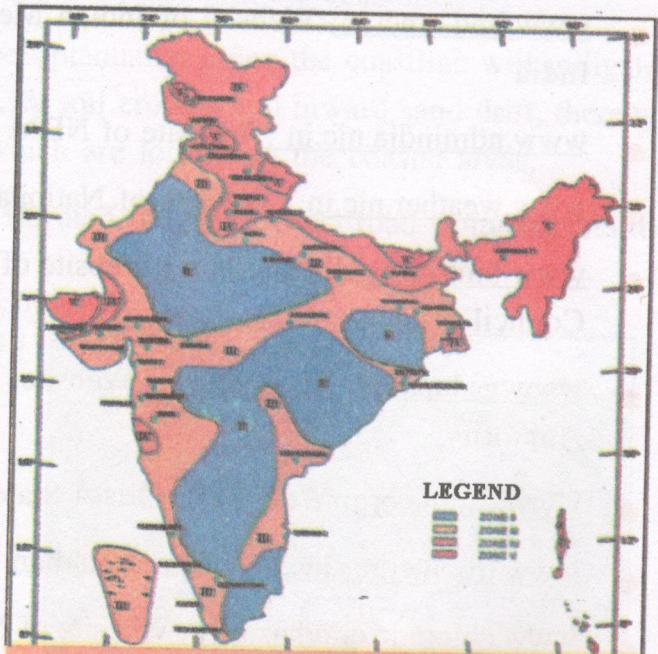
In the Picture on the left :

1. : Collapse of an L-shaped school building in Ahmedabad, 2001.
- 2&3 : Houses damaged in Bam earthquake, 2003
4. : School damaged in China earthquake, 2008



Many of us staying in India have experienced a number of sudden shocks of high or low intensity which are normally known as 'earthquakes', and many of us have faced the severe impact of an earthquake. In the class VIII textbook, you have already read what an earthquake is and the history of some of the major earthquakes that have occurred in our country, and have landed a major blow to the country's economy.

Warning : Earthquake is a sudden onset hazard and can happen at any time of the year, day or night with sudden impact without any warning. Extensive research has been conducted in recent decades but as yet there is no accepted method of earthquake prediction. Most of the predictions of earthquakes that have happened till date have failed. It is therefore a myth when we say earthquakes can be predicted and there is a warning period.



Earthquake Zoning Map of India

Source : Bureau of Indian Standards, 2000

Activity I : A seismometer is instrument which is used for measuring earthquakes. Collect information and pictures on various nru-icn! ways of measuring earthquakes of various countries across the world.

To reduce the impact of earthquakes, which is a regular phenomenon in countries like Japan and Indonesia various mitigation strategies have been taken up by the governments and the people of these countries to minimize the impact of these hazards. Let us now try to analyze some of the structural and non-structural mitigation measures that can be taken up to reduce the impact of an earthquake.

Mitigation Measures :

Structural Mitigation :

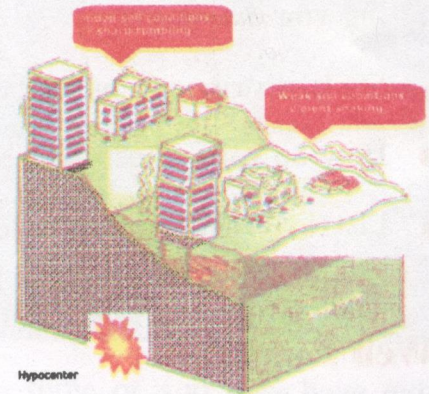
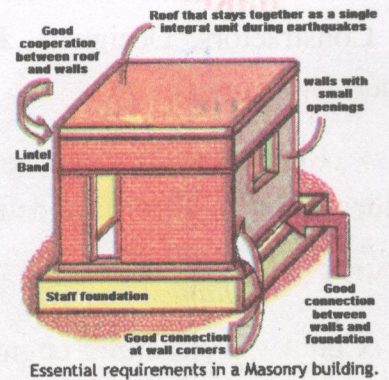
Engineered structures should be designed and built to withstand ground shaking. Architectural and engineering inputs need to be put together to improve building design and construction practice. Soil type must be analyzed before construction and structures must not be built on soft soil. Note : Buildings built on soft soils are more likely to get damaged even if the earthquake is not particularly strong in magnitude. Similar problem persists in the alluvial plains and on the river banks. Heavy damages are sustained when ground is soft.

