Disaster resilience services

The National Disaster Management Authority (NDMA), headed by the Prime Minister of India, is the apex body for Disaster Management in India. Setting up of NDMA and the creation of an enabling environment for institutional mechanisms at the State and District levels is mandated by the Disaster Management Act, 2005. NDMA is mandated to lay down the policies, plans and guidelines for Disaster Management. India envisions the development of an ethos of Prevention, Mitigation, Preparedness and Response.

The Indian government strives to promote a national resolve to mitigate the damage and destruction caused by natural and man-made disasters, through sustained and collective efforts of all Government agencies, Non-Governmental Organizations and People's participation. This is planned to be accomplished by adopting a Technology-Driven, Pro-Active, Multi-Hazard and Multi-Sectoral strategy for building a Safer, Disaster Resilient and Dynamic India.

The NDMA Logo reflects the aspirations of this National Vision, of empowering all stakeholders to improve the effectiveness of Disaster Management in India. NDMA has 5 major divisions viz. Policy & Plans, Mitigation, Operations & Communications & Information & Technology, Administration and Finance.

Some of frequently occurring Natural Disasters in India are:

Cyclone:

Cyclones are caused by atmospheric disturbances around a low-pressure area distinguished by swift and often destructive air circulation. Cyclones are usually accompanied by violent storms and bad weather. The air circulates inward in an anticlockwise direction in the Northern hemisphere and clockwise in the Southern hemisphere. Cyclones are classified as: (i) extra tropical cyclones (also called temperate cyclones); and (ii) tropical cyclones. The word Cyclone is derived from the Greek word Cyclos meaning the coils of a snake. It was coined by Henry Peddington because the tropical storms in the Bay of Bengal and the Arabian Sea appear like coiled serpents of the sea.

Classifications

Cyclones are classified as extra tropical cyclones (also called temperate cyclones); and tropical cyclones.

The World Meteorological Organisation (WMO, 1976) uses the term 'Tropical Cyclone' to cover weather systems in which winds exceed 'Gale Force' (minimum of 34 knots or 63 kph). Tropical cyclones are the progeny of ocean and atmosphere, powered by the heat from the sea; and driven by easterly trades and temperate westerlies, high planetary winds and their own fierce energy.

In India, cyclones are classified by:

- Strength of associated winds,
- Storm surges
- Exceptional rainfall occurrences.

Extra tropical cyclones occur in temperate zones and high latitude regions, though they are known to originate in the Polar Regions.

Cyclones that developin the regions between the Tropics of Capricorn and Cancer are called tropical cyclones. Tropical cyclones are large-scale weather systems developing over tropical or subtropical waters, where they get organized into surface wind circulation.

Worldwide terminology

Cyclones are given many names in different regions of the world – They are known as typhoons in the China Sea and Pacific Ocean; hurricanes in the West Indian islands in the Caribbean Sea and Atlantic Ocean; tornados in the Guinea lands of West Africa and southern USA.; willy-willies in north-western Australia and tropical cyclones in the Indian Ocean.

Indian Meteorological Department

The criteria below have been formulated by the Indian Meteorological Department (IMD), which classifies the low-pressure systems in the Bay of Bengal and the Arabian Sea on the basis of capacity to damage, which is adopted by the WMO.

Type of Disturbances	Wind Speed in Km/h	Wind Speed in Knots
Low Pressure	Less than 31	Less than 17
Depression	31-49	17-27
Deep Depression	49-61	27-33
Cyclonic Storm	61-88	33-47
Severe Cyclonic Storm	88-117	47-63
Super Cyclone	More than 221	More than 120

1 knot - 1.85 km per hour

Cyclones are classified into five different levels on the basis of wind speed. They are further divided into the following categories according to their capacity to cause damage: -

Cyclone Category	Wind Speed in Km/h	Damage Capacity
01	120-150	Minimal
02	150-180	Moderate
03	180-210	Extensive
04	210-250	Extreme
05	250 and above	Catastrophic

Storm surges (tidal waves) are defined as the rise in sea level above the normally predicted astronomical tide. Major factors include:

- A fall in the atmospheric pressure over the sea surface
- Effect of the wind
- Influence of the sea bed
- A funnelling effect
- The angle and speed at which the storm approaches the coast
- The tides

The very high specific humidity condenses into exceptionally large raindrops and giant cumulus clouds, resulting in high precipitation rates. When a cyclone makes landfall, rain rapidly saturates the catchment areas and the rapid runoff may extensively flood the usual water sources or create new ones.

How Cyclones are formed

The development cycle of tropical cyclones may be divided into three stages:

Formation and Initial Development Stage

The formation and initial development of a cyclonic storm depends upon various conditions. These are:

- A warm sea (a temperature in excess of 26 degrees Celsius to a depth of 60 m) with abundant and turbulent transfer of water vapour to the overlying atmosphere by evaporation.
- Atmospheric instability encouraging formation of massive vertical cumulus clouds due to convection with condensation of rising air above ocean surface.

