



Together Towards a Safer India Part-III

A Stride Ahead

A Textbook on
Disaster Management
for Class X



CENTRAL BOARD OF SECONDARY EDUCATION

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1. *Introduction...Do you remember*



Are we in hazard free zones?

Do you know that any of these disasters could hit your area at any time, with or without any warning?

People have been living with risk ever since they first joined efforts, shared resources and assumed responsibilities in social groups. Social development and human well being have advanced only because people have taken risk. Time and again, we see the terrible toll that natural disasters inflict on vulnerable communities around the world. Over the recent decades there has been an alarming increase in the occurrence of natural disasters and the magnitude of their social, economic and environmental impacts. This extensive damage to lives, property and livelihood of the affected communities has turned back the development clock of the areas by decades.

But are we apathetic towards disasters?

The answer is 'No'. The recent Kumbakonam fire tragedy in Tamilnadu that killed 93 innocent lives has made us all think about "our lives" which is precious. The recurring floods in Assam and Bihar, frequent drought in Rajasthan and Gujarat and the 2001 earthquake in Gujarat have disrupted the normal life of people across the country. Disasters are as old as human history. They have been mostly dealt with from a purely humanitarian angle, while natural hazards such as cyclones; floods,

droughts and earthquakes have been analyzed technically and scientifically within scientific disciplines. Disasters can no longer be seen as '*acts of God*' or '*acts of nature*' over which we have little control nor can we leave disasters to be understood by natural scientists. It is high time that we as responsible future citizens of our country think of it and get ourselves prepared for a safer tomorrow.

Knowing about risk that lead to disasters, understanding how they affect our livelihoods and environment and dedicating collective efforts to manage those conditions. This book on Disaster Management, "*Together Towards a Safer India – Part III*" aims at stimulating the students and the teachers by transacting through case studies on various hazards. Let us analyze some of the major disasters that have created havoc with huge loss to life and property and how the affected communities have been able to cope up with it. Let's learn from the past experiences and get our-selves prepared. This chapter gives an overview of all the chapters that has been covered in this book.

Just one year to the day that an earthquake hit Bam, the dusty desert town in southern Iran, nature struck again on Sunday (December 26). The strongest earthquake in the world for 40 years struck under the sea north-west of the Indonesian island of Sumatra. Massive sea surges (tsunamis) spread from its epicenter bringing death and destruction to the coastal areas of south and south-east Asian countries ringing the Indian ocean. Waves ranging in size from 10 ft. to 30 ft. were reported by different witnesses. Water surged kilometers inside into many of the islands. Radio listeners who woke to hear the news in morning were told 500 were feared dead, but by evening the number was approaching 10,000 and still climbing. Many thousands more were missing or injured and millions more displaced... **Chapter 2** of the book aptly discusses the devastating killer waves that hit the country disrupting the normal life and ways and measures to prevent oneself from them.

The Tragedy of Kumbakonam

Kumbakonam, July 16, the fire of sustenance turned into a mass pyre for children between the ages of seven and nine with at least 93 getting charred to death, trapped in their blazing thatched-roof classrooms in Saraswati Primary School. The fire started in a kitchen on the ground floor when the mid-day meal for children was being cooked. Fire fighters said that the victims stood no chance of survival as the blazing thatched roof collapsed on the trapped children. The terrible tragedy not only jolted the pilgrim town of Kumbakonam in Tamil Nadu, but the entire nation.

Are we in schools that
are safe?
Ask yourself, your parents
and teachers today!



"Prevention is better than cure".

Have you ever analyzed why did this tragic incident occur?

The local authorities who reached the site as soon as they received the information said that the school had no proper evacuation route and there was lack of fire safety measures taken up by the school authorities. Due to the lack of awareness among the teachers, staff members and the children present in the school, many precious lives were lost. The local hospitals lacked the facilities to cope up with huge number of burnt victims and the school children too were not trained in *first aid*. No initiatives were taken up by the authorities to review the structural safety of school functioning in thatched rooms.

Who is to be held responsible for it? Is it the school administration, teachers or the children?

Yes, all of us. Each one of us has a role to play. It was important for the school principal along with the other staff members to prepare the *school disaster management plan* and share it with the district administration. They need to train the students on first aid, search and rescue and usage of fire extinguishers. They too need to create awareness on the do's and don'ts for fire and other hazards that they are vulnerable to.

You can yourself be safe and also save the lives of your dear friends by knowing some of the “*Survival Skills*” for search and rescue and first aid. **Chapter 3** deals with the survival skills, which would give you an insight into *Search and Rescue* measures that need to be taken during an emergency and *First Aid* measures that need to be taken for burns, bleeding, snakebite, poisoning etc.

Dear Friends,

Join me today...

Karnataka's Fire Department runs a programme called SAFE (Students Association of Fire Education) imparting fire safety training to students.
www.karnatakafireservices.gov.in

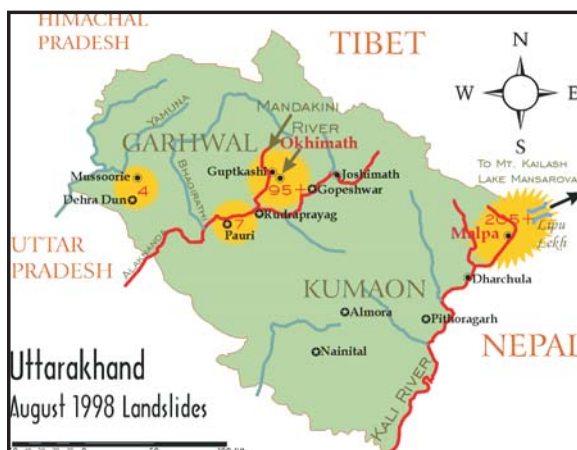
Talk to the Fire Service Department in your area and find out if they have any such training facilities. If 'yes' get yourself trained now.

ACTIVITY

If you were one of the students in the classroom where these ninety-three children were your dear friends, how would you have reacted to it and what steps would you have taken up? Analyze it with your friends and teachers and paste your learnings on the notice board of your classroom.

Yet another Example.....

Landslide affecting the villages



In the later half of August 1998, severe rains lashed the Himalayas, causing devastation in their wake. On August 14, 69 people died in a landslide in Okhimath block (near Gutptkashi). A week later, the entire village of Malpa, lying along the Kali River on the way from Dharchula to Lipu Lekh, was swept away

Isn't one-week time enough for the people of Malpa to evacuate? Probably there was no proper communication given by authorities to villagers.

The death toll, 205, included road workers, porters, members of the border police, and five dozen pilgrims returning from a yatra (pilgrimage) to Mount Kailash and Lake Mansarovar in Tibet (August 18). Two dozen more people died when Mansuna village in Rudraprayag district also disappeared (August 19). In addition, the torrential rains demolished hundreds of homes and infrastructure and intense winds also hampered rescue efforts.

Isn't site selection important for carrying out constructions?

By August 20, the authorities began evacuating 50,000 residents of the Okhimath block, as rubble, debris, and boulders had fallen into the Madmaheshwar River, a tributary of the Mandakini, plugging it and causing the formation of an artificial lake. Many houses that were located in these vulnerable sites were washed away. As the lake swelled, so did the danger, as a flash flood would submerge two - dozen villages. The army cautioned against blasting the artificial dam with dynamite, as the sudden discharge would overwhelm the villages below. Instead, the villagers suggested that the lake should be left to erode naturally. Also, local villagers and social activists went on search and rescue expeditions, while various NGOs scrambled to attend to the needy.



Don't you think help from various agencies and community has helped in rapid search and rescue operations?

In Dehradun and other large cities, generous people rallied to send aid to the victims of the landslides and flooding that had afflicted the plains.

What do you think were the steps that were to be necessarily taken by the people and the administration?

Early warning to the villagers and the pilgrims regarding the weather, specialized training to the villagers on search and rescue and first aid, construction of retaining walls on the hilly terrains would have saved many precious lives.

If you are residing in any of these areas, then look out for its safety. Know the type of soil and if vulnerable move to a safer place.

Develop an evacuation plan for your locality in case you are prone to landslides.

From the above case study we need to realize the need for *alternative communication* for carrying out search and rescue operations and also establish linkage with various government and non-governmental agencies. **Chapter 4** of the book discusses about various *alternative communication* systems that exist in the world of science and technology today. As this chapter is based

on science do take help from your Science teachers. Hope you all will enjoy reading it and relate it to your favorite subject of 'Physics'.

This case study that you have just read points out how important it is for us to have an understanding of good constructional practices so that you are safe in your schools and at home. To have a better understanding of *safe construction practices* **Chapter 5** of the book discusses about various safe construction practices that needs to be adhered to by people residing in vulnerable pockets like earthquake, landslide, flood and cyclone prone regions of the country.

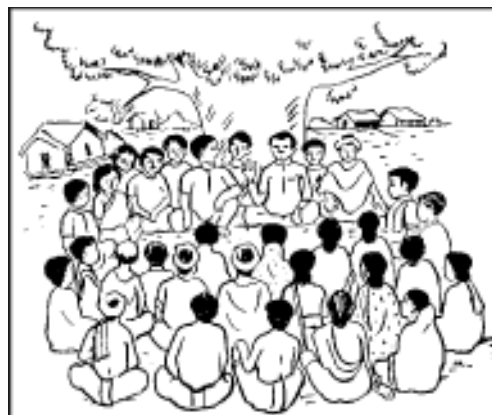
It is time to take help and support from the government and various agencies like the NCC, NSS, Home Guards etc and get ourselves prepared. **Chapter 6** discusses the roles that government and various agencies play in managing disasters. You too as an active and responsible citizen of the country can play a major role. You can be a volunteer and also a skilled personnel and save lives of your near and dear country men/women in any disaster scenario.

To have a safer living and a safer tomorrow it is time for us to plan ahead for our community/locality that we live in. Being a part of the community you should now take up the responsibility of preparing the community/locality that you live in, based on the hazard that you are prone to.

Chapter 7 of the book discusses the components and the process of preparing the disaster management plan for your area. The case study below shows how proper planning at the community level has saved people of Bangladesh from the devastating cyclones.



Safe traditional house which has survived the major landslide



Community planning in progress

Following the 1970 cyclone, which killed 50,000 people, the Government of Bangladesh began working to improve the coastal warnings and evacuation. The main objective was to issue warnings, building and operating shelters assisting evacuation, search and rescue, first aid, relief and rehabilitation and building up community preparedness capacity.

A cadre of 32,000 village volunteers, men and women were, organized into local teams of 12. They were equipped with radios to monitor weather bulletins, megaphones and hand operated sirens, first aid kits, rescue equipments and protective clothing. These volunteers were trained at regular interval. Specialist training such as radio use, first aid and leadership was provided separately. The volunteers organized regular rehearsals and demonstrations in the villages and mass awareness campaigns every year. However, this community preparedness programme has been widely acknowledged and hundreds and thousands of people can now routinely be evacuated from the path of cyclone. In May 1994, three quarters of a million people were safely evacuated; only few people died.

Thus, from the above case studies it is evident that proper planning and knowledge is necessary for reducing human, social, economic and environmental losses due to various natural and man made hazards. This would build a disaster resilient community and would make the world a safer place to live.

Reference for further reading:

- <http://www.gsi.gov.in/quake.htm>
- www.karnatakafireservices.gov.in.
- Good Practice Review - Disaster Risk Reduction Mitigation and Preparedness in development and emergency programming by John Twigg.
- World Congress on Natural Disaster Mitigation, Proceedings volume -2

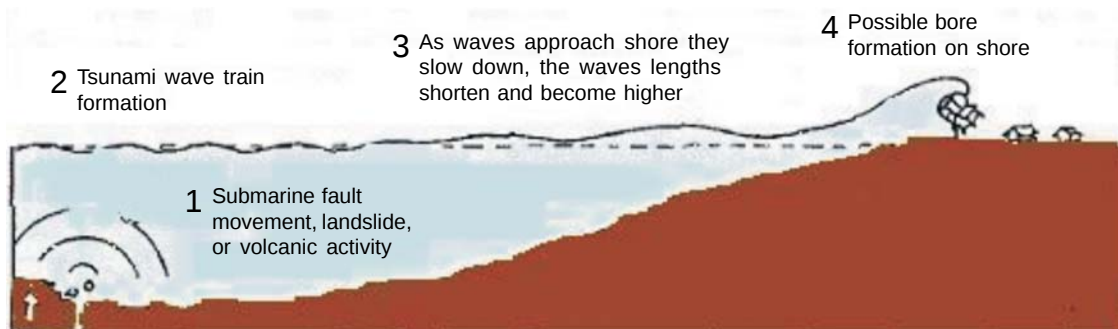
2. *Tsunami – The killer sea wave*



A killer Tsunami hit 11 South Eastern Countries of Asia on the 26th of December 2004 killing more than 1,50,000 precious lives. The count hasn't stopped.... At the end of the day statistics only remain. The emotional, economical and ecological toll of the disaster can't be calculated. Many villages have lost an entire generation. This was the biggest earthquake to hit the world in 40 years and no one could have thought that its effects would ripple worldwide overnight.

Do you know what Tsunamis are? How they can be predicted and how you can save yourself from the deadly Tsunami? Read the section below and you will know more about it. Follow the instructions if you reside in any of the coastal states of the country.

The term 'Tsunami' has been coined from the Japanese term Tsu meaning 'harbour' and nami meaning 'waves'. Tsunamis are waves generated by earthquakes, volcanic eruptions, or underwater landslides and can reach 15m or more in height devastating coastal communities. In recorded history, tsunamis worldwide have killed hundreds of thousands of people. Tsunamis caused by nearby earthquakes may reach the coast within minutes. When the waves enter shallow water, they may rise to several feet or, in rare cases, tens of feet, striking the coast with devastating force. The Tsunami danger period can continue for many hours after a major earthquake.



In 1883, the violent explosion of the famous volcano, Krakatoa in Indonesia, produced tsunamis measuring 40 meters which crashed upon Java and Sumatra. Over 36,000 people lost their lives as a result of tsunamis that are capable of crossing oceans. Tsunamis are nearly always created by movement of the sea floor associated with earthquakes which occur beneath the sea floor or near the ocean.

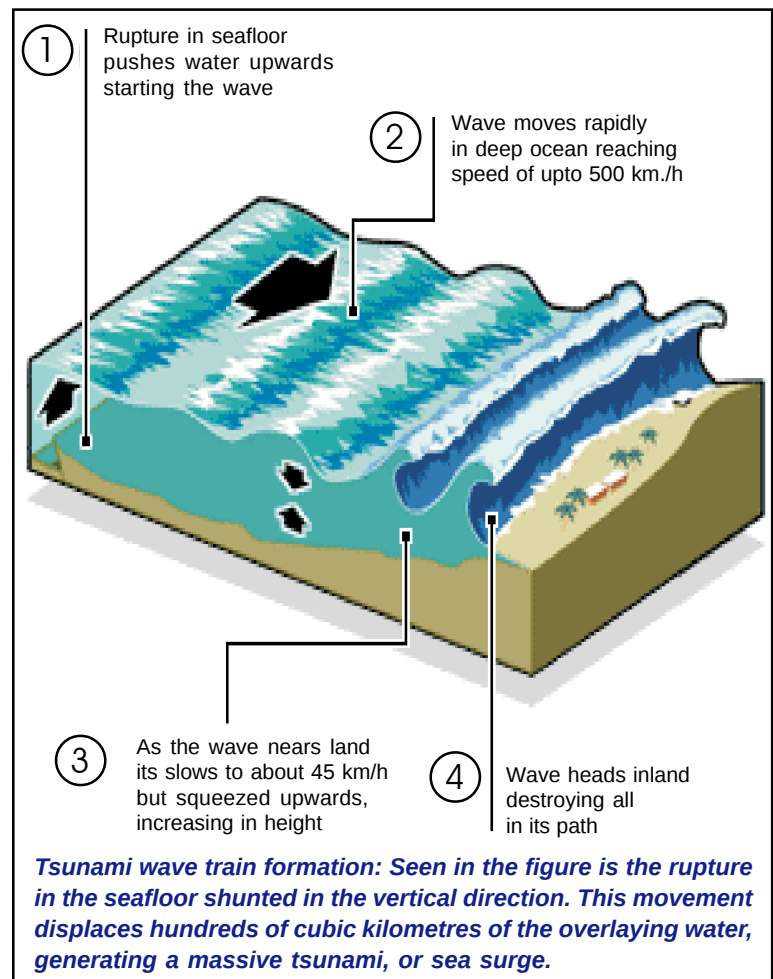
Tsunamis may also be generated by very large earthquakes far away in other areas of the Ocean. Waves caused by these travel at hundreds of kilometers per hour, reaching the coast several hours after the earthquake. Unlike ordinary tides, which are short, frequent and surface level, tsunami, are barely noticeable in their deep-sea formation stage. At this point despite a wavelength up to 100 km, they are shallow in depth and move at hundreds of kilometer per hour. *If a quake hits Los Angeles, a Tsunami can reach Tokyo in a time less than a Jet would take to traverse the same distance.*

Important Facts About Tsunamis

- Some tsunamis can be very large. In coastal areas their height can be as great as 10m or more (30m in extreme cases), and they can move inland several hundred meters.
- All low-lying coastal areas can be struck by tsunamis.
- A tsunami consists of a series of waves. Often the first wave may not be the largest. The danger from subsequent tsunami waves can last for several hours after the arrival of the first wave.
- Tsunamis can move even 50 km per hour on coastal plain, faster than a person can run.
- Sometimes a tsunami causes the water near the shore to recede, exposing the ocean floor. This is nature's Tsunami warning and should be heeded.
- The force of some tsunamis is enormous. Large rocks weighing several tons along with boats and other debris can be moved inland several meters by tsunami wave activity. Homes

and other buildings are destroyed. All floating material and water move with great force and can kill or injure people.