Non-Structural Mitigation Measures :

Enforcing building codes : The Bureau of Indian Standards has published building codes and guidelines for safe construction to reduce the impact of earthquakes.

Before the buildings are constructed, the building plan has to be checked by the Municipality to verify if the structure conforms to the building guidelines set by the Government.

Many existing lifeline buildings like hospitals, important government offices, schools, fire stations need to be retrofitted with safety devices based on these guidelines as they play a very crucial role in case a disaster strikes.



Effects of soil type on ground shaking

Public Awareness: sensitization and training programmes for Architects, Builders, Constructors, Designers, Engineers, Financiers, Government functionaries, House owners, Masons etc.

Reduce possible damages from secondary effects like fire, floods, landslides etc. by identifying potential landslide sites and restricting construction in those areas.

FIND FURTHER INFORMATION

- Contact a structural engineer and discuss about earthquake resistance of the building you live in.
- Study distribution of earthquakes in India for the past 100 yrs.
- How do soils affect vulnerability to an earthquake ?
- List down actions that could be taken in your school and home to reduce vulnerability to earthquake damage. Discuss with your teacher and parents.

Web Resources :

You may refer to the following websites for more information.

www.nicee.org; website of National Information Center of Earthquake Engineering, IIT Kanpur

www.asc-india.org: website of Amateur Seismic Center

www.imd.ernet.in/section/selismo/static/welcome.htm: Indian Meteorological Department (IMD) in the Nodal department of Government of India, dealing with earthquakes.

www.bmtpc.org: Website of Building Materials & Technology of Promotion Council, New Delhi.

www.earthquake.usgs.gov: website of US Geological Survey.

LANDSLIDES

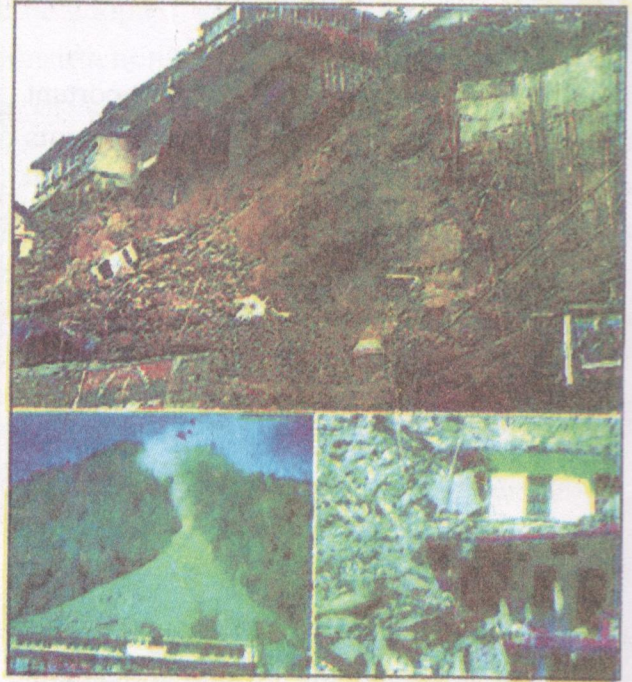
LANDSLIDES

are slippery masses of rock, earth or debris which move by force of their own weight down mountain slopes or river banks.

In the picture: (Top) House wrecked in landslide - Twenty-five residents of a private building in the heart of Shimla had a miraculous escape when a major portion of house collapsed following a landslide. The landslide was triggered by haphazard cutting of the hill below it for construction of a hotel.

(Bottom Left) : The Varunavat mountain rising on the edge of Uttarkashi town. Huge cracks on its side have set off several landslides. A building in danger of being buried.