Mature Tropical Cyclones

When a tropical storm intensifies, the air rises in vigorous thunderstorms and tends to spread out horizontally at the tropopause level. Once air spreads out, a positive perturbation pressure at high levels is produced, which accelerates the downward motion of air due to convection. With the inducement of subsidence, air warms up by compression and a warm 'Eye' is generated. Generally, the 'Eye' of the storms has three basic shapes: *(i)* circular; *(ii)* concentric; and *(iii)* elliptical. The main physical feature of a mature tropical cyclone in the Indian Ocean is a concentric pattern of highly turbulent giant cumulus thundercloud bands.

Modification and Decay

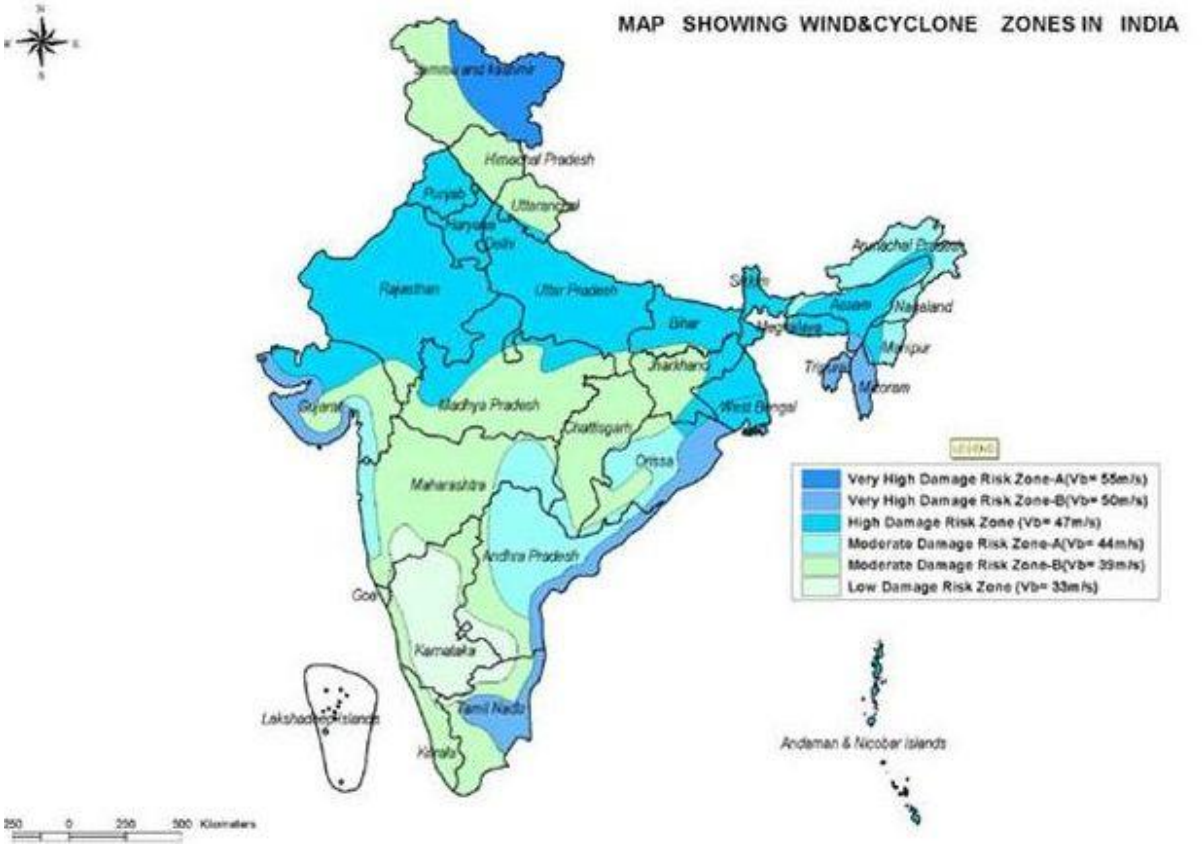
A tropical cyclone begins to weaken in terms of its central low pressure, internal warmth and extremely high speeds, as soon as its source of warm moist air begins to ebb, or is abruptly cut off. This happens after its landfall or when it passes over cold waters. The weakening of a cyclone does not mean that the danger to life and property is over.

Indian Context

The Indian subcontinent is one of the worst affected regions in the world. The subcontinent with a long coastline of 8041 kilometres is exposed to nearly 10 per cent of the world's tropical cyclones. Of these, the majority of them have their initial genesis over the Bay of Bengal and strike the East coast of India. On an average, five to six tropical cyclones form every year, of which two or three could be severe. More cyclones occur in the Bay of Bengal than the Arabian Sea and the ratio is approximately 4:1. Cyclones occur frequently on both the coasts (the West coast - Arabian Sea; and the East coast - Bay of Bengal). An analysis of the frequency of cyclones on the East and West coasts of India between 1891 and 1990 shows that nearly 262 cyclones occurred (92 of these severe) in a 50 km wide strip above the East coast. Less severe cyclonic activity has been noticed on the West coast, where 33 cyclones occurred the same period, out of which 19 of were severe.

Tropical cyclones occur in the months of May-June and October-November. Cyclones of severe intensity and frequency in the North Indian Ocean are bi-modal in character, with their primary peak in November and secondary peak in May. The disaster potential is particularly high during landfall in the North Indian Ocean (Bay of Bengal and the Arabian Sea) due to the accompanying destructive wind, storm surges and torrential rainfall. Of these, storm surges cause the most damage as sea water inundates low lying areas of coastal regions and causes heavy floods, erodes beaches and embankments, destroys vegetation and reduces soil fertility.