- Tsunamis can occur at any time of day or night.
- Tsunamis can travel up rivers and streams that lead to the ocean.



Detecting Tsunamis

With the use of satellite technology it is possible to provide nearly immediate warning of potentially tsunamigenic earthquakes. Warning time depends upon the distance of the epicenter from the coast line. The warning includes predicted times at selected coastal communities where the tsunami could travel in a few hours.

Coastal tidal gauges can stop tsunamis close to the shore, but they are useless in deep oceans. Tsunami detectors, linked to land by submarine cables, are deployed 50 odd kms. out at sea. 'Tsunamieters' transmit warnings of buoys on the sea surface, which relay it to satellites.

What to do BEFORE a Tsunami

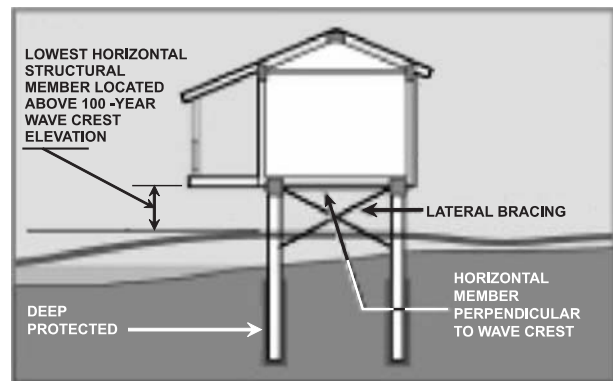
- Find out if your home, school, workplace, or other frequently visited locations are in tsunami hazard prone areas.
- Know the height of your street above sea level and the distance of your street from the coast or other high-risk waters.
- Plan evacuation routes from your home, school, workplace or any other place you could be where tsunamis present a risk.
- Practice your evacuation routes
- Have disaster supplies on hand.
- Discuss tsunamis with your family
- Develop an emergency communication plan. In case family members are separated from one another during a tsunami have a plan for getting back together. Ask an out-of-state relative or friend to serve as the family contact (After a disaster, it is often easier to call long distance).

Myth...

Tsunamis are caused by moon's pull.

If you are at risk from tsunamis, you should:

- Avoid building or living in buildings within several hundred feet of the coastline.
- Make a list of items to bring inside in the event of a tsunami.
- Elevate coastal homes. Most tsunami waves are less than 10 feet (3 meters). Elevating your house will help reduce damage to your property from most tsunamis.
- Take precautions to prevent flooding.
- Have an engineer check your home and advise about ways to make it more resistant to tsunami water.
- Use a local radio or television station for updated emergency information.
- Follow instructions issued by local authorities.



Design Solution to Tsunami effect

What to do DURING a Tsunami

- If you are at home and hear there is a tsunami warning, you should make sure your entire family is aware of the warning. Your family should evacuate the house if you live in a tsunami prone area. Evacuate to a safe elevated area and move in an orderly, calm and safe manner to the evacuation site.

- Take your Disaster Supplies Kit. Having supplies will make you more comfortable during the evacuation.
- If you evacuate, take your animals with you.
- If you are at the beach or near the ocean and you feel the earth shake, move immediately to higher ground. Do not wait for Tsunami warning to be announced. Stay away from rivers and streams that lead to the oceans.
- High multi-storey, reinforced concrete buildings (like hotels etc.) are located in many low-lying coastal areas. The upper floors of these buildings can provide a safe place.
- Offshore reefs and shallow areas may help break the forces of tsunami waves, but large and dangerous waves can still be a threat to coastal residents in these areas. Staying away from low-lying coastal areas is the safest advice when there is a tsunami warning.
- Update yourself on emergency information or warning announced on radio and television from time to time.

Eyewitness...

I saw the water disappearing and the water went back so far away and everyone wondered what it was - a full moon or what? Then we saw the waves come, and we ran," said Katri Seppanen a tourist from Finland

If you are on a boat or ship

- Since tsunami wave activity is imperceptible in the open ocean, do not return to port if you are at sea and a tsunami warning has been issued for your area. Tsunami can cause rapid changes in water level and unpredictable dangerous currents in harbors and ports.
- If there is time to move your boat or ship from port to deep water (after you know a tsunami warning has been issued), you should weigh the following considerations:
 - ◆ Most large harbors and ports are under the control of a harbor/port authority. These authorities direct operations during periods of increased readiness. Keep in contact with the authorities should a forced movement of vessels is directed.
 - ◆ Smaller ports may not be under the control of a port authority. If you are aware there is a tsunami warning and you have time to move your vessel to deep water, then you may do so in an orderly manner. Owners of small boats may find it safest to leave their boat at the pier and physically move to higher grounds.

Damaging wave activity and unpredictable currents can affect harbors for a period of time following the initial tsunami impact on the coast. Contact the harbor authority before returning to port.

What to do AFTER a Tsunami

After a tsunami, you should:

- Continue using a radio or television for updated emergency information. The tsunami may have damaged roads, bridges, or other places that may be unsafe.
- Check yourself for injuries and get first aid if necessary before helping injured or trapped persons. If someone needs to be rescued, call professionals with the right equipment to help. Many people might get killed or injured while trying to rescue others in flooded areas.
 - Help people who require special assistance-infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
 - Avoid disaster areas. Your presence might hamper rescue and other emergency operations and put you at further risk from the residual effects

of floods, such as contaminated water, crumbled roads, landslides, mudflows, and other hazards.

- Use the telephone only for emergency calls. Telephone lines are frequently overwhelmed in disaster situations. They need to be cleared for emergency calls to get through.
- Stay out of a building if water remains around it. Tsunami water, like floodwater, can undermine foundations, causing buildings to sink, floors to crack, or walls to collapse.
- When re-entering buildings or homes, be very careful ! Tsunami-driven floodwater may have damaged buildings where you least expect it. Carefully watch every step you take.
- Wear long pants, a long-sleeved shirt, and sturdy shoes. The most common injury following a disaster is cut feet.
- Use battery-powered lanterns or flashlights when examining buildings. Battery powered lighting is the safest and easiest to use and it does not present a fire hazard for the user, occupants, or building. **DO NOT USE CANDLES.**
- Examine walls, floors, doors, staircases, and windows to make sure that the building is not in danger of collapsing.
- Inspect foundations for cracks or other damage. Cracks and damage to a foundation can render a building uninhabitable.
- Look for fire hazards. There may be broken or leaking gas lines, flooded electrical circuits, or submerged furnaces or electrical appliances. Flammable or explosive materials may have come from upstream. Fire is the most frequent hazard following floods.
- Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and get everyone outside quickly. Turn off the gas using the outside main valve if you can, and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
- Check for damage to sewage and water lines. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes that were made before the tsunami hit. Turn off the main water valve before draining water from these sources. Use tap water only if local health officials advise it is safe.
- Watch out for wild animals, especially poisonous snakes that may have come into buildings with the water. Use a stick to poke through debris. Tsunami floodwater flushes snakes and animals out of their homes.
- Watch for loose plaster, drywall, and ceilings that could fall.
- Open the windows and doors to help dry the building.
- Shovel mud before it solidifies.

The above brief on Tsunami teach us clearly that we can no longer afford to ignore the forces of nature and it should serve as a wake up call to us to rebalance our relationship with our environment.

Yield not to misfortunes, but advance all the more boldly against them.

Reference for further reading:

- <http://ioc.unesco.org/itsu/> IOC/UNESCO International Coordination group for the Tsunami Warning System in the Pacific (ICG/ITSU), Paris, France.
- <http://quake.usgs.gov/tsunami/> Tsunamis and Earthquakes, USGS, USA.
- www.asc-india.org Amateur Seismic Centre is a comprehensive website carrying details of state wise seismicity for the country. This also has extensive reports on various past Earthquakes/ Tsunamis.
- <http://www.prh.noaa.gov/pr/itic/> International Tsunami Information Center, Honolulu, Hawaii.
- <http://www.tsunami.org/> Pacific Tsunami Museum site. Includes answers to frequently asked questions, links, and information related to Pacific Ocean tsunamis.



1. Name three causes of Tsunami and explain its impact.
2. Explain two different ways of detecting Tsunami.
3. State two preparedness measures each in pre, during and post tsunami scenario.

3.

Survival Skills



Search and Rescue being carried out by Village Volunteers in Gujarat

The Orissa super cyclone of 1999 offers several lessons in disaster management. When the cyclone struck, western Orissa was already in the grip of a drought. It hit the landfall point near Paradip coast on October 29 with a wind velocity of 270 to 300 km per hour. That cyclone and the one that preceded it on October 17-18 together affected over 19 million people, including 3.5 million children. They affected 128 blocks in 14 districts. Search and Rescue measures were carried out on a massive scale. To cater to the requirement of huge human resource, volunteers were roped in from various walks of life. NCC and Civil Defence played a vital role in burning carcasses, distribution of relief and carrying out search and rescue operations.

Looking at the need for large-scale volunteers in an emergency situation, this chapter aims at understanding the survival skills for various natural and man made hazards. It also discusses various Search and Rescue skills and First Aid measures that can be carried out by "**you**" and "**me**" which would save many precious lives. Mankind has been coping with disasters since time immemorial. This chapter also gives an in-sight into the indigenous ways to cope up with disasters.



Victims being evacuated by the Air Force in the Tsunami hit area in Tamil Nadu

Search and Rescue Skills

Whenever and where ever disasters strike the first responder for search and rescue always begins at the local levels: individual and neighborhood. It is a daunting task for the locals to rescue the victims due to lack of skilled human resources. Disasters or emergencies disrupt normal life. We cannot stop hazards from happening but preparedness can make all the difference between life and death. People habitating in highly vulnerable pockets cope up with frequent disasters on the basis of their acumen, accumulated knowledge, accumulated skills and resources of the community and they have managed to survive the fury of the nature through centuries.

In a post disaster scenario Search and Rescue has always played a major role in disaster management. It is on the strength, capability and effectiveness of the search and rescue team that more of human lives could be saved.

Defining Search and Rescue

Search and rescue is a technical activity rendered by an individual or a group of specially trained personnel, who rescue and attend to the casualties under adverse conditions, where life is at threat.

Search and rescue is organized in close cooperation with the community and in a team approach. The search and rescue activities are undertaken in two manners:

- **Community as Local Rescuers:** With adequate safety measures, rescue activities are taken up immediately by the community after any disaster.
- **Outside Community Resources:** Circumstances where the situation is grave and the local rescuers do not have required skills and equipments then specialist assistance from outside the community is required.

The main **Objectives** of a Search and Rescue Team are to:

- ★ Rescue the survivors trapped under the debris, from the damaged buildings or from a cyclonic storm surge.
- ★ Provide First Aid services to the trapped survivors and to dispatch them for medical care.
- ★ Take immediate necessary actions, as for temporary support and protection to endangered collapsed buildings to structures.
- ★ Hand-over, recover and dispose-off the bodies of the deceased.
- ★ Train, demonstrate and raise awareness on how to use the local materials for rescuing the community people.

1.1 Team Composition

Honest, emotionally sound, professionally decisive, volunteers male and female, having good physical condition, with demonstrated capacity and willingness to work in an emergency, could constitute a rescue team.

Volunteers, of both sex, above the age of 18 years with a minimum education level (reading and writing the local language) can be a part of the search and rescue team.

Preference would be given to ex-military or army personnels.

Maggie an 18 year old young girl from Pilloba - one among several small islands in Nicobar, belongs to the fishing community and is an only daughter. On Sunday morning she was woken up by the roar of the sea. She felt her home giving way. She quickly clutched on to a large bamboo raft, and shoved her ailing parents onto it. She held on to it tight. "So did several others", says Maggie. She did scream at everyone to hold as tight as she was doing. That was the only way to escape the fury of the giant waves. The Coast Guard commander confirms: "The waves were well above 10 meters high. They sucked in anything in their path." He says 44 persons from Pilloba were found hanging on the rafts on the violent sea when Coast Guard vessels stopped them. Maggie says "I did what I could do for my dear villagers. I knew I would survive this way, and if I could, the others would too."

1.2 What are the duties of a Rescuer?

The first job of a rescuer is to assess the area so as to save time, which would help in effective response. It is very important for a rescuer to collect information on the extent of damage, approach to the damage area, particulars of the damage and understand if any further damage is likely to occur. The local leaders or the people residing in that particular locality provide all this information. Follow three key principles during the survey:

- (a) Look: See physically the incidents and make a thorough visual inspection.
- (b) Listen: Listen to all the sources of information - from the community, Government records and media reports.
- (c) Feel: Feel convinced regarding the fact, the gravity of the dangers and our own capacity to respond.



School students being trained by Fire Services on Search and Rescue

1.3 Plan

Rescue is a team effort that needs coordination and planning amongst the members for an optimum response operation. After the assessment, the Rescue Team would be in a position to adequately plan the Rescue Operation based on the following specifications:

(a) Manpower (b) Equipment (c) Method

(a) Manpower—The Rescuers can use the skilled manpower if available and also take the help of the local community if required.

(b) Equipment: Ropes, ladders, bamboos or stick, stretchers, boats etc are essential to rescue the affected victims. Sometimes these rescue materials are not available to the rescue team at the site of emergency. Therefore the rescuers use locally available resources like barrels, tinned cans, tubes etc.

(c) Method: There are various other methods, which would be useful for rescuing the victims. The adequate method of rescue is to be determined depending upon the nature of the casualty, the nature of the injuries and the position in which the casualty is found.

- ★ Infra red cameras help in locating people under the rubble by detecting the body heat of the victim.
- ★ Acoustic devices can detect faint noises from the rubble.
- ★ Bio radars are equipments used for the location of marooned victims in flood-affected areas.

Do you know some of the indigenous methods of rescue? When you visit different states do understand the hazard that they are prone to and the indigenous ways to cope up with them.

Be 'BRAVE' and 'STAY CALM' if you have to rescue people



PRECAUTIONS

Some precautions need to be taken while rescuing a person from a building in the following situations.

Before entering a building

- ★ Observe the construction of the building and collapsed portions
- ★ Check whether the walls need any support
- ★ Be careful for possible hazards, which may occur from weak structures

When entering the damaged building

- ★ Use a helmet
- ★ Work in pairs - do not move alone
- ★ Listen for possible sounds
- ★ Keep calling
- ★ Do not touch or disturb any damaged walls or blocked doors which are broken and/or projected.
- ★ Treat all naked wires as live wires.

While moving inside the damaged building

- ★ Do not ignite fire.
- ★ Keep close to the walls
- ★ Be careful in all of your movements.
- ★ Do not pull anything projecting out from the collapsed portions.



Do's for Search and Rescue Operations

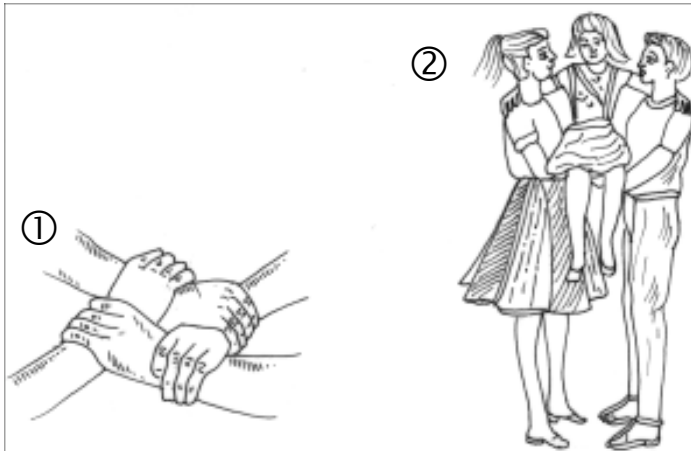
- ☐ Keep calm
- ☐ Make a thorough assessment prior to rescue
- ☐ Keep as near to the wall on damaged stairs as possible.
- ☐ Take maximum safety while removing debris from the vicinity of the casualty.
- ☐ Proper examination of the casualty is a must.
- ☐ Provide First Aid, check and facilitate proper breathing
- ☐ Cover the patient with a blanket or tarpaulin etc. and protect the casualty from further injury
- ☐ Use sharpened tools carefully when moving the casualties.
- ☐ Loosen the clothing and keep the patient lying down and warm.
- ☐ Give artificial respiration, if required, and control bleeding

Don'ts

- ☐ Do not panic
- ☐ Do not start rescue work until you are equipped with adequate information
- ☐ Do not pull timber out of the wreckage indiscriminately. You may cause further collapse.
- ☐ Do not carelessly move an injured casualty unless the person is in immediate danger.
- ☐ Do not expose to further possible injury or adverse conditions.
- ☐ Unless absolutely necessary do not crawl over the debris or on the damaged structure.
- ☐ Do not touch live electric wiring
- ☐ Do not violate safety measures

After rescuing, the victim has to be provided First Aid and every attempt has to be made to see to it that the condition of the victim doesn't deteriorate.