(Bottom Right) : A building partly buried under rocks and other debris.



Have you ever experienced a landslide ? Yes, some of you may have either experienced it while visiting one of the hill stations for your vacation. Although landslides are primarily associated with mountainous terrains, these can also occur in areas where an activity such as surface excavations for highways, buildings and open pit mines takes place.

Landslides are a major natural disaster in hilly terrains like the Himalaya's Western Ghats and in the North Eastern parts of the country and destroy life and property almost perennially and cause devastating damage to transportation and communication network.

Warning : Normally, landslides occur gradually, however at times sudden failure (sliding) can occur without warning. They may take place in combination with earthquakes, floods and volcanoes. There are no clearly established warning systems in place indicating occurrence of landslide and hence they are difficult to predict the actual occurrence. Areas of high risk can be determined by use of information on geology, hydrology vegetation cover, past occurrence and consequences in the region.

Since most of the landslides occur without any prior warning, there is a need to be better prepared and carry out certain mitigation measures to reduce the impact.

Mitigation Strategies :

Structural Mitigation :

Drainage Corrections: The most important triggering mechanism for mass movements is water infiltration into the land area during rains. Hence the natural way of preventing this situation is by reducing water infiltration and allowing excess water to move down without hindrance. In such situation, the first and foremost mitigation measure is drainage correction. This involves maintenance of natural drainage channels both micro and macro in vulnerable slopes.

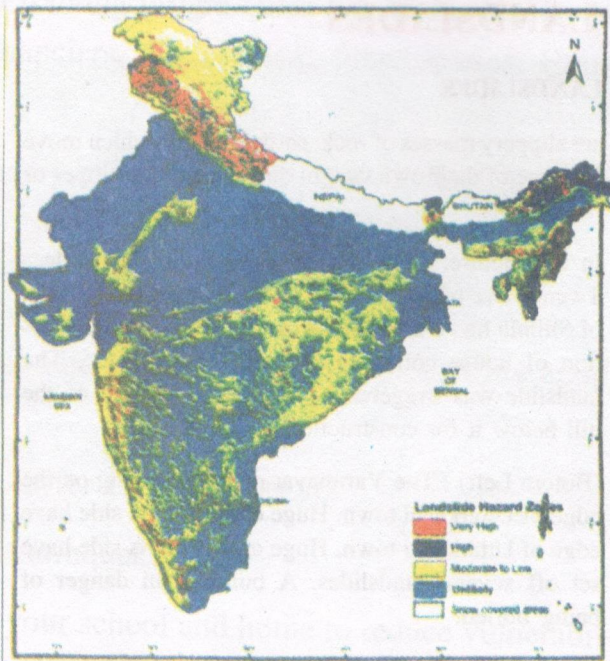
Engineering structures with strong foundations can withstand the ground movement forces. Underground installations (pipes, cables, etc.) should be made flexible to move in order to withstand forces caused by the landslide.

Retaining walls can be built to stop land from slipping (these walls are seen along roads in hill stations).

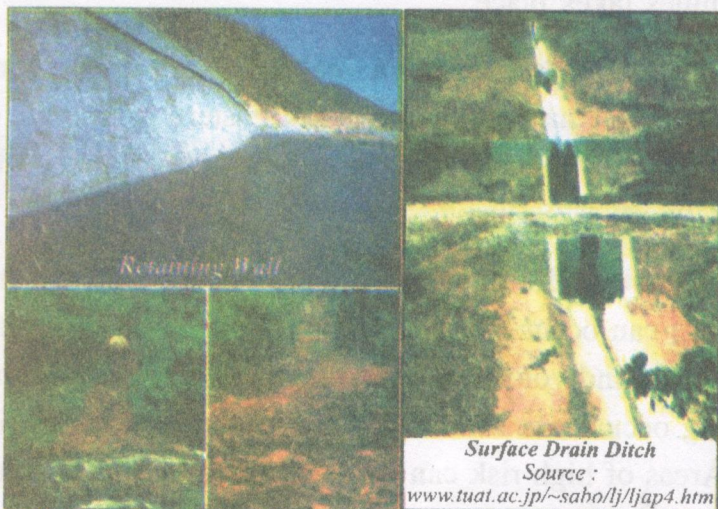
Increasing vegetation cover is the cheapest and most effective way of arresting landslides. This helps to bind the top layer of the soil with layers below, while preventing excessive water run-off and soil erosion.