Cyclones vary in diameter from 50 to 320 km but their effects dominate thousands of square kilometers of ocean surface and the lower atmosphere. The perimeter may measure 1,000 km but the powerhouse is located within the 100-km radius. Nearer the Eye, winds may hit at a speed of 320 km. Thus, tropical cyclones, characterized by destructive winds, torrential rainfall and storm surges disrupt normal life with the accompanying phenomena of floods due to the exceptional level of rainfall and storm surge inundation into inland areas. Cyclones are characterized by their devastating potential to damage structures, viz. houses; lifeline infrastructure-power and communication towers; hospitals; food storage facilities; roads, bridges and culverts; cropss etc. The most fatalities come from storm surges and the torrential rain flooding the lowland areas of coastal territories.



Recover and build

After 'All Clear' is issued for back movement by 'State' give attention to the following:

- Whether 'roads' for reaching home is recommended by authorities
- Whether power lines are safe
- Whether transport arrangement is approved by authorities
- Pure drinking water is available
- Sewage lines are working
- Any epidemic spread in the area
- Safety of neighbor(s) assured

Emergency Kit

- Battery operated torch
- Extra batteries
- Battery operated radio
- First aid kit and essential medicines
- Important papers (Ration card, Voter ID card, Aadhar card etc)
- Emergency food (dry items) and water (packed and sealed)
- Candles and matches in a waterproof container
- Knife
- Chlorine tablets or powdered water purifiers
- Cash, Aadhar Card and Ration Card
- Thick ropes and cords
- Shoes

Cyclone: Do's & Dont's

Before the Cyclone season:

- Check the house; secure loose tiles and carry out repairs of doors and windows
- Remove dead branches or dying trees close to the house; anchor removable objects such as lumber piles, loose tin sheets, loose bricks, garbage cans, sign-boards etc. which can fly in strong winds
- Keep some wooden boards ready so that glass windows can be boarded if needed
- Keep a hurricane lantern filled with kerosene, battery operated torches and enough dry cells
- Demolish condemned buildings
- Keep some extra batteries for transistors
- Keep some dry non-perishable food always ready for use in emergency

Necessary actions

The actions that need to be taken in the event of a cyclone threat can broadly be divided into :

- Immediately before the cyclone season
- When cyclone alerts and warnings are communicated
- When evacuations are advised
- When the cyclone has crossed the coast

When the Cyclone starts

- Listen to the radio (All India Radio stations give weather warnings).
- Keep monitoring the warnings. This will help you prepare for a cyclone emergency.
- Pass the information to others.
- Ignore rumours and do not spread them; this will help to avoid panic situations.
- Believe in the official information
- When a cyclone alert is on for your area continue normal working but stay alert to the radio warnings.

- Stay alert for the next 24 hours as a cyclone alert means that the danger is within 24 hours.

When your area is under cyclone warning get away from low-lying beaches or other low-lying areas close to the coast

- Leave early before your way to high ground or shelter gets flooded
- Do not delay and run the risk of being marooned
- If your house is securely built on high ground take shelter in the safe part of the house. However, if asked to evacuate do not hesitate to leave the place.
- Board up glass windows or put storm shutters in place.
- Provide strong suitable support for outside doors.
- If you do not have wooden boards handy, paste paper strips on glasses to prevent splinters. However, this may not avoid breaking windows.
- Get extra food, which can be eaten without cooking. Store extra drinking water in suitably covered vessels.
- If you have to evacuate the house move your valuable articles to upper floors to minimize flood damage.
- Ensure that your hurricane lantern, torches or other emergency lights are in working condition and keep them handy.
- Small and loose things, which can fly in strong winds, should be stored safely in a room.
- Be sure that a window and door can be opened only on the side opposite to the one facing the wind.
- Make provision for children and adults requiring special diet.
- If the centre of the cyclone is passing directly over your house there will be a lull in the wind and rain lasting for half an hour or so. During this time do not go out; because immediately after that, very strong winds will blow from the opposite direction.
- Switch off the electrical mains in your house.
- Remain calm.

During a cyclone

DO NOT venture out even when the winds appear to calm down. The 'eye' of the cyclone might be passing. Winds might intensify and gush again and cause damage. Be safe inside till it is officially announced that the cyclone has passed.

When Evacuation is instructed

- Pack essentials for yourself and your family to last a few days. These should include medicines, special food for babies and children or elders.
- Head for the proper shelter or evacuation points indicated for your area.
- Do not worry about your property
- At the shelter follow instructions of the person in charge.
- Remain in the shelter until you are informed to leave

Post-cyclone measures

- You should remain in the shelter until informed that you can return to your home.
- You must get inoculated against diseases immediately.
- Strictly avoid any loose and dangling wires from lamp posts.

- If you have to drive, do drive carefully.
- Clear debris from your premises immediately.
- Report the correct losses to appropriate authorities.