You can have hand made stretchers also!



(a) Upper Garment as stretchers:

The upper garment can be used as stretcher with the help of rods. Close the front openings (buttons/zips) and pull the sleeves inwards. Insert rods through the sleeves in succession for three or four garments.

(b) Ladder/rope as stretcher:

Ladders/ropes are very commonly available. These can be used as stretchers and if you have accessibility to rope and two rods or only rope this can also be used as stretchers.

Try it along with your friends.

Temporary arrangements need to be made for seating the injured and this can be done with the help of two persons using their hands to form a seat. With this the patient can be shifted to a short distance.



Making stretchers out of ropes

Personal Equipments for Rescuer:

Helmet
Torch
Gum- boots
Life Jackets
Whistle



Team Equipments for Rescuer:

Rope
Ladder
Pulley
Small Cutting tools
First Aid Box
Crow Bar
Hammer
Stretcher

ACTIVITY

The class can be divided into five groups and each group need to spell out the equipments that they would require if they had to be a part of the Search and Rescue Team.

Group A: - Cyclone

Group C: - Floods

Group E: - Landslides

Group B: - Earthquake

Group D: - Fire

First Aid

The *Encyclopedia Britannica* states First Aid as "measures to be taken immediately after an accident not with an idea to cure but in order to prevent further harm being done". It uses the available human and material resources at the site of accident to provide initial care to the victim of injury or sudden illness until more advance care is provided.

First Aid has the following main objectives:

- (i) To preserve life
- (ii) To prevent the victim's condition from worsening
- (iii) To promote recovery

Golden Rule of First Aid.....

BE CALM - DO NOT PANIC

Take a moment to think clearly as to what "YOU" should do. If you think you can take appropriate action during the emergency then do so, but if you are in any doubt then don't act as a "HERO". Do not hesitate to ask others to assist you or to raise the alert.

The Goals of First Aid are:

1. To restore and maintain vital functions. **The ABC of basic life support (Airway, Breathing, and Circulation)** are always the first priority.
 - **Airway** must be open so that air containing oxygen enters the body
 - **Breathing** must take place so that oxygen passes through the lungs into the blood stream
 - The heart must **circulate** the oxygen carrying blood
2. To prevent further injury or deterioration
3. To reassure the victim and make him or her as comfortable as possible

Action Plan

This Action Plan is a vital aid to the first aider in assessing whether the victim has any life-threatening conditions and if any immediate first aid is necessary. They are '**DRABC**'

D - Check for **DANGER**

- To you
- To others
- To victim

R - Check **RESPONSE**

- Is victim conscious?
- Is victim unconscious?

A - Check **AIRWAY**

- Is airway clear of objects?
- Is airway open?

Make your own First Aid Kit:

- Cotton wool
- Adhesive tape
- Crepe bandage
- Sterile Dressing
- Triangular Bandage
- Thermometer
- Scissors
- Glove
- Soap
- Pain reliever
- Antacid
- ORS Packets



B - Check for BREATHING

- Is chest rising and falling?
- Can you hear victim's breathing?
- Can you feel the breath on your cheek?

C - Check for CIRCULATION

- Can you feel a pulse?
- Can you see any obvious signs of life?

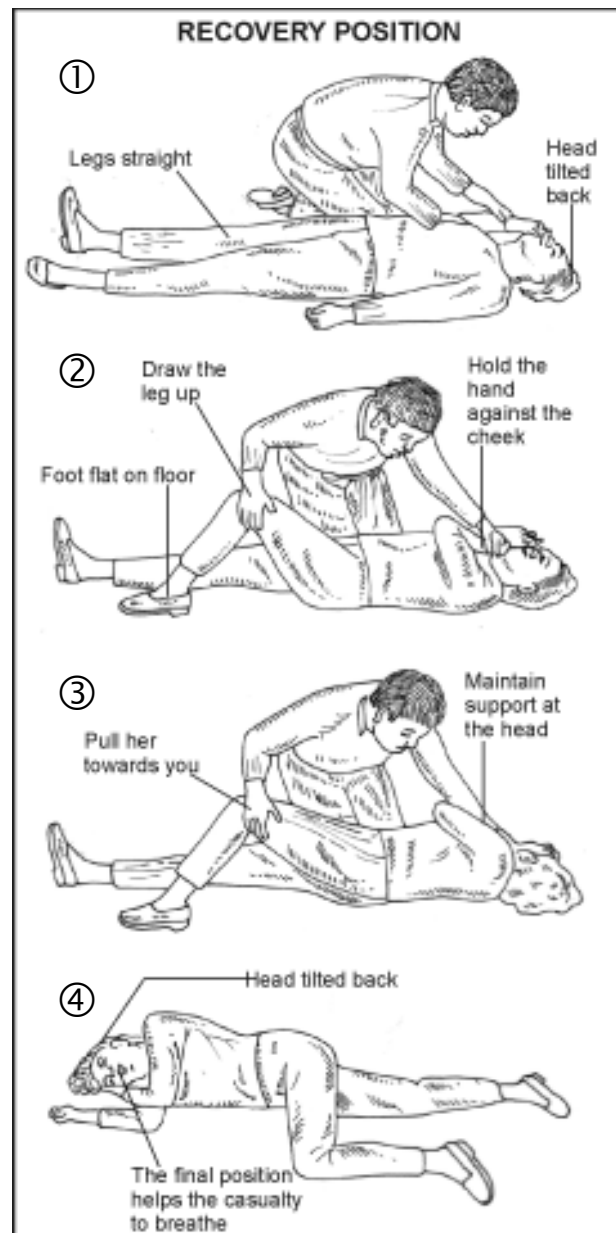
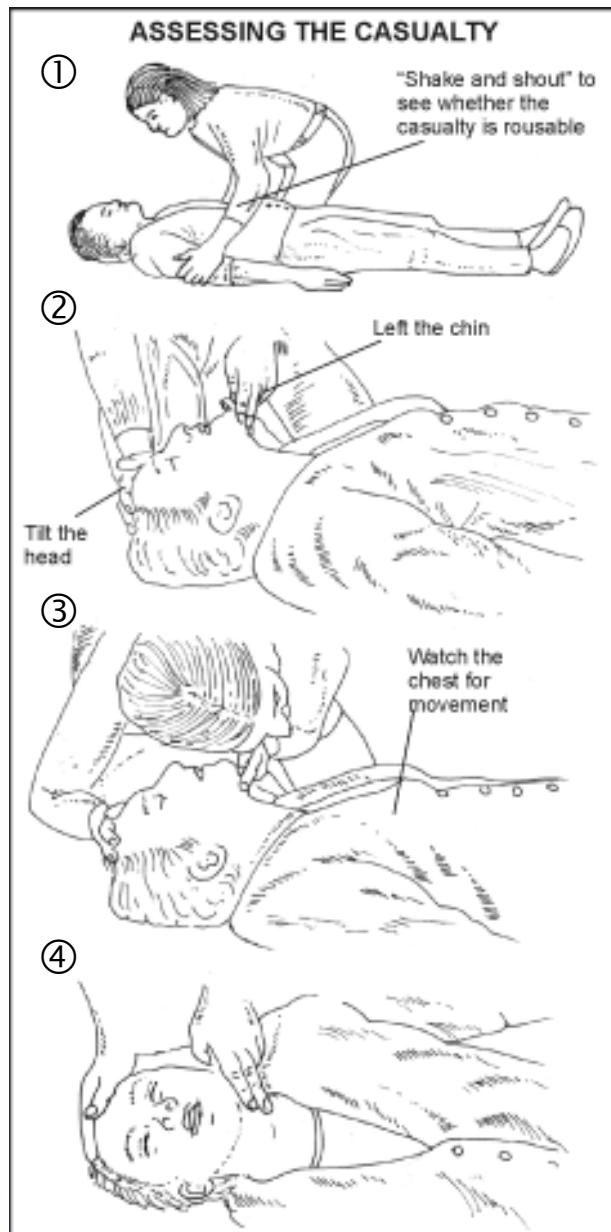


FIG 1: Assessing the casualty / Recovery position

Fainting or losing consciousness

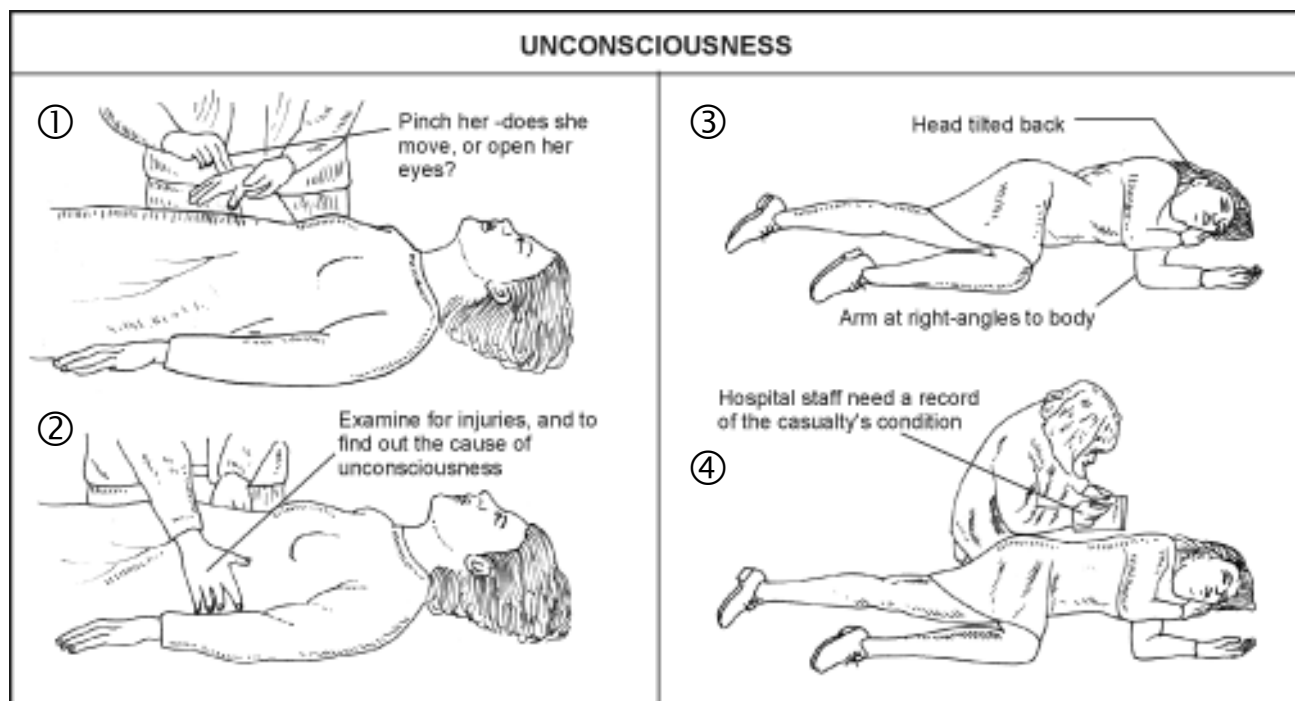
Fainting is a brief loss of consciousness and is the result of an interference with the function of the brain. There are many causes of unconsciousness, the most common of which are: fainting, head injury, epilepsy, stroke, poisoning, diabetes and conditions associated with lack of oxygen. If you have seen a person fainting then:

Do's

- ☐ Catch the person before he/she falls
- ☐ Pinch the person and see if she moves or opens her eyes
- ☐ Examine the injuries and causes of unconsciousness
- ☐ Tilt head back and keep arms at right angle to body
- ☐ Raise the legs 8 – 12 inches. This promotes blood flow to the brain.
- ☐ Loosen any tight clothing
- ☐ Keep the victim warm if it is cold outside
- ☐ Keep a record of the casualty's condition

Don'ts

- ☐ Don't give the patient anything to eat or drink
- ☐ Don't allow the person who has just fainted to get up until the victim is fully conscious
- ☐ If the area is warm, don't crowd around the victim

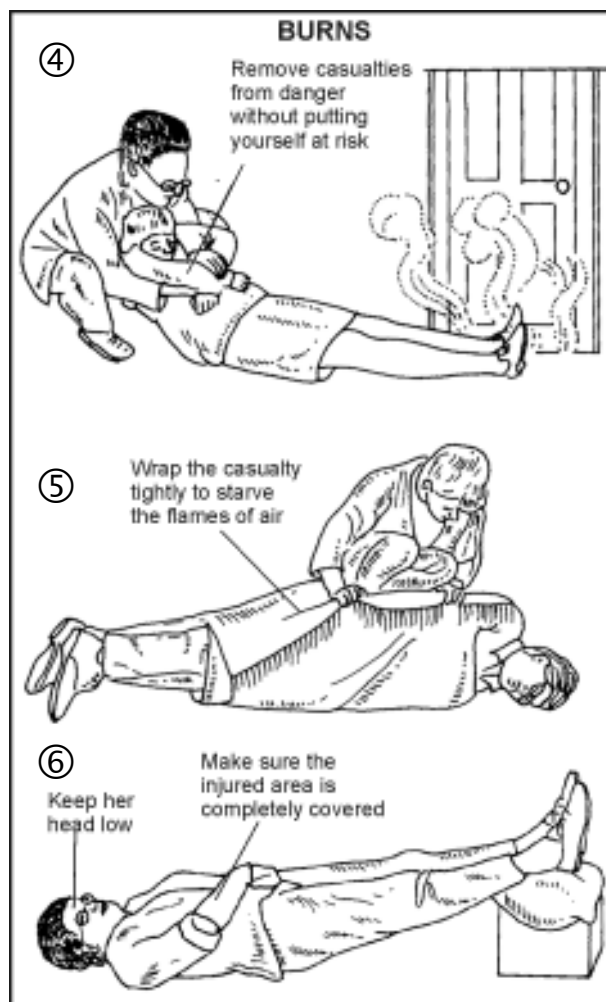
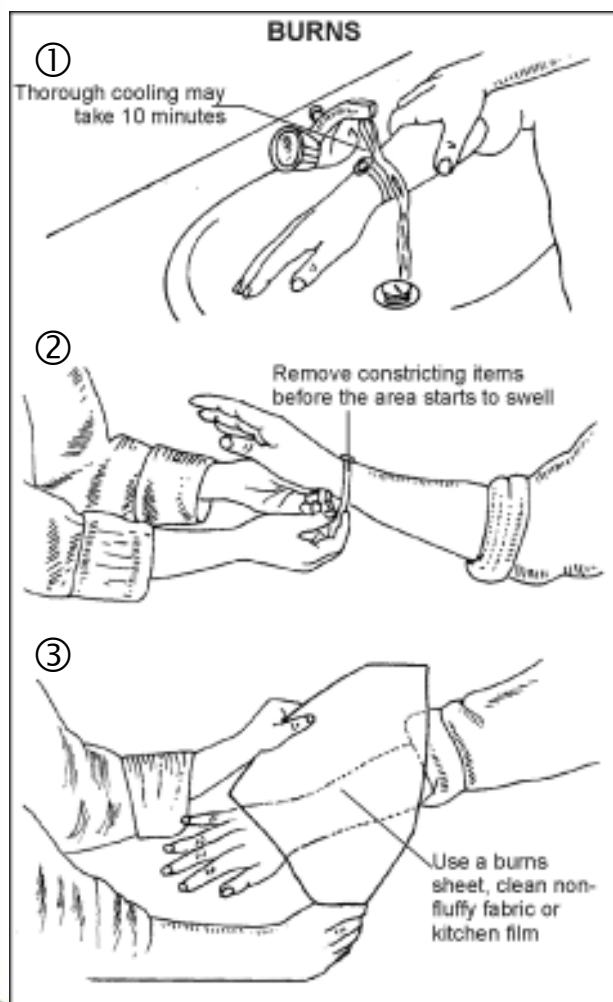


Burns

A burn is damage to the skin caused by contact with dry heat. It may be caused by fire, flames, steam, hot liquids, hot metal, sunlight, electricity or chemicals.