Non Structural Mitigation :

Hazard mapping will locate areas prone to slope failures. This will permit to identify avoidance of areas for building settlements.



Landslide Zoning Map of India



Landslide in Kerala

In Western Ghats several types of mass movements/landslides have been recorded. The most prevalent, recurring and disastrous type of mass movement in Kerala are "debris flow". Note the boulder movement along the path.

Land use practices such as preserving existing natural vegetation (forest and natural grass land) in good condition should be adopted. Denuded upper slopes must be reforested with suitable tree species. In construction of roads, irrigation canals etc. proper care is to be taken to avoid blockage of natural drainage.

Awareness generation : The public should be educated about signs that a landslide is imminent so that personal safety measures may be taken and also gathering information on indigenous methods used to reduce the impact.

FIND FURTHER INFORMATION

- Common factors triggering landslides
- Areas generally prone to landslides
- Information of past landslide events in the country and spot the locations on the map
- Consulting a geologist and an engineer, for advice concerning slope stability and engineered structures
- Geological hazards in your area and list suitable mitigation measures

Web Resources :

You may refer to the following websites for more information :

www.csre.iitb.ac.in/rn/resume/landslide/ls1.html.

<http://landslides.usgs.gov>.

www.fema.gov/hazards/landslides/landslif.shtm

DROUGHTS

DROUGHT

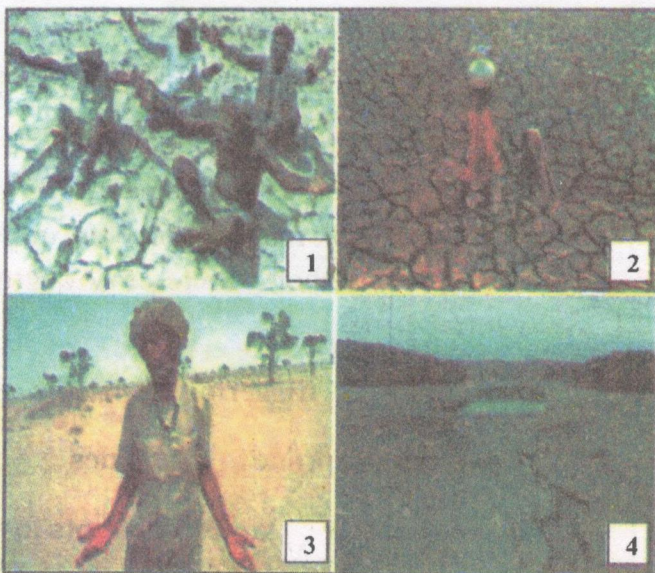
Drought is a climatic anomaly, characterized by deficient supply of moisture resulting either from sub-normal rainfall, erratic rainfall distribution, higher water need for a combination of all the factors.

Drought is a **slow-onset** disaster and it is difficult to demarcate the time of its onset and its end. Its effects often accumulate slowly over a considerable period of time and may linger from months to years after the termination of the event. In the Class VIII textbook, we have already identified the causes, impact and areas which are frequently affected by drought in India.

Warning : According to the Indian Meteorological Department, the country is said to be drought affected when the overall **rainfall deficiency** is more than 10 per cent of the long period average and more than 20 per cent of the country's area is affected by such drought conditions. Falling rainfall levels, falling groundwater levels, drying wells, rivers and reservoirs, and poor agricultural production warn the onset of drought.

In general, drought means different things to different people. To a meteorologist it is the absence of rain while to the agriculturist it is the deficiency of soil moisture in the crop root zone to support crop growth and productivity. To the hydrologist it is the lowering of water levels in lakes, reservoirs, etc., while for the city management it may mean the shortage of drinking water availability. Thus, it is unrealistic to expect a universal definition of drought for all fields of activity.