Tsunami

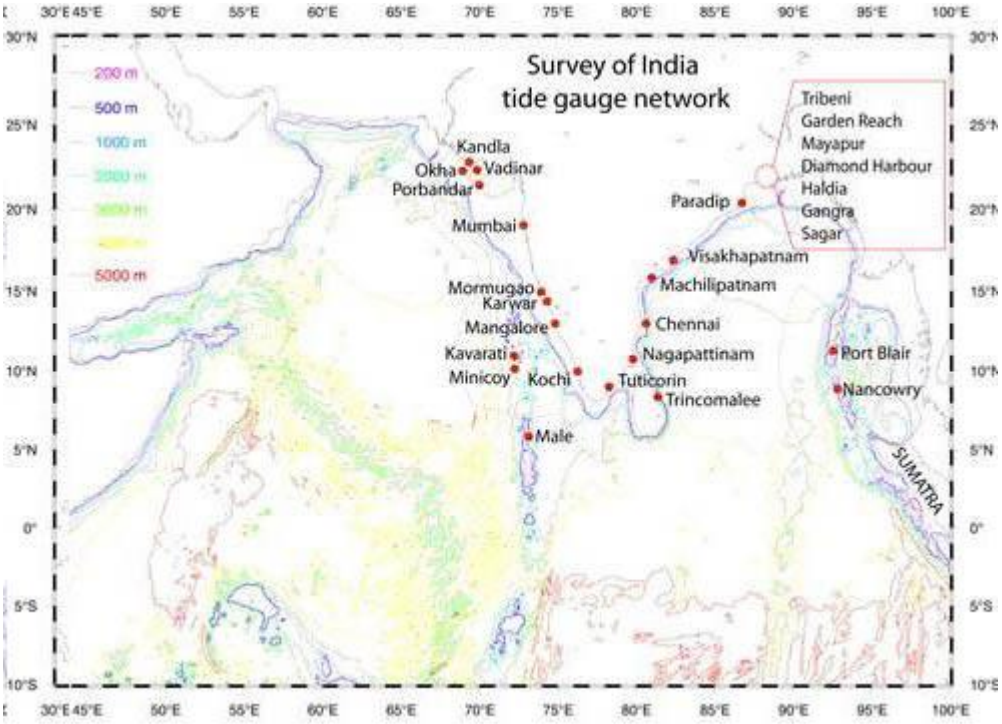
The Earth's lithosphere is broken up into a bunch of discrete pieces, called plates that move around the surface of the planet. There are seven or eight major plates (depending on how they are defined) and many minor plates. This motion is driven by the flow of the mantle rock beneath the plates and by the forces plates exert at their boundaries where they touch each other. Earthquakes happen when plates move with respect to each other because of the friction and stress at the edges of plates prevents them from slipping smoothly at their boundaries. **When one plate is forced to dive beneath another plate, there is no way to do it except with some component of vertical motion creating tsunami (please see figure) .** The tsunami that occurred during 2004 Sumatra-Andaman earthquake of Mw 9.3 was primarily caused by vertical displacement of the seafloor, in response to slip on the inter-plate thrust fault. The earthquake and resulting tsunami in the Indian Ocean affected many countries in Southeast Asia and beyond, including Indonesia, Sri Lanka, India, Thailand, the Maldives, Somalia, Myanmar, Malaysia, Seychelles and others. Many other countries, especially Australia and those in Europe incurred casualties due to the tsunami, because they had large numbers of citizens traveling in the region on holiday. This tsunami-genic earthquake was one of the ten worst earthquakes in recorded history, as well as the single worst tsunami in history. Indonesia was the worst affected country. Beyond the heavy toll on human lives, the Indian Ocean earthquake has caused an enormous environmental impact that will affect the region for many years to come. The disaster also caused a substantial geo-physical impact in Indian Ocean. The disaster invited attention of affected countries for setting up effective tsunami early warning system and institutional mechanism for handling disasters.

The Government of India has put in place an Early Warning System for mitigation of such oceanogenic disasters under the control of Indian National Center for Ocean Information Services (INCOIS), Hyderabad. A state-of-the-art early warning centre was established with the necessary computational and communication infrastructure that enables reception of real-time data from sensors, analysis of the data, generation and dissemination of tsunami advisories following a standard operating procedure. Seismic and sea-level data are continuously monitored in the Early Warning Centre using custom-built software application that generates alarms/alerts in the warning centre whenever a pre-set threshold is crossed. Tsunami warnings/watches are then generated based on pre-set decision support rules and disseminated to the concerned authorities for action, as per pre-decided standard operating procedure. The efficiency of this end-to-end system was proved during the large under-sea earthquake of 8.4 M that occurred on September 12, 2007 in the Indian Ocean.

The 2004 tsunami also prompted NDMA to formulate Tsunami Risk Management Guidelines to outline inter-agency roles and responsibilities, tsunami risk preparedness, mitigation and response.
The Guidelines recommends practical and effective ways for awareness generation, capacity building, education, training and research & development for better tsunami risk

management. The Guidelines explore options for effective dissemination of tsunami alert and warning messages generated by INCOIS to the concerned agencies and coastal vulnerable communities exposed to tsunamis in a coordinated manner.