The degree of burn varies:

- (i) First Degree (Superficial) - Involves only top layer of the skin and is red and dry and the burn is generally painful. The area may swell. Most burns are first degree burns.
- (ii) Second degree (Partial - Thickness) - Involves both the epidermis and dermis. The area is red and blisters may open and weep fluid, making the skin appear wet. These types of burns are usually painful and the area often swells.
- (iii) Third Degree (Full Thickness) - Destroys both the layers of the skin with muscles, bones, blood vessels and nerves. These burns may look brown or charred with tissues underneath sometimes appearing white.



Do's

- ☐ *Immediately immerse the burnt area in cool water or by applying clothes soaked in cool water.*
- ☐ *Remove jewellery and constrictive clothing before swelling or blisters occurs.*
- ☐ *Cover the area with a dry, sterile dressing and not cotton or other fluffy material.*
- ☐ *Drop, Cover and Roll if caught fire or cover the person with a blanket immediately*

Don'ts

- ☐ *Don't place a burn under extreme water pressure*
- ☐ *Don't remove the cloth that is stuck to the burnt area.*
- ☐ *Don't apply butter ointment, oil, ice in the area affected*

Frost-bite

Frost- bite occurs when body tissues freeze after exposure to below zero temperatures. The signs and symptoms include white, waxy looking skin that is firm to the touch but the tissue underneath feels soft and pain followed by numbness.

Do's

- ☐ *Cover frostbitten toes, ears with warm hands.*
- ☐ *The area affected can be warmed by breathing on them or placing them in a warm area of the body or by dipping the affected area in warm water (40 degree centigrade).*
- ☐ *Cover the area affected.*

Don'ts

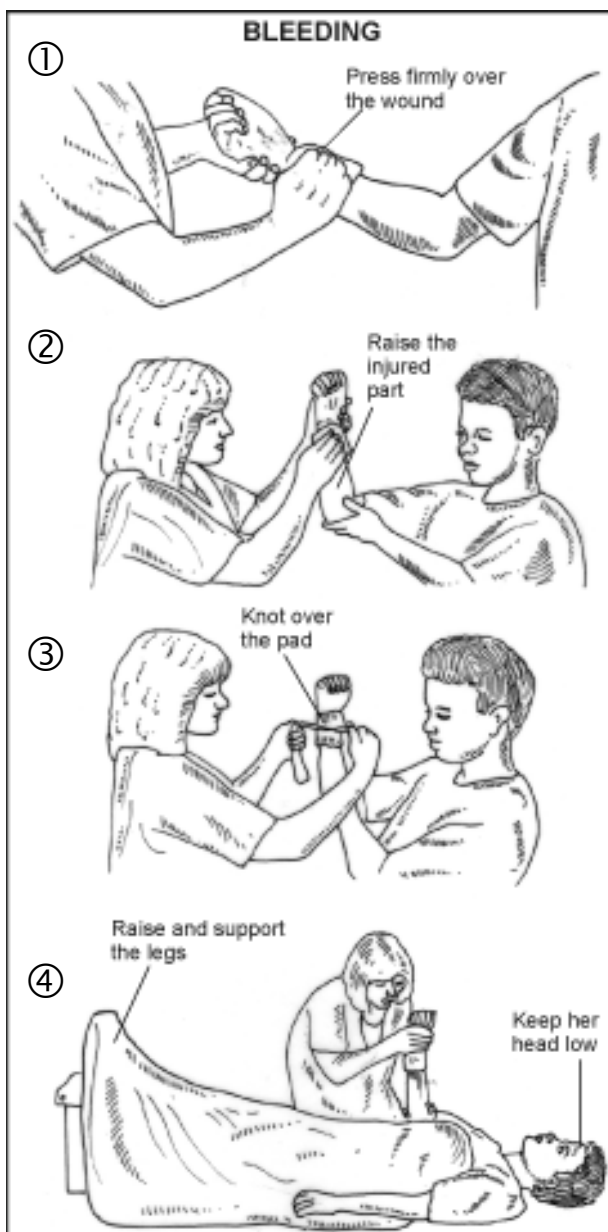
- ☐ *Do not rub as tiny ice crystals in the tissues may cause more damage.*
- ☐ *Never rub snow on the area as this may cause further freezing and do not apply direct heat as this may re-warm the area too quickly.*
- ☐ *Do not let the patient walk.*
- ☐ *Do not break blisters if any.*

Bleeding

Cuts, scrapes and puncture can result in bleeding. Severe bleeding can be life threatening. To stop bleeding restore to:

- ☐ Direct pressure
- ☐ Elevation - Lie victim down and raise the injured part above the heart and handle gently if you suspect a fracture.

The blood gets thicker after bleeding for a few minutes. This is called clotting. Clotting slows down bleeding. Bandaging is done to stop bleeding and to stop dirt infecting the wound. Change the bandage at least once a day and tetanus injection needs to be taken if required.



Warning

- ❑ If bleeding from a limb doesn't stop, apply pressure with hand to pressure point.
- ❑ If embedded object in wound, apply pressure either side of wound and place pad around it before bandaging.
- ❑ Wear gloves, if possible to guard against infection
- ❑ If the victim becomes unconscious, follow DRABC

Electrocution

Electricity can be very dangerous unless used with care. When an accident occurs with electricity, the First Aider must remember that it is not safe to touch the casualty until the power has been turned off. The signs and symptoms include surface and internal burns and breathing and heart beat stopped.

The best way to treat the person electrocuted is to cut off the power supply and remove the victim from the source with non-conductive material. Carry out the DRABC exercise and cover the area affected with clean dressing and send him/her to the hospital immediately if necessary.

REMEMBER...Never approach the casualty in a high-voltage zone, as the first aider might endanger his own life

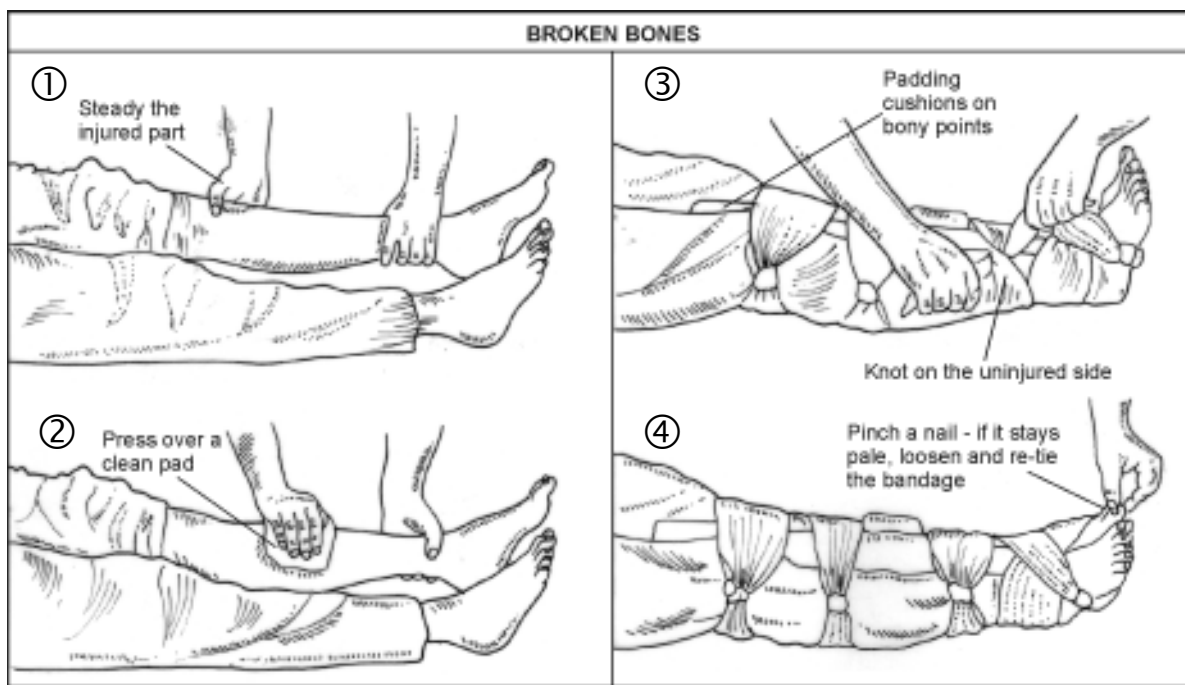
Snake Bite

Most of the snakes are harmless. It is because of our fear that snakes generally attack us. Snakebites generally occur on the limbs and most often on the legs. Always assume the bite to be from a venomous snake. Suspected snakebite must be treated with a pressure immobilization bandage.

Do's

- ❑ Keep the bitten limb below the level of the heart
- ❑ Allow the affected area to bleed freely for 15 – 30 seconds
- ❑ If the bite is on the limb, apply a firm roller bandage two inches away from the wound.
- ❑ Wash the affected area with soap and disinfect the area
- ❑ The bandage should be loose enough for a finger to slip through
- ❑ Constantly check airway, breathing and blood circulation
- ❑ Start resuscitation if needed but see to it that there are no wounds in the mouth. Suck it out but do not swallow – spit the venom out. Rinse your mouth afterwards.
- ❑ Shift the patient immediately to the hospital and see to it that the person is at rest during transport.
- ❑ Stay calm.
- ❑ Instruct the person to avoid all movement on the area affected.

Fractures and Sprains



Fracture refers to an injury affecting the skeleton and can be caused by the application of direct and indirect force. The general signs and symptoms are:

- ★ Pain at or near the site of injury increased by movement.
- ★ Movement may be difficult or impossible
- ★ Swelling and later bruising of the injured part
- ★ Deformity at the site of the fracture
- ★ Shock may occur

General First aid that could be given to a person is

- ★ Check the danger, response, airway, breathing and the blood circulation of the victim (DRABC)
- ★ Always control severe bleeding before immobilizing any fractures
- ★ Place sufficient padding to support fracture site
- ★ Immobilize fracture sites
- ★ Do not force bones back into the wound
- ★ Give proper padding before the patient is shifted to the hospital
- ★ Apply ice pack on the affected area to reduce pain and control swelling
- ★ Treat to prevent shock

Poisoning

Poisoning is any substance that causes injury, illness or death when introduced into the body.

Ingested poisons are introduced through the mouth by eating or drinking poisonous substances.

Inhaled poisons are introduced through the lungs by inhaling industrial gases, fumes from fire, chemical vapors and petrol and engine exhaust. *Absorbed poisons* are absorbed through the skin via contact with poisonous sprays such as pesticides and insecticides.

Do's

- ☐ Check the danger, response, airway, breathing and the blood circulation of the victim
- ☐ Give milk or water to dilute down the poison
- ☐ Monitor vital signs and prevent shock
- ☐ Observe the amount and colour of vomitus
- ☐ Check for foreign matter in his or her mouth and remove it so that he/she can breath freely
- ☐ Place the patient in the recovery position and wait for medical assistance.
- ☐ Send to hospital

Don'ts

- ☐ Don't induce vomiting

Heat Stroke

It strikes suddenly with very little warning. When the body's cooling system fails, the body temperature rises fast. This creates an emergency condition.

The signs are: the temperature of the body is very high, hot and dry. The skin is red with no sweating and fast pulse rate, dilated pupils, confusion and sometimes there might be loss of consciousness.

Do's

- ☐ Lower the body temperature by removing/loosing the clothing or fanning the person.
- ☐ Put ice pack or cold compresses to the neck, under the armpits and to the groin area.
- ☐ Drink lots of fluid and those who perspire more should drink as much fluid as possible.
- ☐ Stay away from places that are hot.

Oral Rehydration Solution (ORS)

ORS has been a lifesaver in case of dehydration (loss of salt and water in the body). The ORS is prepared by dissolving a pinch of salt in a glass of water (the amount of salt added should just be enough for the water to taste like tear drops) and one tablespoon of sugar to it. ORS helps in restoring back the electrolyte balance of our body and re-hydrate it.

You too can now make it at home when you feel you are de-hydrated

Dog Bite

The aim of First Aid in case of dog bite is to prevent rabies, to reduce the risk of infection and to get medical aid as soon as possible.

- ★ Wipe the saliva away from the wound using a clean cloth or handkerchief.
- ★ Do not come in contact with the saliva that gets wiped away.
- ★ Wash the wound thoroughly with plenty of soap and water.
- ★ Cover the wound with a dry, sterile dressing.
- ★ Get medical aid or send the patient to the hospital as soon as possible.

Reference for further reading:

- ★ Report on 'Training Programme on Search and Rescue for the members of the Village Disaster Management Teams, by Disaster Mitigation and Management Centers, Government of Uttaranchal.
- ★ Training manual of Indian Red Cross.
- ★ <http://www.frontlineonnet.com/fl1805/18050350.htm>



1. What is the main objective of Search and Rescue team? Define the team composition.
2. Identify two indigenous ways to rescue people in case of Floods.
3. Name three different ways to make a stretcher with the locally available resources.
4. Explain the goals of First Aid.
5. What are the causes of fainting and what are the measures that need to be taken up if you see someone who has fainted?
6. Identify two signs and symptoms of sprain and fracture.

4. *Alternative Communication Systems... during disasters*



In Monsoon-2004, severe flood situations in the States of Assam and Bihar caused major devastation. Many district head quarters got totally cut-off from the State head quarter and neighboring districts due to submerged telephone exchanges or damaged cables and disrupted roads and railways communication. In the worst affected districts the need for relief and rescue operation could not be communicated to the State head quarters. Realizing this, State

Government requested National Disaster Management Division of the Government of India to immediately send the emergency coordination kits containing satellite phones to establish communication links among the severely affected districts and state headquarters.

From the above case study, we see that during any major disaster or emergency situation, the communication links are totally disrupted. Therefore, it is crucially important to have completely functional communication links among Government authorities at various levels to provide adequate assistance to the affected population. This chapter tries to explain various basic telecommunication facilities, need for alternative communication systems during the large-scale natural disaster/emergency situations, and modes of emergency communication systems including satellite based communication systems.

Can you think of today's world without the telecommunication links?

Quite difficult, right? The telecommunication links have become a vital part of our daily life. Most popular means of communication is the public wired telephone, which is known as *Public Switched Telephone Network (PSTN)* line. This is the prime network connecting all Government and Private offices, police stations, fire stations, hospitals and majority of homes and business places by transmitting and receiving voice, fax and data. The usage of Wireless phones such as mobile (cellular) phones have also become widespread in recent times.

Why does telecommunication network get disrupted or jammed in event of a major natural disaster or emergency situation?

Unfortunately at the time of major natural disasters such as earthquake, cyclone, flood and landslide, the regular telecommunication infrastructure of public wired and wireless (mobile) telephones get severely damaged and become non-functional. This mainly happens because of the *damaged cables* and *cellular transmission towers* or *disrupted power supply* to operate the telephone exchanges and cellular transmission towers. The wireless radio communication network of Police and Civil authorities also gets affected due to damaged transmission towers. During this emergency situation, the communication traffic goes beyond its capacity which leads to congestion of the network or in worst case, complete failure of network.

Do You Know...

Generally, a perfectly working PSTN system is designed so that no more than 5% of the phones connected to it can be talking at the same time. During a crisis, there may be too much traffic for it to handle as 'Everyone wants to speak to everyone', and hence the network gets jammed.

Do we really need to have alternative communication systems, in case the normal communication lines fail?

Yes, we do. At the time of any major disaster or emergency situation, it is extremely necessary to have the communication links operational among Government authorities at various levels and the people/volunteers working in the disaster affected areas to help the affected population.

It becomes imperative to ensure that the critical needs of search and rescue operations, relief and response measures are communicated among the authorities of State Government, local administration, voluntary organizations and the affected population. This situation calls for reliable alternate communication links, which ensures the rapid movement of the right resources to the right place at the right time. It may also happen that some severely affected areas get completely disconnected from other parts of the world. In such situations, the urgent needs of the disaster-affected population are not known or communicated to the responsible Government authorities, voluntary organizations and unaffected populations in the vicinity. This may lead to severe losses in terms of human lives, livestock and property.

The prime communication networks of Government of India.

NIC: National Informatics Centre (NIC) is a premiere Science & Technology organization of the Government of India in this field. It functions through a nationwide information and communication technology (ICT) network called NICNET.

BSNL: The Department of Telephone Operations, Government of India became a corporation on October 1, 2000 and was christened Bharat Sanchar Nigam Limited (BSNL). Today, BSNL is a leading telecommunication company and the largest public sector undertaking of India. It has a network of over 45 million lines covering 5000 towns with over 35 million telephone connections. Its responsibilities include improvement of the quality of telecom services, expansion of telecom network, introduction of new telecom services in all villages and instilling confidence among its customers.

Modes for Emergency Communication

RADIO COMMUNICATIONS

In the scenario where normal telephone and mobile phone network is disrupted or such services have never existed in the disaster affected area, we need to find out other reliable means of communicating urgent messages from the site to shorter and longer distances. The first obvious choice is to establish a wireless radio communication network limited to the area of operations. Any wireless communication link is based on the Radio waves either using the terrestrial or satellite systems.