Activity 1 : Identify the areas that are normally affected by drought in India and write a short narrative on the impact of the drought on community along with a case study.



In the Picture:

1. Drought affected communities praying to God for rain;
2. Drought forcing people to walk miles in search of drinking water;
3. Farmers in distress as there is no crop;
4. Water source dried up due to lack of rainfall.

Activity 2

1. Prepare a brochure for an NGO to create awareness about use of traditional water harvesting systems.
2. Read and review any book related to drought for example P. Sainath's "Everybody Loves a Good Drought" and Anupam Mishra's "Rajasthan ki Rajat Boonde".
3. Interview a bank manager on how crop insurance is given and report to class. Let us now read a short article of how drought has affected the people of Nepal.

Drought prompts first ever emergency food operation in Nepal (23rd May, 2006)

Who suffers maximally when drought comes? It is always the women. And where are the trees that once covered Nepal landscape?

Ten of Nepal's 75 districts are affected by the drought, which is following the driest winter on record in the region, among the poorest parts of this badly impoverished country. Earlier this month World Food Programme (WFP) revealed that 47 per cent of Nepalis do not have enough food to live active and healthy lives. About half of all children are malnourished. But while the national poverty rate is about 31 per cent, in the Karnali region and affected adjoining districts it

is 45 per cent, said de Margerie. In normal years there is a "hunger gap" in the Karnali, the period between harvests when food stocks run out and people survive by buying food with what little money they earn as day labourers or with cash in patriated by relatives who have migrated for jobs. - Marty Logon.

The story shared above, thus reveals that drought impacts the rainfed crops to start with and subsequently the irrigated crops. This results in lack of food supply for the local people leading to extreme poverty and migration.

Mitigation Strategies :

Reducing the risks and therefore the impacts associated with drought in the future requires that much greater emphasis be placed on preparedness and mitigation.



Source: http://WMV, worldproutassembly.oi-g/images/dmught_nepal.jpg

Preparedness leads to greater institutional capacity to cope with drought event through the creation of an organizational structure that improves information flow and coordination between and within levels of government. Drought preparedness, with appropriate mitigation actions and programmes, can reduce and, in some cases, eliminate many of the impacts associated with drought.

Structural Mitigation :

Revival of **traditional water harvesting structures** like canals, tanks etc. In Gujarat

‘Jhalara’ also known as ‘Baolis’ in Rajasthan are some examples of traditional water harvesting structures in India.

Construction of **water harvesting structures**, in houses and farm areas. Water harvesting can be carried out by either allowing the runoff water from all the areas to a common point or allowing it to infiltrate into the soil, thereby increasing the ground water level.

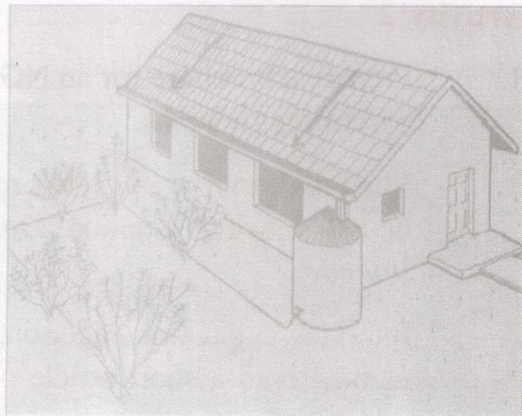
Activity 1 : Discuss various methods of recycling water in your school and at home. List how recycled water can be used.

Non-Structural Mitigation :

Drought Monitoring : Monitoring and early warning essentially provides the foundation on which timely decisions can be made by decision makers at all levels (i.e., farmers to national policy makers) Given drought’s slow onset or creeping characteristics, monitoring all components of the hydrological system is the only mechanism for detecting drought’s early onset and its potential impacts on sectors, regions and population.