Structural Mitigation measures, as envisaged in the Guidelines, gives a brief guidance on design and construction of new structures as well as strategies for protecting lifeline and priority structures from Tsunamis along the seafront. The Guidelines urge BIS to roll out the pending construction standards entitled 'Criteria for Tsunami-Resistant Design of Structures'. It further recommends a robust techno-legal regime through efficient land use practices, bioshields, shelter belt plantation and mangrove regeneration with community involvement. A strong mechanism has been recommended for effective emergency response by involving local police network, civil defence volunteers wherever available, home guards, State Disaster Response Forces and National Disaster Response Force. Further, the Guidelines explore the provisions of Disaster Management Act 2005 to mainstream concern of Tsunami risk management in disaster management plans of various levels.



Recover and build

- You should continue using a Weather Radio or staying tuned to a Coast Guard emergency frequency station or a local radio or television station for updated emergency information.
- 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 have been killed or injured 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 clear 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, use extreme caution. 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. Under the earthquake action there may be broken or leaking gas lines, and under the tsunami 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 neighbour'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 under the quake, 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.
- Take pictures of the damage, both of the building and its contents, for insurance claims. Open the windows and doors to help dry the building.
- Shovel mud before it solidifies.

- Check food supplies. Any food that has come in contact with floodwater may be contaminated and should be thrown out.
- Expect aftershocks. If the earthquake is of large magnitude (magnitude 8 to 9+ on the Richter scale) and located nearby, some aftershocks could be as large as magnitude 7+ and capable of generating another tsunami. The number of aftershocks will decrease over the course of several days, weeks, or months depending on how large the main shock was.
- Watch your animals closely.
- Keep all your animals under your direct control.

Tsunami Do's and Dont's:

- You should find out if your home, school, workplace, or other frequently visited locations are in tsunami hazard areas along sea-shore.
- Know the height of your street above sea level and the distance of your street from the coast or other high-risk waters. (Local administration may put sign boards).
- Plan evacuation routes from your home, school, workplace, or any other place you could be where tsunamis present a risk.
- If your children's school is in an identified inundation zone, find out what the school evacuation plan is.
- Practice your evacuation routes.
- Use a Weather Radio or stay tuned to a local radio or television station to keep informed of local watches and warnings.
- Talk to your insurance agent.Homeowners' policies may not cover flooding from a tsunami. Ask the Insurance Agent about the benefits from Multi-Hazard Insurance Schemes.
- Discuss tsunamis with your family.Everyone should know what to do in a tsunami situation. Discussing tsunamis ahead of time will help reduce fear and save precious time in an emergency. Review flood safety and preparedness measures with your family.

If you are in an area at risk from tsunamis

- You should find out if your home, school, workplace, or other frequently visited locations are in tsunami hazard areas.
- Know the height of your street above sea level and the distance of your street from the coast or other high-risk waters. (Local administration may put sign boards). Also find out the height above sea level and the distance from the coast of outbuildings that house animals, as well as pastures or corrals.
- Plan evacuation routes from your home, school, workplace, or any other place you could be where tsunamis present a risk. If possible, pick areas (30 meters) above sea level or go as far as 3 kilometres inland, away from the coastline. If you cannot get this high or far, go as high or far as you can. Every meter inland or upward may make a difference. You should be able to reach your safe location on foot within 15 minutes. After a disaster, roads may become blocked or unusable. Be prepared to evacuate by foot if necessary. Footpaths normally lead uphill and inland, while many roads parallel coastlines. Follow posted tsunami evacuation routes; these will lead to

safety. Local emergency management officials can advise you on the best route to safety and likely shelter locations.

- If your children's school is in an identified inundation zone, find out what the school evacuation plan is. Find out if the plan requires you to pick your children up from school or from another location. Telephone lines during a tsunami watch or warning may be overloaded and routes to and from schools may be jammed.
- Practice your evacuation routes. Familiarity may save your life. Be able to follow your escape route at night and during inclement weather. Practicing your plan makes the appropriate response more of a reaction, requiring less thinking during an actual emergency situation.
- Use a Weather Radio or stay tuned to a local radio or television station to keep informed of local watches and warnings.
- Talk to your insurance agent.Homeowners' policies may not cover flooding from a tsunami. Ask the Insurance Agent about the benefits from Multi-Hazard Insurance Schemes.
- Discuss tsunamis with your family. Everyone should know what to do in a tsunami situation. Discussing tsunamis ahead of time will help reduce fear and save precious time in an emergency. Review flood safety and preparedness measures with your family.

If you are visiting an area at risk from tsunamis

- Check with the hotel or campground operators for tsunami evacuation information and find out what the warning system is for tsunamis. It is important to know designated escape routes before a warning is issued.
- One of the early warning signals of a tsunami is that the sea water recedes several metres, exposing fish on shallow waters or on the beaches. If you see the sea water receding, you must immediately leave the beach and go to higher ground far away from the beach.
- Protect Your Property
- You should avoid building or living in buildings within 200 meters of the high tide coastline.
- These areas are more likely to experience damage from tsunamis, strong winds, or coastal storms.
- Make a list of items to bring inside in the event of a tsunami.
- A list will help you remember anything that can be swept away by tsunami water.
- Elevate coastal homes.
- Most tsunami waves are less than 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.
- There may be ways to divert waves away from your property. Improperly built walls could make your situation worse. Consult with a professional for advice.
- Ensure that any outbuildings, pastures, or corrals are protected in the same way as your home. When installing or changing fence lines, consider placing them in such a way that your animals are able to move to higher ground in the event of a tsunami.