A radio wave is an electromagnetic wave propagated by an antenna. Radio waves have different frequencies, and by tuning a radio receiver to a specific frequency you can pick up a specific signal. Hand held wireless sets (walky talky) are considered to be more suitable for local communication in case of such emergencies.

Amateur (Ham) Radio

In the event of major disasters/emergencies, it has been experienced that Amateur Radios have worked successfully when no other communications worked.

Amateur radio, also known as 'Ham radio', does not refer to special kind of radio but to a special set of rules which apply to certain frequencies as defined by the International Telecommunications Union (ITU) and regulated in India by Wireless Planning and Coordination Wing, Ministry of Communications. The laid down rules allow these frequencies to be used only for research, education and personal purpose. The word Amateur implies the use of radio communications for non-commercial purposes. Amateur Radio operation does not use the ground based infrastructure, and has limited power requirements which can be easily met by batteries and generators and thus work successfully in emergencies.



Amateur radio is getting popular in India as a creative hobby and there are around 15,000 licensed Amateur Radio Operators (Hams) in India. Amateur Radio is an unbeatable way of learning about radio communications, and not only will you learn much, but you would also be able to help at the time of emergency. Licensed Amateur Radio Operators are known as Amateurs or Hams. Most Governments expect their Amateurs to provide emergency communication support in case of an emergency and Amateurs always come forward to provide their services voluntarily for establishing crucial

communications among the emergency response managers. Such Amateur volunteers provided commendable services during the Orissa super cyclone in 1999 and Gujarat earthquake in 2001.

In efforts to popularize the Amateur Radio in the country and develop a trained force of licensed Amateurs, Department of Information Technology has initiated a nation wide programme to establish Amateur Radio Stations at various places and provide the necessary training for interested Amateur Station Operators.

SATELLITE BASED COMMUNICATIONS SYSTEMS

Satellite based Communication systems mean communication systems intended for users on the Earth but which have some equipment in space, i.e. a satellite. Different satellites carry out different jobs, such as taking weather pictures or finding accurate positions on earth in terms of latitudes and longitudes. Communications satellites are essentially radio relay stations in space and are sometimes referred to as COMSATS. The other words you may hear are SATCOMS for satellite communications in general and SATPHONE for a satellite phone terminal.

The most important feature of a communications satellite is the transponder - a radio that receives a conversation at one frequency and then amplifies it and re-transmits it back to Earth on another frequency.

HAM operator helps families connect with tsunami victims

New Delhi, December 28 .The Tribune



An amateur radio enthusiast based in the Capital has succeeded where most government agencies have failed. Sandeep Baruah, a licensed HAM operator who works in a government organisation by day and pursues his hobby from home at night, has managed to establish communication links with Port Blair, the capital of Andaman and Nicobar Islands, and has helped relay messages between the people stranded on the island and their families back home.



When deadly floods struck central and southern Texas-USA in mid-October 1998, amateur radio operators from four states volunteered their time. A volunteer is shown helping with communications at a Red Cross office.



A Ham operator is on the radio, reporting a new flare up during the forest fires that broke out in several counties in Florida-USA during June and July of 1998.

YOU CAN ALSO BECOME AN AMATEUR AT THIS AGE BY PASSING THE AMATEUR STATION OPERATORS LICENSE (ASOL) EXAMINATION TAKEN BY WPC WING, MINISTRY OF COMMUNICATION, GOVT. OF INDIA



A young operator enjoys making friends over the radio. Amateur radio is a fascinating hobby for people of all ages and all walks of life irrespective of educational qualifications and status.

A satellite normally contains hundreds or thousands of transponders. Data, television, image and some telephone transmissions are routinely received and re-broadcasted by these transponders of communication satellites.

Present operational Indian space systems include Indian National Satellite (INSAT) for tele-communication, television broadcasting, meteorology

and disaster warning and Indian Remote Sensing Satellite (IRS) for resources monitoring and management.

This mode of communication is most reliable as the radio relay stations, Communications satellites, are in space and not at all vulnerable to any natural disasters on the earth, while global communications links can be established with very small, portable and easy to install satellite antennas.

Most widely used means of satellite communications in disaster management is 'satellite phone'. For these phones the satellite works as a telephone exchange. These phones provide very reliable voice and data communication and are very handy and can be transported to any location.

Government of India is equipping the Disaster/Emergency managers in multi-hazard prone Districts/States with portable Satellite phones so that proper communication among the administrations at local and State level can be maintained in case the main communication lines fail.



INMARSAT Satellite Phone

Radio communications and satellite based communication system are highly reliable and widely used. All India Radio, Doordarshan and Press Trust of India also play a key role in collecting and disseminating information.

Reference for further reading:

- <http://home.nic.in>
- www.isro.org
- <http://www.dotindia.com/wpcc/spectrum-home.htm>
- www.itu.int
- www.howstuffworks.com



1. Why should the alternative communications systems be installed?
2. Name two prime communication networks of Government of India and explain their functions.
3. How is Amateur (Ham) radio different from the common radio communication?
4. What makes the Satellite based communication systems more reliable in case of large-scale natural/manmade emergencies?

5. *Safe Construction Practices*



*A powerful earthquake measuring 6.6 at the Richter scale struck **SOUTHEASTERN IRAN** on **26th December, 2003** at **5:26:52 AM** (local time) and caused enormous loss of life, and near total destruction of physical assets, killing 30,000 people and injured another 30,000. The health and education infrastructure was severely damaged and over 85% houses collapsed.*



A super cyclone slammed the state of Orissa on October 29, 1999 with a wind speed of 270-300 kmph, accompanied by torrential rains ranging from 400 mm to 867 mm continuously for three days. Over 7 lakh buildings were completely damaged and 13 lakh buildings were partially damaged.

In Class VIII and Class IX textbooks we have studied about causes, effects and mitigation strategies of natural and manmade hazards. In this chapter we will discuss about some of the important factors to be considered to construct a building resistant to four natural hazards: **earthquake, landslide, cyclone and flood**. The cost of natural disasters to lives, property, livelihood and infrastructure have skyrocketed in last few decades, as the world's population has grown and people have started residing in areas that are vulnerable to natural hazards. The most successful way to mitigate loss of life and property, is to construct buildings that are **disaster resistant**. This chapter outlines some of the structural safety measures that need to be taken up for constructing disaster resistant buildings.

Earthquakes

On December 23, 1972, a series of earthquakes shook the Central American nation of Nicaragua. The largest earthquake registered 6.2 on the Richter scale. The earthquake's epicenter was located precisely at the capital city of Managua. The earthquake resulted in the destruction of the heavily populated central zone and damage to a total area of about 27 square kilometers (10 square miles). Subsequent fires blazed throughout the city, compounding the damages. In the wake of the disaster, at least 8,000 of Managua's total population of 430,000 had died, 20,000 were injured, over 260,000 had fled the city, 50 percent of the employed were jobless, and 70 percent were left temporarily homeless. At least 10 percent of the nation's industrial capacity, 50 percent of commercial property, and 70 percent of government facilities were rendered inoperative. Overall, the damage estimated in US dollars was \$845 million.

GROUND MOVEMENTS

The ground movements caused by earthquakes can have several types of damaging effects. Some of the major effects are:

1. Ground shaking, i.e. back-and-forth motion of the ground, caused by the passing vibratory waves through the ground.
2. Soil failures, such as liquefaction and landslides, caused by shaking;
3. Surface fault ruptures, such as cracks, vertical shifts, etc.
4. Tidal waves (tsunamis), i.e. large waves on the surface of bodies of water that can cause major damage to shoreline areas.

EFFECT ON BUILDINGS

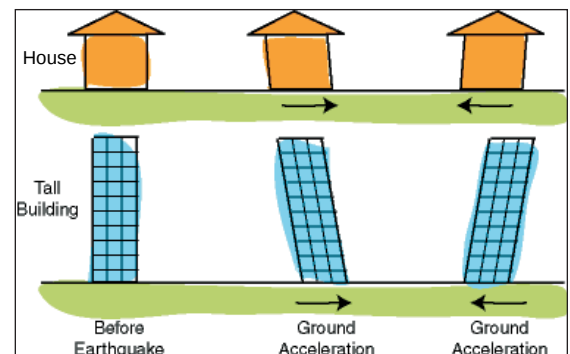
As the vibrations and waves continue to move through the earth, buildings on the earth's surface are set in motion. Each building responds differently, depending on its construction. When the waves strike, the earth begins to move backward and forward along the same line. The lower part of a building on the earth's surface immediately moves with the earth. The upper portion, however, initially remains at rest; thus the building is stretched out of shape.

Gradually the upper portion tries to catch up with the bottom, but as

it does so, the earth moves in the other direction, causing a "whiplash" effect. The vibration can cause structural failure in the building itself,



The building has tilted as a result of column failure & has partly damaged the nearby building (Taiwan 1999). (By Bachmann H., Sesimic Conceptual Design of Buildings)



Shaking of short and tall building due to ground acceleration

or to an adjacent building having different response characteristics.

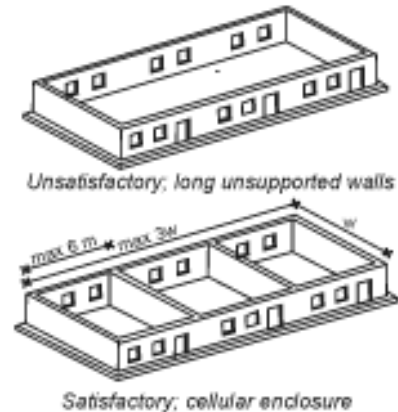
Taller buildings also tend to shake longer than short buildings, which can make them relatively more susceptible to damage.

PROTECTION MEASURES

The primary objective of earthquake resistant design is to prevent collapse during earthquakes thus minimising the risk of death or injury to people in or around the buildings. There are certain features which if taken into consideration at the stage of architectural planning and structural design of buildings, their performance during earthquakes will be appreciably improved. Some of these are stated below :

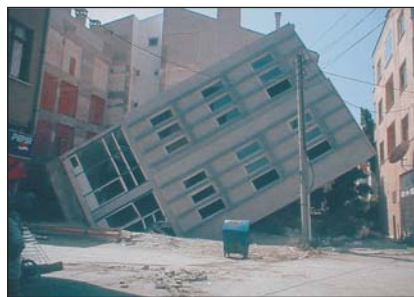
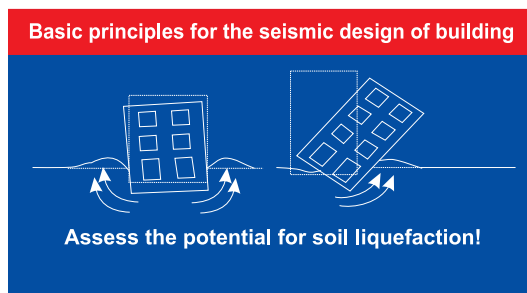
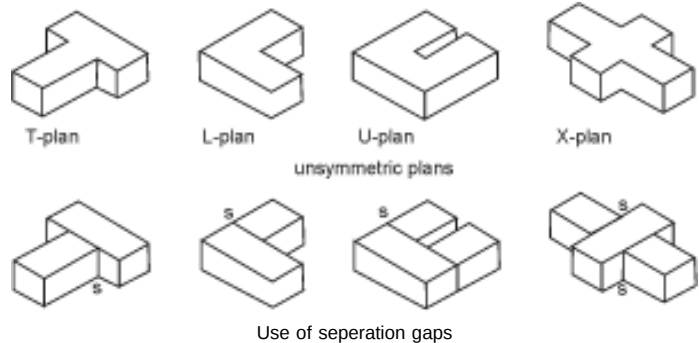
Building configuration

- ★ The building should have a simple rectangular plan.
- ★ Long walls should be supported by Reinforced Concrete columns as shown on the right side.
- ★ Large buildings having plans with shapes like T, L, U and X should preferably be separated into rectangular blocks by providing gaps in between.



Foundation

Buildings which are structurally strong to withstand earthquakes sometimes fail due to inadequate foundation design. Tilting, cracking and failure of structure may result from soil liquefaction. *Soil liquefaction refers to transformation of soil from a solid state to a liquid state as a consequence of increased pressure.*



*Tilting of building due to liquefaction (Adapazari, Turkey 1999)
By Bachmann H., Sesimic Conceptual Design of Buildings*

Depending on the type of soil conditions the depth of the foundation has to be decided.

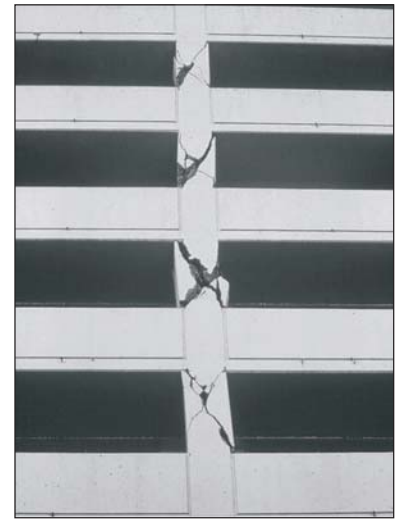
Control on openings in walls

Door and window openings in walls should preferably be small and more centrally located. Too many or large openings will make the wall vulnerable to collapse during earthquakes. The location of openings should not be too close to the edge of the wall.



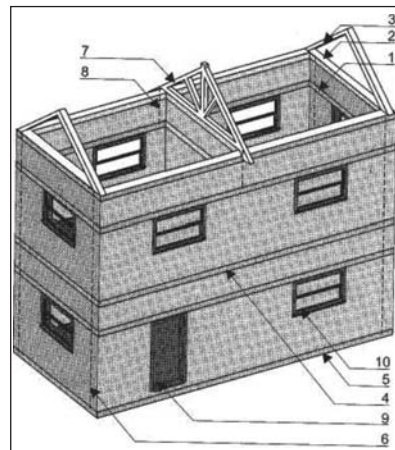
RIGHT: Damage to columns due to long openings & windows located at the edge of the column (Northridge, California 1994)

LEFT: Long window opening caused additional shear stress & column failure (Izmit, Turkey 1999) By Bachmann H., Sesimic Conceptual Design of Buildings



Reinforced concrete bands in masonry buildings

For integrating the walls of an enclosure to perform together like a rigid box reinforced concrete bands are provided which *run continuously on all external and internal walls including fixed partition walls*. One or more of the following bands may be necessary in a building. Plinth band, lintel band, roof band, and gable band are names used for the band depending on the level of the building where the band is provided.



Overall arrangement of reinforcing in masonry double storey building having pitched roof

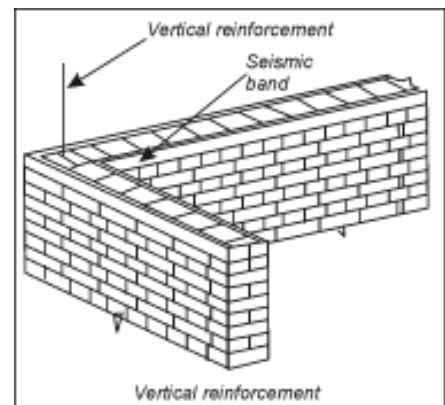
Legend

- 1 Lintel band
- 2 Eave level (Roof) band
- 3 Gable band
- 4 Floor band
- 5 Plinth band
- 6 Vertical band
- 7 Rafter
- 8 Holding Down bolt
- 9 Door
- 10 window

Vertical reinforcement

Vertical reinforcement should be provided at corners and junction of walls. It shall be passing through the lintel bands and floor slabs or floor level bands in all storeys.

Earthquake doesn't kill people. It is the badly designed buildings that kill the people. So to prevent an earthquake hazard from becoming a disaster our buildings should be properly designed incorporating the earthquake resistant design features into it.



Landslides

Landslides are among the major natural disasters or calamities in the world. In hilly terrains of India, including Himalayan mountains landslides have been a major and widely spread natural disasters that strike life and property almost perennially and occupy a position of major concern. These landslides, year after year, bring about untold misery to human settlements apart from causing devastating damages to transportation and communication network.

Landslides, debris fall, debris slide, debris flow, rock toppling etc. cause destruction of slope and ground surface, initiating the change of uncontrolled erosion in the mountain terrains.

On 21st August, 2002, heavy monsoon in eastern Nepal triggered landslides and flashfloods which killed 419 people and injuring 105 people. More than 53,152 families were affected and about 19,485 houses were destroyed. A total of 47 districts were affected.

FACTORS THAT CAUSE LANDSLIDES

Landslides occur because of the interplay of several factors.