Drought Awareness Programmes :

In areas that are normally affected by drought, Government, Non-Government Organizations (NGOs), local corporate and other key players have taken the initiative to



Source: www.seo.state.nm.us

Rooftop rainwater harvesting: Roof acts as catchments, draining the water to a cistern.



Farm ponds collected the rainwater and helped in escaping the drought impacts in Karnool District of Andhra Pradesh. Source : www.thehindubusinessline.com

bring in awareness on water conservation, livelihood planning, land use planning, Traditional water conservation strategies etc.

Land Use Planning : Land use based on its capability helps in optimum use of land and water and can prevent undue demand created due to misuse.

Livelihood Planning : It identifies those livelihoods which are least affected by drought. Some of such livelihoods that are normally practiced in areas which are affected by drought include collection of non-timber forest products from the community forest, carpentry, raising goats etc.

Crop Insurance : This is an insurance given to the farmers, who have lost their crops because of lack of water supply.

Success story : What mitigation can do ?

Ralegaon Siddhi

The people of Ralegaon Siddhi in Maharashtra transformed their dire straits to prosperity. Twenty years ago the village showed all traits of abject poverty. It practically had no trees, the topsoil had blown off, there was no agriculture and people were jobless. Anna Hazare one of India's most noted social activists, started his movement concentrating on trapping every drop of rain, which is basically a drought mitigation practice.

The villagers built check dams and tanks. To conserve soil they planted trees.

Crop Insurance Scheme

Comprehensive Crop Insurance Scheme was introduced from 1985 Kharif season with the objective of providing financial support to the farmers in the event of crop failure due to natural vagaries like droughts and floods. It is offered by the General Insurance Corporation of India and its subsidiaries. This scheme covers food grains and oilseeds.



Ralegaon, before drought mitigation efforts



Ralegaon, after drought mitigation efforts

Source : <http://www.rainwaterharvesting.org/catchwater/feb2001/photogallery.htm>

The result : from 80 acres of irrigated area two decades ago, Ralegaon Siddhi has a massive area of 1300 acres under irrigation. The migration for jobs has stopped and the per capita income has increased ten times from Rs. 225 to 2250 in this span of time. No World Bank funding, no-government grants - only people's enterprise.

FIND FURTHER INFORMATION

- Contact your nearest agricultural department and learn about watersheds.
- Study various domestic rainwater harvesting methods.
- Various Government programmes that are operative in drought affected areas.

Interlinking of major rivers in India and find out if it helps in drought mitigation.

Web Resources :

You may refer to the following websites for more information

- Area you prepared (www.areyouprepared.com)
- Center for Science and Environment (www.cseindia.org)
- Center for Water Efficient Landscaping, Utah (<http://www.hort.usu.edu/cwel/>)
- Central Arid Zone Research Institute (<http://cazri.raj.nic.in>)
- Central ground water authority (<http://www.cgwaindia.com/>)
- Central Research Institute for Dryland Agriculture (CRIDA) (<http://dryland.ap.nic.in/>)
- Crop Weather Outlook: <http://www.cropweatheroutlook.org:8080/crida/>
- Department of agriculture and cooperation (DOAC), Ministry of Agriculture (MOA): <http://agricoop.nic.in/drought/drought22.htm>
- DOAC, MOA, Weather Watch (<http://agricoop.nic.in/weather.htm>)
- Down to Earth, CSE (<http://www.downtoearth.org.in/water.htm>)

EXERCISE

1. What do you understand by structural and non-structural mitigation efforts ? Suggest any two for each of the hazards discussed in the chapter.
2. What is hazard mapping ? How is it an effective mitigation tool for cyclones ?
3. What is water harvesting ? How is it a good measure in overcoming shortage of water ?
4. What efforts do you think helped the people of the Ralegaon Siddhi village in Ahmednagar to overcome the problems of drought ?
5. Explain why it is women and children who are the most affected in drought-prone areas.
6. Explain any 2 structural mitigation strategies for floods.
7. List 5 agencies that play a major role in the issuing of cyclone warnings.