What to Do if You Feel a Strong Coastal Earthquake

If you feel an earthquake that lasts 20 seconds or longer when you are in a coastal area, you should:

- Drop, cover, and hold on. You should first protect yourself from the earthquake damages.

When the shaking stops:

- Gather members of your household and move quickly to higher ground away from the coast. A tsunami may be coming within minutes.

Avoid downed power lines and stay away from damaged buildings and bridges from which Heavy objects might fall during an aftershock.

If you are on land

- Be aware of tsunami facts. This knowledge could save your life! Share this knowledge with your relatives and friends. It could save their lives!

If you are in school and you hear there is a tsunami warning:

- You should follow the advice of teachers and other school personnel.

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 your house if you live in a tsunami evacuation zone. Move in an orderly, calm and safe manner to the evacuation site or to any safe place outside your evacuation zone. Follow the advice of local emergency and law enforcement authorities.

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 a tsunami warning to be announced. Stay away from rivers and streams that lead to the ocean as you would stay away from the beach and ocean if there is a tsunami. A regional tsunami from a local earthquake could strike some areas before a tsunami warning could be announced.
- Tsunamis generated in distant locations will generally give people enough time to move to higher ground. For locally-generated tsunamis, where you might feel the ground shake, you may only have a few minutes to move to higher ground.
- High, multi-storied, reinforced concrete hotels are located in many low-lying coastal areas. The upper floors of these hotels can provide a safe place to find refuge should there be a tsunami warning and you cannot move quickly inland to higher ground.
- Homes and small buildings located in low-lying coastal areas are not designed to withstand tsunami impacts. Do not stay in these structures should there be a tsunami warning.
- Offshore reefs and shallow areas may help break the force of tsunami waves, but large and dangerous wave can still be a threat to coastal residents in these areas.
- Staying away from all low-lying areas is the safest advice when there is a tsunami warning.

If you are on a boat:

- 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. Tsunamis can cause rapid changes in water level and unpredictable dangerous currents in harbours and ports.

If there is time to move your boat or ship from port to deep water (after a tsunami warning has been issued), you should weigh the following considerations:

- Most large harbours and ports are under the control of a harbor authority and/or a vessel traffic system. These authorities direct operations during periods of increased readiness (should a tsunami be expected), including the forced movement of vessels if deemed necessary. Keep in contact with the authorities should a forced movement of vessel be directed.
- Smaller ports may not be under the control of a harbor authority. If you are aware there is a tsunami warning and you have time to move your vessel to deep water, then you may want to do so in an orderly manner, in consideration of other vessels.
- Owners of small boats may find it safest to leave their boat at the pier and physically move to higher ground, particularly in the event of a locally-generated tsunami.
- Concurrent severe weather conditions (rough seas outside of safe harbor) could present a greater hazardous situation to small boats, so physically moving yourself to higher ground may be the only option.
- Damaging wave activity and unpredictable currents can affect harbours for a period of time following the initial tsunami impact on the coast. Contact the harbor authority before returning to port making sure to verify that conditions in the harbor are safe for navigation and berthing.

What to do after a Tsunami

- You should continue using a Weather Radio or staying tuned to a Coast Guard emergency frequency station or a local radio or television station 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.
- 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 clear 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, use extreme caution.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.Under the earthquake action there may be broken or leaking gas lines, and under the tsunami 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 neighbour'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.\CCheck for damage to sewage and water lines. If you suspect sewage lines are damaged under the quake, 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.
- Take pictures of the damage, both of the building and its contents, for insurance claims. Open the windows and doors to help dry the building.
- Shovel mud before it solidifies.
- Check food supplies.
- Any food that has come in contact with floodwater may be contaminated and should be thrown out.
- Expect aftershocks. If the earthquake is of large magnitude (magnitude 8 to 9+ on the Richter scale) and located nearby, some aftershocks could be as large as magnitude 7+ and capable of generating another tsunami. The number of aftershocks will decrease over the course of several days, weeks, or months depending on how large the main shock was.
- Watch your animals closely. Keep all your animals under your direct control. Hazardous materials abound in flooded areas. Your pets may be able to escape from your home or through a broken fence. Pets may become disoriented, particularly because flooding usually affects scent markers that normally allow them to find their homes. The behaviour of pets may change dramatically after any disruption, becoming aggressive or defensive, so be aware of their well-being and take measures

to protect them from hazards, including displaced wild animals, and to ensure the safety of other people and animals.

Heat Wave

A Heat Wave is a period of abnormally high temperatures, more than the normal maximum temperature that occurs during the summer season in the North-Western parts of India. Heat Waves typically occur between March and June, and in some rare cases even extend till July. The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death.