Natural factors

- ★ Intensity of rainfall
- ★ Steep slopes
- ★ Stiffness of slopes
- ★ Highly weathered rock layers
- ★ Soil layers formed under gravity
- ★ Seismic activity
- ★ Poor drainage

Man made factors

- ★ Deforestation leading to soil erosion
- ★ Non-engineered excavation
- ★ Mining and quarrying
- ★ Non-engineered construction
- ★ Land use pattern



Normal life disrupted in the hilly terrains of Uttarakhand



Large volume of sediments, rudiments of buildings and other debris were transported by debris flows and high flood water

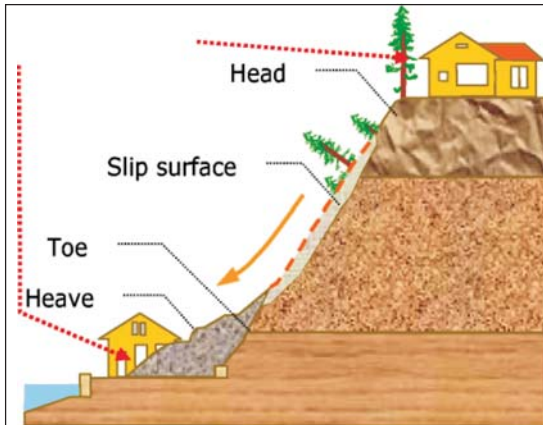
MOST VULNERABLE HOMES

Vulnerable houses are those which are situated on:

- ★ Existing landslides area.
- ★ Steep natural slopes.
- ★ Areas in or at the mouths of drainages (such as canyons).
- ★ Houses constructed near foothills.

PROTECTION MEASURES FROM DAMAGE TO BUILDINGS

Site Selection



Landslides generally happen where they have occurred in the past, and in identifiable hazard locations. Areas that are typically considered safe from landslides include areas that have not moved in the past; relatively flat areas away from sudden changes in slope; and areas at the top of or along ridges. Houses built at the toe of steep slopes are often vulnerable to slides and debris flows.

Signs and Warnings

If your house is on a hill, you can detect possible slope failure if you watch for these signs:

- ★ Doors or windows stick or jam for the first time.
- ★ New Cracks appear on plaster, tile, brick or foundations.
- ★ Outside walls, walks or stairs begin pulling away from the building.
- ★ Slowly developing, widening cracks appear on the ground or on paved areas such as streets or driveways.
- ★ Underground utility lines break.
- ★ Fences, retaining walls, utility poles or trees tilt or move.
- ★ Water or bulging ground appears at the base of a slope.

Take Preventive Action

The potential for landslides and destructive erosion can be greatly reduced or prevented with proper development, sound construction techniques, seasonal inspections and regular maintenance of drainage facilities.

Protect Vulnerable Areas

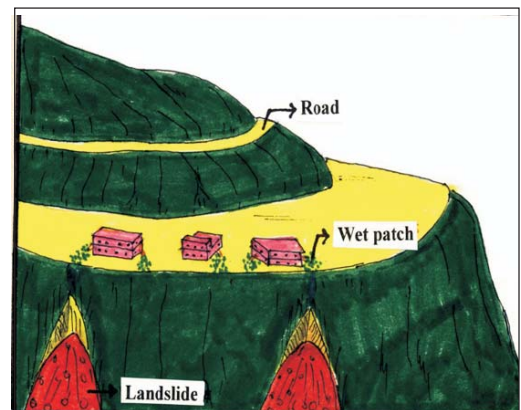
Keep surface drainage water away from vulnerable areas, such as steep slopes, loose soils and non-vegetated surfaces.

Collect Runoff

Collect and direct water from patios, driveways, non-vegetated surfaces, into catch basins; and confine water flow in drainpipe such as a drainage ditch, drywell, gutter, natural drainage or holding pond. Roof water may go directly to the drainpipe.

Intercept Surface Water

When surface water flows onto your property, and where a discharge point is available, dig a shallow, gently sloping ditch to intercept the water and direct it into a natural water course, vegetated drainage area, street pavement, or road drainage ditch. Your intercepting ditch should be nearly horizontal, with a minimum slope, sufficient to allow water to flow slowly. Smoothen the sides of the ditch and grow vegetation ; keep all ditches free of debris.

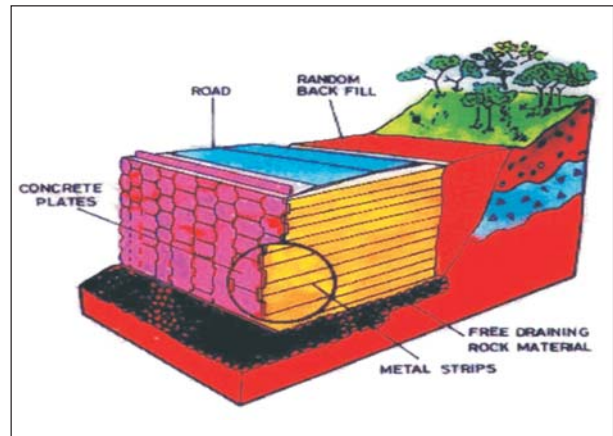


Stabilize Slopes

- ★ Improve your soil's ability to resist erosion by stabilizing slopes by increasing vegetation and trees.
- ★ Straw, woodchips, or bark applied to a depth of at least one inch are effective in holding soil in place on slopes.

BARRIERS

Property owners at the toe of steep slopes may be able, in some situations, to create barriers or catchments that trap smaller landslides. Such structures must be designed to withstand the volumes and velocities of material in any potential slide. In addition, designs must allow removal of trapped material. Barriers may consist of reinforced walls on the side of a building facing the slope.



Floods

Bangladesh is a riverine country where recurrent flooding is both common and necessary. Every year large areas are submerged during the monsoon season and fertilized by deposits of fresh alluvium, i.e., the soil deposited by moving water. However, if the waters remain stagnant for too long, these beneficial floods become major disasters. Such was the case in the summer and fall of 1974 when flooding extended over nearly one-half of the country and stagnated for more than a month. At least 1,200 people died in the floods and another 27,500 died from subsequent disease and starvation. Approximately 425,000 houses were destroyed or severely damaged. A total of 36 million people suffered severe hardship and losses due to the disaster.

Water is a source for all life forms. Without water no life is sustainable. How tragic it is, when water in the form of floods takes away thousand of human and cattle lives. More than one million huts and poor houses are lost every year in floods in India. Can we prevent this loss?

MOST VULNERABLE HOMES

1. Buildings, which are constructed with earth-based materials or using stone and brick in mud mortar are highly vulnerable to damage in heavy rains and/or floods.
2. The huts made from biomass materials like bamboo, leaves, thatch or light construction using metal sheets are easily destroyed in floods and washed away.
3. The occupation of areas within the flood plain of rivers has increased the vulnerability, especially in areas of high population concentration. Flood plains attract poor people because of inexpensive land values.

EFFECT ON BUILDINGS

The damage to buildings due to floods are as follows:

- 1) Houses are washed away due to the impact of the water under high stream velocity. The houses are commonly destroyed or dislocated so severely that their reconstruction is not feasible.
- 2) Houses constructed out of light weight materials like wood float when they are not anchored properly.
- 3) Damage caused by inundation of house. The house may remain intact on its foundation, but damage to materials may be severe. Repair is often feasible but may require special procedures to dry out properly.
- 4) Undercutting of houses. The velocity of the water may scour and erode the foundation of the house or the earth under the foundation. This may result in the collapse of the house or require substantial repair.
- 5) Damage caused by debris. Massive floating objects like trees, electric poles, etc. may damage the standing houses.



Flood disrupting normal life

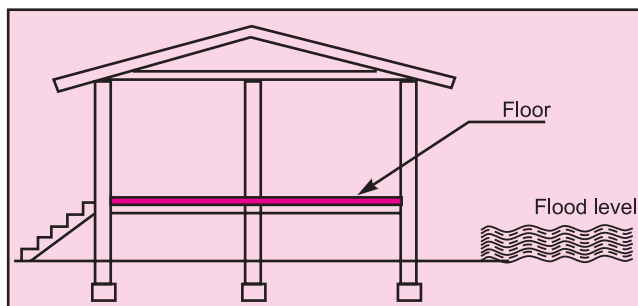
PROTECTION MEASURES FROM DAMAGE TO BUILDINGS

The most effective measures for prevention against inundation are:

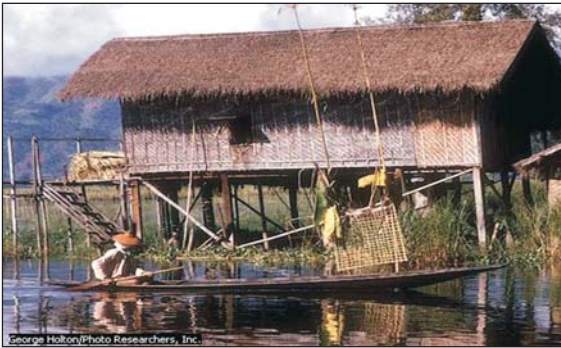
1. to avoid residing on river banks and slopes on river sides and the sides of gorges.
2. to build at least 250 meters away from the sea coast/river banks
3. to build proper drainage system in all flood prone areas, so that the water can be drained off quickly to prevent accumulation.
4. to construct the building with a plinth level higher than the known high flood level.
5. to construct the whole village or settlement on a raised platform higher than the high flood level.
6. to construct buildings on stilts or columns with wall-free space at ground level permitting free flow of water (inundation or flowing), provided that columns are circular and strong. In



Roof tops being used as shelter places during floods



dry weather condition the ground area could be fenced and used for cattle, sheep poultry farming, or storage etc.



Use of stilts for raised floor above flood level

Not only do we contribute to the causes of floods, but reckless building in vulnerable areas, poor watershed management, and failure to control the flooding also help create the disaster condition. Therefore there is an urgent need to mitigate the flood hazard by proper habitat management, watershed management and incorporating flood resistant features in our buildings.

Cyclones

Cyclones pose a major threat to life and property in many parts of the world. Every year these sudden, violent cyclones bring widespread devastation to coastlines and islands lying in their erratic paths. A windstorm's destructive work is done by the high wind; flood producing rains and associated storm surges.

On November 19, 1977, a cyclone, which had been expected to hit Tamil Nadu, instead struck the central coast of Andhra Pradesh State in the Krishna Godavari Delta. Many people perished because advance warning was either too slowly or too narrowly disseminated. Damage in Andhra Pradesh was caused primarily by a storm surge that devastated some 65 villages, about 21 of which were completely washed away. The storm surge was reported to have been 5.7 meters (19 feet) high, 80 kilometers (50 miles) long, 16 kilometers (10 miles) wide, with a speed of 190 kilometers per hour (120 miles per hour). Many of the victims of the Andhra Pradesh cyclone were migrant laborers. This made identification of the dead difficult.

MOST VULNERABLE HOMES

The vulnerability of a human settlement to a cyclone is determined by its location, the probability that a cyclone will occur, and the degree to which its structures can be damaged by it. Buildings are considered vulnerable if they cannot withstand the forces of high winds and storm surge. Generally those most vulnerable to cyclones are lightweight structures with wooden frames, especially older buildings where wood has deteriorated and weakened the walls. Houses made of poorly constructed concrete blocks are also vulnerable.

Urban and rural communities on low islands or in unprotected low-lying coastal areas or river floodplains are considered vulnerable to cyclones. Furthermore, the degree of exposure of land and buildings will be affected by the velocity of the cyclone wind at ground level.



Pictures showing the effect of cyclone on structures

EFFECTS ON BUILDINGS

As a consequence of the storm surge and high wind speed following types of damage are commonly seen :

- ★ Uprooting of trees which disrupt transportation and relief supply missions.
- ★ Damage to signposts, electric poles and transmission line towers.
- ★ Damage to improperly attached windows or window frames.
- ★ Damage to roof/lintel projections.
- ★ Failure of improperly attached or constructed parapets.
- ★ Overturning failures of compound walls of various types.
- ★ Failure of roofing elements and walls along the gable ends particularly due to high internal pressures.
- ★ Failure of large industrial buildings with lightweight roof coverings and long/tall walls due to combination of internal & external pressures.
- ★ Brittle failure of asbestos.
- ★ Punching and blowing off of corrugated iron roofing sheets attached to steel trusses

PROTECTION MEASURES FOR DAMAGE TO BUILDINGS

1. Site selection

Cyclonic windstorms commonly generate storm tides leading to coastal inundation. In cyclonic regions, close to the coast, a site above the likely inundation level should be given preference. In case of non availability of high elevation natural ground, construction should be done on stilts with no masonry or bracings upto maximum surge level, or raised earthen mounds as shown to avoid flooding/inundation.



Fig 1. If natural elevation is not available construction on stilts or on artificially raised earth mounds

2. Platforms and Orientation

- (a) For individual buildings, a circular or polygonal plan shape is preferred over rectangular or square plans.
- (b) A symmetrical building with a compact plan-form is more stable than an asymmetrical building with a zig-zag plan, having empty pockets as the latter is more prone to wind/cyclone related damage.

3. Foundations

The following parameters need to be properly accounted for in the design of foundation.

- (a) *Effect of Surge or Flooding:* Invariably a cyclonic storm is accompanied by torrential rain and tidal surge (in coastal areas) resulting into flooding of the low-lying areas. The flurry of tidal surge diminishes as it travels on shore, which can extend even upto 10 to 15 km.

- (b) *Building on Stilts:* Where building is constructed on stilts, it is necessary that stilts are properly braced on both the directions.

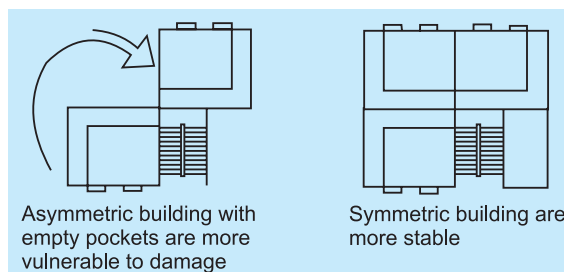


Fig. 2 Desirable orientation & plan form for reducing wind damage.

4. Wall Openings

- (a) Openings just below roof level are avoided except that two small vents without shutters are provided in opposite walls to prevent suffocation in case room gets filled with water if people try to climb up on lofts.
- (b) Doors and windows should have strong closing/ locking arrangements and glass/wooden panels be securely fixed.

5. Glass Panelling

- (a) One of the most damaging effects is the extensive breakage of glass panes caused by high wind pressure or impact of flying objects in air. The large size door or window glass panes may shatter because they are too thin to resist the wind pressures.
- (b) Reduce the panel size to smaller dimensions. Pasting thin plastic film or paper strips can strengthen Glass panes.
- (c) Provide a metallic fabric/mesh outside the panels.
- (d) Provide proper locking arrangement of shutters. Securely fix the frames to walls.

6. Roof Architecture

- (a) The overall effect of wind on a pitched roof building and the critical locations are shown in figures. Therefore, the roof projections should be kept minimum, say not exceeding 500 mm, or else, are tied down adequately.

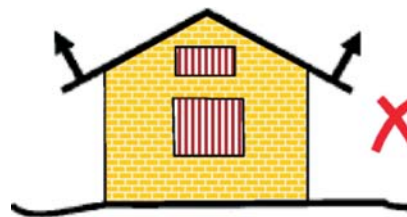


Fig. 4 LEFT: Large overhangs get lifted and broken

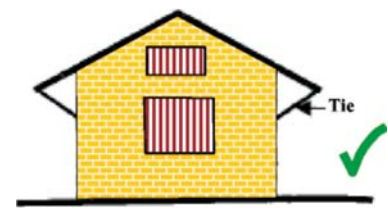


Fig. 5 RIGHT: Avoid large overhangs and use ties

- (b) For the purpose of reducing wind forces on the roof, a hipped or pyramidal roof is preferable to the gable type roof as shown in figure 6.

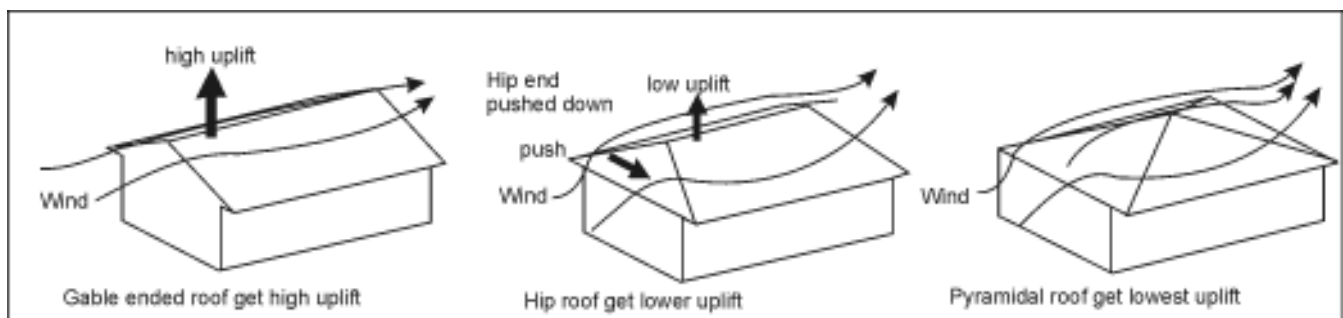


Fig. 6 Effects of roof architecture on uplift force

The damage due to cyclones can be minimised by adopting the technologies and procedures mentioned above. It is advisable to have shelterbelts plantation across the wind direction, in coastal areas and in all large establishments to check the wind speed and reduce damage.