The Indian Meteorological Department (IMD) has given the following criteria for Heat Waves :

- Heat Wave need not be considered till maximum temperature of a station reaches atleast 40°C for Plains and atleast 30°C for Hilly regions
- When normal maximum temperature of a station is less than or equal to 40°C Heat Wave Departure from normal is 5°C to 6°C Severe Heat Wave Departure from normal is 7°C or more
- When normal maximum temperature of a station is more than 40°C Heat Wave Departure from normal is 4°C to 5°C Severe Heat Wave Departure from normal is 6°C or more
- When actual maximum temperature remains 45°C or more irrespective of normal maximum temperature, heat waves should be declared. Higher daily peak temperatures and longer, more intense heat waves are becomingly increasingly frequent globally due to climate change. India too is feeling the impact of climate change in terms of increased instances of heat waves which are more intense in nature with each passing year, and have a devastating impact on human health thereby increasing the number of heat wave casualties.

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Health Impacts of Heat Waves

The health impacts of Heat Waves typically involve dehydration, heat cramps, heat exhaustion and/or heat stroke. The signs and symptoms are as follows:

- Heat Cramps: Ederna (swelling) and Syncope (Fainting) generally accompanied by fever below 39°C i.e.102°F.
- Heat Exhaustion: Fatigue, weakness, dizziness, headache, nausea, vomiting, muscle cramps and sweating.
- Heat Stoke: Body temperatures of 40°C i.e. 104°F or more along with delirium, seizures or coma. This is a potential fatal condition

Recover and Build

If you think someone is suffering from the heat:

- Move the person to a cool place under the shade

- Give water or a rehydrating drink (if the person is still conscious)
- Fan the person
- Consult a doctor if symptoms get worse or are long lasting or the person is unconscious
- Do not give alcohol, caffeine or aerated drink
- Cool the person by putting a cool wet cloth on his/her face/body
- Loosen clothes for better ventilation

Emergency Kit

- Water bottle
- Umbrella/ Hat or Cap / Head Cover
- Hand Towel
- Hand Fan
- Electrolyte / Glucose / Oral Rehydration

Heatwave: Do's & Don't's:

Heat Wave conditions can result in physiological strain, which could even result in death. To minimise the impact during the heat wave and to prevent serious ailment or death because of heat stroke, you can take the following measures:

- Avoid going out in the sun, especially between 12.00 noon and 3.00 p.m.
- Drink sufficient water and as often as possible, even if not thirsty
- Wear lightweight, light-coloured, loose, and porous cotton clothes. Use protective goggles, umbrella/hat, shoes or chappals while going out in sun.
- Avoid strenuous activities when the outside temperature is high. Avoid working outside between 12 noon and 3 p.m.
- While travelling, carry water with you.
- Avoid alcohol, tea, coffee and carbonated soft drinks, which dehydrates the body.
- Avoid high-protein food and do not eat stale food.
- If you work outside, use a hat or an umbrella and also use a damp cloth on your head, neck, face and limbs
- Do not leave children or pets in parked vehicles
- If you feel faint or ill, see a doctor immediately.
- Use ORS, homemade drinks like lassi, torani (rice water), lemon water, buttermilk, etc. which helps to re-hydrate the body.
- Keep animals in shade and give them plenty of water to drink.
- Keep your home cool, use curtains, shutters or sunshade and open windows at night.
- Use fans, damp clothing and take bath in cold water frequently.

TIPS FOR TREATMENT OF A PERSON AFFECTED BY A SUNSTROKE:

- Lay the person in a cool place, under a shade. Wipe her/him with a wet cloth/wash the body frequently. Pour normal temperature water on the head. The main thing is to bring down the body temperature.
- Give the person ORS to drink or lemon sarbat/torani or whatever is useful to rehydrate the body.

- Take the person immediately to the nearest health centre. The patient needs immediate hospitalisation, as heat strokes could be fatal.

Acclimatisation

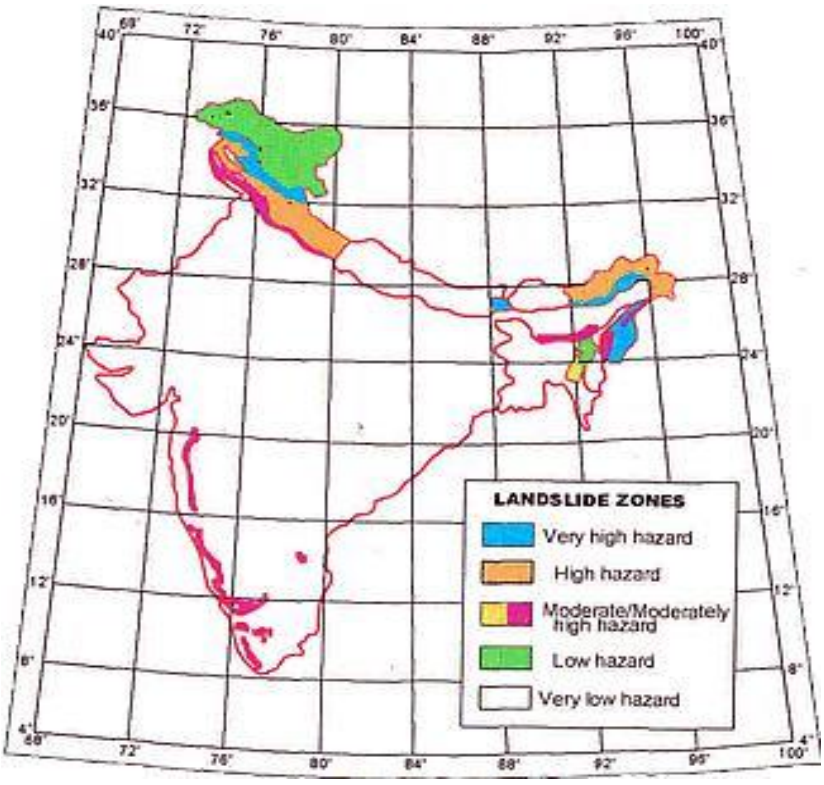
People at risk are those who have come from a cooler climate to a hot climate. You may have such a person(s) visiting your family during the heat wave season. They should not move about in open field for a period of one week till the body is acclimatized to heat and should drink plenty of water. Acclimatization is achieved by gradual exposure to the hot environment during heat wave.