A shelter with special feature to withstand cyclones and floods. Traditional homes can be improved by building in disaster resistant features. Such homes could withstand cyclones with moderate speeds.

Reference for further reading:

- <http://www.bte.gov.au/docs/r103/chapter1.htm>
- <http://gujarat-earthquake.gov.in/>
- http://www.benfieldhrc.org/SiteRoot/activities/misc_papers/DEVRIK/BENSON.HTM
- <http://www.adrc.or.jp/countryreport/IND/INDeng02/India07.htm>
- http://eqseis.geosc.psu.edu/~cammon/HTML/Classes/IntroQuakes/Notes/earthquake_effects.html
- Guidelines For Improving Earthquake Resistance Of Housing – BMTPC
- Guidelines For Improving Flood Resistance Of Housing – BMTPC
- Guidelines For Improving Wind/Cyclone Resistance Of Housing – BMTPC
- <http://quake.ualr.edu/HazardMitigation/claymitg-plan/Landslides.htm>



1. What should be the configuration of an earthquake resistant building?
2. How should the foundation be constructed in soft and firm soil?
3. Which are the most vulnerable homes due to flood?
4. What are the general protection measures for buildings against flood damage?
5. What are the considerations for selecting the site in area prone to landslides?
6. Write about the slope stabilization methods by drainage?
7. What are the desirable plan forms and orientations for cyclone resistant buildings?
8. What kind of roof designs should be used in cyclone prone areas and why?

6. *Sharing Responsibility* *–Role of Local and State Bodies*



Delhi Fire Services trying to extinguish a major fire in a slum

At the time of disaster various agencies both government and non - government organizations play a crucial role in preparing the society. Home Guards, Civil Defence, Volunteers of National Service Scheme, Nehru Yuva Kendra Sangathan too play a major role at the time of crisis. This chapter tries to understand the functions and role of these agencies in disaster management, who make the society a better place to lives.

READ THE FOLLOWING ...

26th January 2001, Earthquake of an intensity of 6.9 occurs in Bhuj.

26th January 2001, reports of the State Government state that, more than 13,000 people have been declared dead and about 1.67 lakh people have been injured. About 1.97 crore population spread over 21 districts have been affected. About 3.20 lakh, permanent and semi permanent (pucca/kucha) houses and 14,000 huts have been fully destroyed and about 7.33 lakh permanent and semi permanent (pucca/kucha) houses and 31,000 huts have been partially damaged,.... What went wrong? Did the houses have faulty structural design?

Let's join hands and be prepared. Students are the future generation of the country and they can make a difference by helping the community for a safer place to live.

28th January 2001, relief teams started reaching Ahmedabad and Bhuj. Individuals, Voluntary organizations, Professionals, Aid agencies have started approaching materials for providing assistance.

Mr Khan is a driver in the town of Bhuj. Thankfully none in his family was injured during the quake; they lost all their valuables, cash, and their house. More than 100 organizations, private, government and non-government, were providing relief materials after the earthquake, but Mr. Khan could not get a single tent for his family, who were living on the street... Who will coordinate?

It is not only Mr. Khan a poor driver who was suffering. There were many ill-fated families and this could happen to you and me. Think about it... When disasters occur they teach us lessons at a very high cost usually to life and property. This indicates how important and how crucial planning for a disaster is. So, are we prepared to face another jolt like the Bhuj? Isn't it time for us to learn from our past experiences?

Managing Disasters

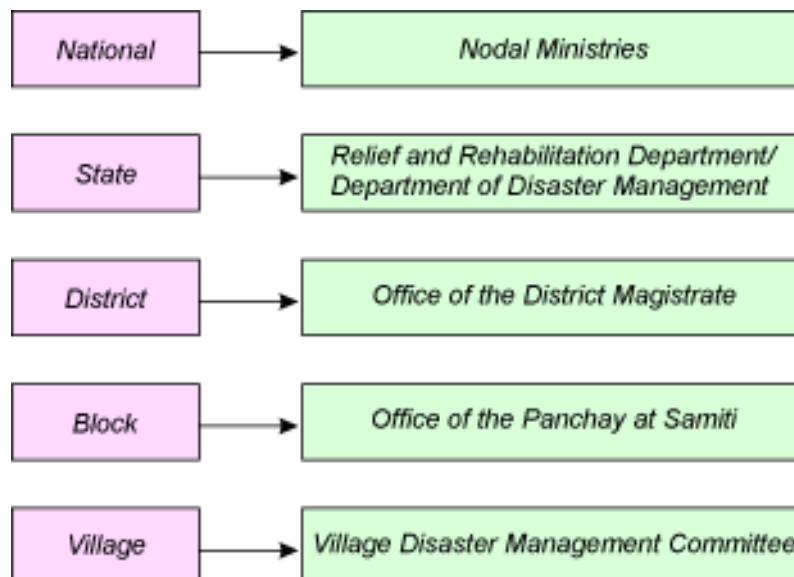
Disasters can be managed effectively through close coordination with various government and non-government agencies. Do you know the agencies that work for our safety?

Let's understand the various agencies which play a key role in Disaster Management.

How are Disasters Managed?

The flow chart given below would give you a better understanding about the management of disasters at various levels in our country.

Do you remember the administrative divisions in India, which you had read in your civics book?



India with its federal system of Government has specific roles for the Central and the State Governments. The country has an integrated administrative machinery for management of disasters at the National, State, District and Sub- District levels. The basic responsibility of undertaking rescue, relief and rehabilitation measures in the event of natural disasters is with the concerned State Governments. The Central Government supplements the efforts of the State Government by providing financial and logistic support.

NATIONAL LEVEL:

The response from the Central Government is based keeping in view the following factors:

1. The gravity of the disaster
2. The scale of the relief operations
3. The requirements of the Central assistance for augmenting financial resources and logistics support at the disposal of the State Government.

The Ministry of Home Affairs is the Nodal Ministry at the centre for coordinating disaster management activities for all natural hazards except drought which is taken care by Ministry of Agriculture under the Department of Agriculture and Cooperation. Other Ministries are assigned the responsibility of providing emergency support in case of disasters that fall within their purview.

Sl.No	Disasters	Nodal Ministry
1	Natural Disasters (other than drought)	Ministry of Home Affairs
2	Drought	Ministry of Agriculture
3	Air Accidents	Ministry of Civil Aviation
4	Railway Accidents	Ministry of Railways
5	Chemical Disasters	Ministry of Home Affairs
6	Biological Disasters	Ministry of Home Affairs
7	Nuclear	Ministry of Home Affairs
8	Epidemics	Ministry of Health and Family Welfare

STATE:

The responsibility to cope up with natural disasters is essentially that of the State Government. The role of the Central Government is to support in terms of physical and financial resources. The Chief Minister or the Chief Secretary of the State heads a state level committee which is in overall charge of the relief operations at the State and the Relief Commissioner who is in charge of the relief and rehabilitation measures in the wake of natural disasters. In many of the states, Secretary, Department of Revenue is also in charge of relief operations. The states have the relief manual called as the 'State Relief Code' and the State Contingency Plan which guides them to manage disaster scenarios.

DISTRICT:

The district administration is the focal point for implementation of all governmental plans and activities. The actual day-to-day function of administering relief is the responsibility of the District Magistrate/ District Collector/ Deputy Commissioner who exercises coordinating and supervising powers over all the departments at the district level.

The 73rd and the 74th constitutional amendments recognise Panchayati Raj Institutions as 'Institutions of self- government'. These local bodies can be effective instruments in tackling disasters through early warning system, relief distribution, providing shelter to the victims, medical assistance etc.

A Disaster Management Committee has been set up at the district level headed by the District Magistrate and officials from the health department, Irrigation Department, Veterinary Department, Department of Water and Sanitation, Police, Fire Services, representatives from National and International NGOs, etc. The Disaster Management Committee which is basically the decision making body takes the help of the Disaster Management Teams, like the Fire Services, Police, Health practioners etc. are:

ACTIVITY 2

As a District Magistrate of a district of Delhi, which is in seismic zone IV (high risk zone), what are the measures or activities you would have organized to generate awareness among the school children and the communities around your school?

BLOCK:

The Block Development Officer/ Taluka Development Officer is the nodal officer at the Block level for all the disaster management activities. The Disaster Management Committee at the Block/ Taluka level is headed by this Nodal Officer. The other members of the committee are officers from the Social Welfare department, Health department, Rural water supply and Sanitation Department, Police, Fire Services, representatives from youth organizations, Community Based Organizations, Non Governmental Organizations, eminent senior citizens, elected representatives etc. The main functions of Block Disaster Management Committee are:

- Helping the Block administration in preparation of the Block Disaster Management Plan
- Coordinating training for the members of the Disaster Management Teams
- Carry out mock drills

VILLAGE:



Villagers preparing a Disaster Management Plan

At the village level, the Village Disaster Management Committee headed by the Sarpanch/ Village Headman is responsible for preparing the Village Disaster Management Plans and also coordinating with various agencies for providing training to the Disaster Management Teams. The members should see to it that mock drills are carried out by the villagers at regular intervals by the villagers for various hazards.

It is accepted that the Government alone cannot take on the entire responsibility of Disaster Management. Apart from national, state, district and local levels there are various institutions who are involved in disaster management at various levels in the country. This includes the police and Para-military forces, Civil Defence and Home Guards, fire services, National Cadet Corps (NCC), Youth Organizations, UN agencies, International and National voluntary groups, public and private sector enterprises, media etc. play a major role in managing disasters. Functions of some of the organizations have been mentioned below.

Recollect and discuss with your friends in the classrooms regarding various disaster management teams at the village level – their members and their roles and responsibilities in before, during and after disasters.

1. UN DISASTER MANAGEMENT TEAM (UNDMT) – INDIA

UN Office for Coordination of Humanitarian Affairs (UN OCHA), has been made responsible by the UN General Assembly mandate for all International disaster response. In India, UNDMT represents various UN agencies to implement disaster preparedness and mitigation efforts and strengthen Government's capacities on disaster risk management. The UNDMT has representation from various UN Agencies such as FAO, ILO, UNDP, UNFPA, UNICEF, WFP and WHO which act together whenever there is a disaster. The primary purpose of the UNDMT is to ensure prompt, effective and concerted country level disaster preparedness by the UN system, and the response when appropriate.

2. INDIAN ARMED FORCES:

The Armed Forces are the core of the government's response capacity. They intervene and take on specific tasks only when the situation is beyond the capacity of civil administration. Due to their ability to organize action in adverse ground circumstances, speed of operational response and the resources and capacities at their disposal, the armed forces have historically played a major role in emergency support functions such as communications, search and rescue operations, health and medical facilities, transportation, power, food and civil supplies, public works and engineering, especially in the immediate aftermath of disaster.

3. NATIONAL CADET CORPS (NCC)

The National Cadet Corps, a body formed in 1948 aims at:

- developing qualities of character, courage, comradeship, discipline, leadership, secular outlook, spirit of adventure and sportsmanship and the ideals of selfless service among the youth to make them useful citizens.
- This it does by creating a human resource of organized, trained and activated youth.
- Providing leadership in all walks of life including the Armed Forces and making themselves available for the service of the nation.



NCC Cadets helping the victims in the local hospital.

Be a part of NCC and serve the country...

Every Indian school going student can join NCC. The NCC is open to all regular students of schools and colleges on a voluntary basis. The officers and cadets have no liability for active military service. It has been divided into four divisions (they are not similar to the Army divisions). The first two divisions are; the Senior Division for college students and the Junior Division for school students. The college cadets and the school cadets are trained differently. To enter the Junior Division, the high school you are studying in should have an NCC troop. If it has one, a board is usually displayed at the school entrance, with the emblem and Troop number. If you meet the physical standards and if all is well you will receive your kit, which contains uniform, beret cap, cap badge, hackles, web belt, etc. An identification card is issued, but it might take some time, since it comes from the Battalion HQ. An NCC troop cannot have more than 100 cadets in its roll, so if you want to join, do it quick. The recruitment begins every academic year.

4. CIVIL DEFENCE



Civil Defence volunteers being trained

Civil Defence aims at saving life, minimizing damage to the property and maintaining continuity of industrial production in the event of a hostile attack. The two war emergencies faced by the country in 1962 and 1965 compelled the Government of India to reorient its emergency training activities from natural disasters to those concerning protection of life and property against enemy action. The National Civil Defence College

was founded on 29th April 1957 at Nagpur as the Central Emergency Relief Training Institute (CERTI) to function as the training wing of the Emergency Relief Organization of the Government of India. This Central Institute focuses on advanced and specialist training to the leaders of relief services, which was essential for efficient conduct of relief operations during natural disasters. Today there are around 500,000 Civil Defence Volunteers throughout the country.

5. NATIONAL SERVICE SCHEME (NSS)



Ever since independence there has been growing awareness of the desirability of involving students in national services. The first Education Commission (1950) recommended the introduction of national service by students on a voluntary basis. Ministry of Education introduced the National Service Scheme during 1969-70. The motto of NSS is “NOT ME BUT YOU”. It underlines that the welfare of an individual is ultimately dependent on the welfare of the society as a whole. The NSS symbol is based on the “Rath Wheel” of the Konark Sun Temple of Orissa. It stand for dynamism and progressive outlook of youth. Any student **enrolled** as a NSS volunteer, as per NSS Manual should put in atleast 240 hours of useful social work in a continuous period of two years (i.e. 120 hours per year). A work diary is to be maintained by each NSS volunteer, which will help him/her in the assessment in his/her performance. Such volunteer is eligible to get NSS Service Certificate from the colleges. The Service Certificate given in the NSS Manual should be strictly adhered. Each NSS unit in the college is expected to adopt a near by village/slum and work for its all-round development. Regular activities and special campus should preferably be organized in the adopted village/rural unit/slum for this purpose.

In the tsunami affected areas of Tamil Nadu about 1200 NSS volunteers have spread themselves into affected areas with relief material especially in the slums. In Pondichery also, the NSS volunteers have been deployed for relief work and they are constantly working under the supervision of NSS Regional Director.

6. NEHRU YUVA KENDRAS:

The Nehru Yuva Kendras were launched in the year 1972 as part of the Silver Jubilee celebration of India's Independence. This was on the recommendation of the National Advisory Board on Youth with the objective of providing the non-student rural Youth avenues to take part in nation building activities and also to provide opportunity for the development of their own personality and skills. As volunteers the members have helped the community at times of crisis. Today, it functions under the Ministry of Youth Affairs & Sports. NYKS is a registered society and is governed by a Board of Governors headed by the Minister of Youth Affairs & Sports.

7. HOME GUARD

Home Guard is a voluntary force, first raised in India in December 1946, to assist the police in controlling civil disturbance and communal riots. Subsequently, the concept of a voluntary citizen's force was adopted by several States. In the wake of Chinese aggression in 1962, the Centre advised the States and Union territories to merge their existing voluntary organization into one uniform voluntary force known as 'Home Guards.' The function of Home Guards is to

- Serve as an auxiliary to the police in maintenance of internal security
- Help the community in any kind of emergency such as air raid, fire, cyclone, earthquake, epidemic etc.
- Help in maintenance of essential services
- Promote communal harmony and assist the administration in protecting weaker sections
- Participate in socio-economic and welfare activities and perform Civil Defence duties.

MAINSTREAMING DISASTER MANAGEMENT IN EDUCATION

In order to make available a competent force, training right from the School to the Technical colleges and Higher education courses about disaster management is being introduced. Courses have been designed with a purpose to sensitize students in all the aspects of Disaster Management.

Various leading institutes of the country like the Indian Institute of Technology {IITs} and The National Institute of Disaster Management {NIDM} intend to upgrade the skilled human resources for the country by providing training to various government level functionaries of various departments. All India Council of Technical Education [AICTE] has introduced Disaster Management courses in Engineering. Similar efforts are being made to introduce Disaster Management in Architecture course and Urban Planning, Medical courses etc. Disaster Management has also been made a part of the foundation course for All India Services like the Indian Administrative Services (IAS), Indian Police Services (IPS) and Indian Forest Services (IFS) etc.

Reference for further reading:

<http://mha.nic.in/ch13.html>

<http://www.iitd.ac.in/~nss/>

<http://www.annauniv.edu/nss/aboutnss.htm>

www.nyks-india.org



1. If you were the Relief Commissioner of the State of Assam which is affected by floods every year list out five departments that you need to contact.
2. List out four members of the Disaster Management Committee at the district level.
3. Write the main aim of the National Cadet Corp.
4. List the organisations which help the state govt. functionaries in responding to disasters.
5. Explain the role of Central Govt. in responding to disasters.

7.

Planning ahead... by the people, for the people



Gopal Hazong aged 57 years having a family of 5 members lived in Nalbari village of Assam. Every year the tyrant Brahmaputra River washed his house away. Apart from his house the whole village was being affected and ninety percent of the houses washed off. One day a trained volunteer approached him and said that they could reduce the loss that they have been facing since years. They first decided to prepare a Community Plan to combat floods. They involved all the villagers and prepared a village map. The map became a key reference point and this exercise was carried out for three days.

More details were added day by day, until every household detail was added in the map. This mapping exercise gave the villagers a chance to identify the most vulnerable and it led to discussions that described how the situations could change. It was decided by the villagers that henceforth all the houses would be built on raised platforms and to combat the problem of drinking water, all the tube wells would be raised. All the villagers then decided to contribute their best of efforts in this gigantic task and formed Village Disaster Management Teams.



In Standard IX Chapter 6, we discussed about the process of community planning for disasters. In continuation to the earlier chapter this chapter outlines the practical steps of community level disaster preparedness. It covers important steps such as awareness building in the neighborhood or community, analyzing the situation, formation of task force and drawing emergency response plans for taking long-term measures to reduce risk.

Community Planning

Community planning is a forward planning process, which identifies human and material resources and puts in place potential response system. It involves active participation from the people residing in that locality in making decision about the implementation of processes, programmes and projects, which affect them.

In other words, a community plan is a list of activities a neighborhood, community or a group of people agree to follow to prevent loss of life, livelihoods and property in case of warning or a disaster. The Plan identifies in advance action to be taken by individuals, in the community so that each one knows what to do when a warning is received or when a disaster strikes. The major thrust is to address possible scenario of an event and focus on the impact the humanitarian operations.

For what do we need to plan?

We can plan for any possible critical event. It can vary upon the scale of operations or processes involved as well as the population that could possibly be affected in case of an untoward event. The most common could be natural disasters affecting human operations or industrial disaster. The primary goal of Community Planning for disasters is to reduce the vulnerability of the concerned community and strengthen its existing capacity to cope up with disasters. The approach of preparing a Community Based Disaster Management Plan considers people's participation a necessary pre-requisite for disaster management. By involving the community in the preparedness phase, it increases the likelihood of coordinated action by the communities during emergencies.

Importance of Peoples' Contingency Plan

A contingency plan need not be sophisticated, very scientific, or computer generated model. It need not have a series of flow diagrams showing the process of planning. Use of technology or sophisticated analysis is only useful when it is combined with the people's participation. Basic information, risk assessment and intelligence analysis is normally adequate to have a functional people contingency plan for various hazards. The task cannot be of a single person in the preparation of a working plan, since accuracy is considerably enhanced through the assimilation of experience, information and skills of widest possible range of sources.

Contingency plans are prepared at different levels such as Neighborhood, Village, Block, District, State and National Levels. It has to be made very specific by involving both government and non-government organizations. The plan should be ideally people-centric and hence the term peoples' contingency plans.

Contingency Plan can be :

- Natural disaster affecting humanitarian operations and needs.
- Outbreak of an epidemic or serious health problem
- Industrial accidents (Onsite/Offsite Plans)
- Threat to staff, staff evacuation, attack on premises etc.
- Outbreak of civil conflict affecting civilian population
- Sudden shortage of food or other commodities.

Why peoples' Contingency plan?

- They know better about the risk, their vulnerabilities and the capacities.
- They have the best idea of the place where they stay and also the strengths and weaknesses of the community to cope with an eventuality.
- They are the First Responders.
- They are also the ultimate sufferers. Their plans will be more effective to respond to any situation if confronted.

An effective contingency plan is prepared involving people from all areas and different categories using participatory process. The active community members take a lead in facilitating and developing the plan. It is also important that the plan prepared at the lowest level should be in lines to the plans prepared at the higher levels for effective coordination during a disaster.

What should a Community Contingency Plan answer?

A typical contingency plan should answer the **WHO, WHERE, WHEN, WHAT** and **WHY** with regard to Disaster Preparedness. The Plan should answer the following:

Who/Whom	Who is assigned what? Who is living where? Whom to give priority? Who will listen to messages? Who will mobilize what?
Where/Where to	Where to inform? Where does each family live? Where do they go? Where do they work? Where are the safe places for shelter?
When	If it is an event with early warning: (Well before the event or on raise of early warning/Just before the event or a season/During different stages of the event/ After the event) If it is a sudden event: (Before the event - preparedness measures/ During the event/After the event)
What	What arrangements are there at the community level? What are the available resources? What material needs to be stocked to meet the emergency? What equipments are available? What is the condition of safe shelters and the equipments? What is to be done at different time intervals?
How	How to reach a place? How to get the message? How to disseminate the message in case of early warning? How to plan movement of people to safe places? How to ensure security? How to ensure stock in supply of essential food/water? How to take care of emerging rescue/medical attention? How to keep in touch and seek outside help?
Why?	Why each of the above?

Note: This is not to be treated as a complete list. It is just an example.

The contingency plan is followed by a set of operational plans by various individuals, teams and agencies. Further improvement of the plan should be carried out based on the lessons learnt during practice.

How to prepare a plan and what should a contingency plan consist of?

The Contingency Planning Exercise is a forum and opportunity for all sections of the society to participate. Each has something useful to contribute to the planning. The views of one may differ from others, but this will often be to the advantage of the planning process since it provides a useful forum for all assumptions to be questioned and refined. The end product is thus more realistic. To start with the plan one individual or a group of people may facilitate the Contingency Planning Exercise. Due importance is given to each individual in the development of the Plan.

In this part we will look into some detail on the preparation of the Contingency Planning process. There is no clear demarcation of an exact procedure as situation may vary in terms of geographical spread, the hazard, the location from the hazard, the exposure, vulnerability aspects and processes involved. A typical Community Contingency Plan will involve following basic steps:

- Initial awareness and rapport building
- Outlining the profile of the community
- Analyzing the situation on a participatory basis
- Selection of Task Forces, Indicative Responsibilities and Capacity Building of Task Forces
- Rehearsals/ Mock Drills.

1. Rapport Building and Initial Awareness

Rapport building with the senior citizens, Village Self Help Groups, youth clubs, elected representatives etc .is the first step in preparation of the Community Contingency Plan. The main objective is to motivate them and get them involved in the planning process. Usually Government functionaries working at the village level, elected representatives and voluntary organizations help in the preparation of plans at the community level.

Discussing the recent disaster incident and the losses and risks that were involved could generate initial interest. The discussion has to be done through a participatory process. If the community does not have a recent experience to recollect, but still is a potentially vulnerable area the incidences of nearby areas should be discussed.

Local knowledge to cope up with the disaster should not be overlooked during these discussions. It is essential to tap information and take it forward towards a meaningful process during the next step of analyzing situations.

The important task here is to mobilize community participation through awareness generation techniques by various options such as:

- Mass meetings
- Cultural activities
- Street plays
- Audio/visual aids



People in group discussion



Street play in an urban area to sensitize the community

- Displaying of posters

This awareness campaign will help the people to understand the need for planning.

2. Formation of a village disaster management committee (VDMC)

Village Disaster management Committee (VDMC) is formed in each of the village and it is responsible for initiating disaster preparedness activities. It consists of local elected representatives, grass root level government functionaries, NGOs, CBOs, youth clubs and members from the Mahila samities. Senior citizens too are a part of the committee. The head of the VDMC takes a lead in mobilizing the community for the preparation of the Disaster Management Plan.

3. Outlining the profile of the community

It involves outlining data pertaining to the following namely:

- Population
- Local resources (both human like skilled manpower - health practitioners, Ex- servicemen etc and material like boats, generators etc).
- Housing pattern in that locality (RCC, tiled etc).
- Cropping and Occupational pattern

4. Review and Analysis of Past Disasters

It refers to prioritizing disasters based on its frequency and analysis of the estimated losses. This can be carried out by taking the help of elderly people of the village. The villagers analyze the losses that they had incurred during various disasters and learn the best practices carried out. Based on the assessment of the situation actions need to be assigned to the community members.

A village disaster management committee save dozens lives.....

Villagers of a sea coast village in Cuddalore district in Tamil Nadu were taking lessons on Disaster management when they were caught by killer tsunami waves. The lesson learnt came handy to them in saving many lives. The death toll restricted to 22 -21 in this village of around 2000 population. Villagers were asked to make use of local resources such as dry tree stem or empty drums when drowning in sea. The Village had of the VDMC set up in October last year. Women in team were engaged in giving first aid to the victims.

Source: Dainik jagaran

5. Seasonality Calendar for Disasters

While analyzing the past experiences pertaining to various natural hazards, communities develop the seasonality calendar based on the occurrence of the disaster.

Seasonality Disaster Calendar													
	Hazards	Jan	Feb	Mar	April	May	June	July	August	Sept.	Oct	Nov	Dec
1	Flood							√	√	√			
2	Cyclone				√	√					√	√	
3	Drought								√	√			
4	Forest fire				√	√							
	√	Month of Occurrence											

4. Mapping Exercise

One of the most important activities of preparing the Disaster management plan at the village level is the mapping of risk, vulnerabilities and capacities of the village by the community itself as it is a simple and cost effective tool for collecting ground level data. This is done through Participatory Rural Appraisal (PRA) exercise. This mapping exercise aims to provide a pictorial base to the planning process especially to the semi-literate populace and ensures maximum community involvement across gender, caste and other divides. The villagers/community members are encouraged to draw the maps on the ground using locally available resources such as stones, colour powders etc. for different items and indicators. The types of maps are as follows:



Mapping exercise of a village in progress

(a) Social Mapping

The villagers/community need to pictorially show the overall layout of the locality. The map shows

- ◆ Location of the habitat with respect to natural topography
- ◆ Number of pucca houses and kuchha houses
- ◆ Other common infrastructure (eg. Safe shelter, temple, mosque, church, drinking water facilities, school, health centre, hospital, telephone, public addressal system, road, electricity etc).

ACTIVITY

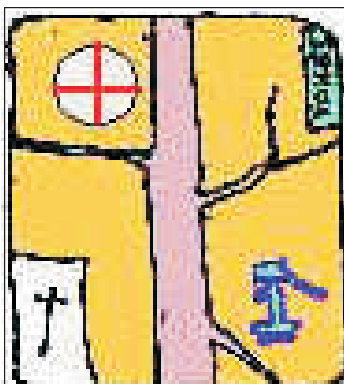
Form a group of 10 students and draw a **social map** of your locality showing the households, community places, roads etc. give symbols to each item demarcated in the map as shown in the map on your right.



Social map of Pathapeta village

(b) Resource Mapping

It focuses on the locally available resources and assets that can be utilized for building the capacities of the community during and after disasters. Individual skills too can be identified in the map. The resource map is therefore not limited to a map depicting the available resources but also plotting the distribution, access and its use.



Mapping of the natural resources in the area includes:

- ◆ Individual skills (community leaders/doctors/drivers, swimmers etc)
- ◆ Resources around the area (boats, food stock etc)
- ◆ Important locations such as open land/low lying and elevated areas
- ◆ Protection bunds
- ◆ Drainage facilities
- ◆ Agriculture area, Forest area, mangrove plantations, shelterbelts etc.



The picture is a Resource map prepared by the community under the Village Plan of Assam. Map shows the location of human resources, equipments to be used during emergency, open spaces etc.

(c) Vulnerability Mapping

In this mapping exercise the members of the community are expected to know the hazards that the village is prone to and the possible areas that are likely to get affected like:

- ◆ Household wise vulnerable groups
- ◆ Vulnerable houses and defunct infrastructure
- ◆ Low lying areas prone to floods
- ◆ Landslide prone areas
- ◆ Location of hazardous industries/ electrical installations/ tall weak structures - buildings, etc.
- ◆ Narrow roads.



Vulnerability Map of Barahipur Village

(d) Safe and Alternate route mapping

In this exercise the members of the community are expected to know the places that are safe. For example in areas that are frequently affected by floods we need to know the houses that are located on raised platforms, multi-storied buildings, mounds etc.

This map should also show the alternate safest approach route to the area. It could be either roadway or waterways.

5. Selection of Disaster Management Teams (DMTs)

After analyzing the situation and mapping out the resources the next step is to form Disaster management teams/ task forces from the village/ward/city so as to carry out response activity for facing any crisis situation.

Selection of Disaster management teams

Willing and active men and women folk from the community can be members of the Disaster management teams. The DMTs/task force should also involve experienced and skilled people such as doctors, nurses, fire fighting personnel, Ex-service men, police personnel, swimmers, youth with Scout/NCC/NSS background, Civil Defence personnel's, mahila samiti members and others. It is ideal to have a team of 25 members per task force for a unit of 400-500 households. If the area/community is large, it is advised to increase the number of teams accordingly.

It is necessary to allot and specify the responsibilities to the selected task forces in pre/during and post disaster operations. The different task forces are as follows:

Early Warning Team, First Aid Team, Rescue and Evacuation Team, Shelter Management, Relief Team, Water and Sanitation, Carcass Disposal Team, Trauma Counseling, Damage Assessment

ACTIVITY

Select any one of the teams and indicate the role and responsibilities of the team members in pre, during and post disaster

6. Training of Disaster Management Teams (DMTs)



Village Volunteer being trained in Search and Rescue

The selected team members need to be well trained in specific skills so as to carry out their specific tasks efficiently during a given situation of a disaster. The DMTs, which need to be well trained, are:

1. First Aid Group
2. Rescue and Evacuation Group
3. Water and Sanitation
4. Trauma Counseling

To train the DMTs/task force members one take the help of the Fire Services, Local health Centre, Red Cross, St. John's Ambulance etc.)

7. Rehearsals/Mock Drills and Plan Updating



Village DM Team Carrying out Mock Drill



Village Task force members doing Mock Drill on measures to be taken during fire incident

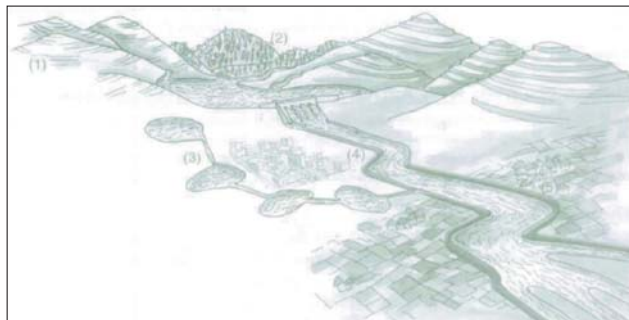
It is important to conduct live disaster situation drills/rehearsals. Mock drill is an integrated part of the disaster preparedness plan, as it is a preparedness drill to keep the community alert.

The drills are basically a series of actions according to the plan and are usually tried out as a dummy exercise by keeping the people informed of the exercises. If practiced several times the community would be well prepared to respond to the situation. This is usually done keeping in mind the real time situation. In case of areas prone to cyclone or flood the drills shall be conducted twice a year, one immediately before the cyclone/flood season and other after 6 months time. The drills should be conducted at least twice a year.

The plans should not just remain on paper rather it should be dynamic and working. The plan should ensure that it addresses the responsibilities of the task force members as well as the families/ individuals living in that area. Over a period of time there could be many changes/developments in an area for which the contingency plan has been prepared. Hence it is very important that the plan is revised every six months or at least once in a year with updated information. The working plan prepared by the community should be aimed towards the development in the region. It is also important to note that there should be an effective convergence of the plan prepared by the community with the larger programmes/development plans of the region.

Suggested activities for students:

- Choose one natural disaster in the country and:
- Identify what it was, where and when it occurred.
- What effects did this disaster have in the local community, various lifelines and essential services?
- Were the local people prepared and did they have any contingency plan?
- What sort of problems did the effected population went through and how did they cope with during and after the disaster?
- What steps do you think should have been taken by the community and the administration to prevent the losses?
- In a few points describe suitable mitigation and preparedness measures that the community should take in advance to guard this kind of disaster occurring again.



1. Define Community Contingency Plan and give two reasons for the need of a Plan?
2. Name four elements of Community Contingency Plans or what should the Community Contingency Plan consist of?
3. Identify the components to be present in a Resource map?
4. Identify four different task forces and list out two responsibilities of each of the task forces?



References for further reading:

www.ndmindia.nic.in

www.osdma.org

www.gsdma.org

http://www.undmtp.org/modules_e.htm (A book on Introduction to Natural Hazards, 3rd edition Disaster Management Training Programme, UNDP DHA 1997),

http://planningcommission.nic.in/plans/planrel/fiveyr/10th/volume1/v1_ch7.pdf (Chapter 7- Disaster Management: The Development Perspective)



KNOW - AS YOU GROW



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