Landslide:

India has the highest mountain chain on earth, the Himalayas, which are formed due to collision of Indian and Eurasian plate, the northward movement of the Indian plate towards China causes continuous stress on the rocks rendering them friable, weak and prone to landslides and earthquakes. The slow motion of the Indian crust, about 5 cm/year accumulates stress to which natural disasters are attributed. Some landslides make unique, and unparalleled catastrophes. Landslides and avalanches are among the major hydro-geological hazards that affect large parts of India besides the Himalayas, the Northeastern hill ranges, the Western Ghats, the Nilgiris, the Eastern Ghats and the Vindhyans, in that order, covering about 15 % of the landmass. The Himalayas alone count for landslides of every fame, name and description- big and small, quick and creeping, ancient and new. The Northeastern region is badly affected by landslide problems of a bewildering variety. Landslides in the Darjeeling district of West Bengal as also those in Sikkim, Mizoram, Tripura, Meghalaya, Assam, Nagaland and Arunachal Pradesh pose chronic problems, causing recurring economic losses worth billions of rupees. A different variety of landslides, characterized by a lateritic cap, pose constant threat to the Western Ghats in the South, along the steep slopes overlooking the Konkan coast besides Nilgiris, which is highly landslide prone.

Some spectacular events of tragedies are reported as Varnavat landslide, Uttarkashi District, Malpha landslide Pithoragarh district, Okhimath landslide in Chamoli district, UK and Paglajhora in Darjeeling district as well as Sikkim, Aizawl sports complex, Mizoram.These are some of the more recent examples of landslides. The problem therefore needs to be tackled for mitigation and management for which hazard zones have to be identified and specific slides to be stabilized and managed in addition to monitoring and early warning systems to be placed at selected sites.

A general landslide hazard map of India shown here marks the areas of different hazard zones in various states of India; one may note that Himalayas of Northwest and Northeast India and the Western Ghats are two regions of high vulnerability and are landslide prone.



NDMA guidelines are being followed for Landslide Hazard Zonation (LHZ) maps at 1: 50,000 scale and progressively larger scales for specific areas. National Remote Sensing Center

(NRSC), Department of Science and Technology (DST), Council of Scientific and Industrial Research (CSIR), Indian Institute of India (IITs), Universities have done tremendous work in this regard. The NRSC Atlas on selected corridors of Uttarakhand and Himachal Pradesh has been a very useful Atlas (Please see NRSC work on Landslides). DST has funded more than 30 projects spread over India by various academic institutions the reports of which can be requested from DST (NRDMA).

An example of LHZ map at 1: 50,000 scale from a part of Himalayas in Chamoli district (Pachauri, 1992) shown here is based upon several geological, geotechnical parameters. Such maps are being refined and relooked for higher level of verification and acceptability for public use. Approximately 15 % of the Indian landmass has to be covered by such maps at 1: 50,000 scale or higher to classify slopes in various levels of hazards. Geographical Information System (GIS) and Remote Sensing applications are being used through NRSC under a special group of GIS for LHZ at NDMA through database collection from all concerned departments and being stored through good offices of GIS and other agencies, CSIR labs, DST etc as a parallel theme on landslide mitigation.

Emergency Kit

- Battery operated torch
- Extra batteries
- Battery operated radio
- First aid kit and manual

- Emergency food (dry items) and water (packed and sealed)
- Candles and matches in a waterproof container
- Knife
- Chlorine tablets or powdered water purifiers
- Can opener.
- Essential medicines
- Cash, Aadhar Card and Ration Card
- Thick ropes and cords
- Sturdy shoes

Recover and build

Remain calm and be alert and awake, listen to warnings of heavy and prolonged period of rainfall from weather station, if your home is located below a debris covered area move away to safer place, listen to sounds of rock fall, moving debris and cracking of trees, or cracks in ground or any movement. Keep a battery operated ready for the night.

Call and help rescue teams, keep drinking water containers, first aid kit and essential medicines and avoid entering damaged houses.

Watch for flooding if close to river, help others who need help especially elderly people, children and women, seek advice from local authorities for rebuilding damaged houses, roads etc.

Report any damage of roads, power and telephone lines to concerned authorities.

Landslide: Do’s & Dont’s:

We cannot stop disaster but minimize its impact by preparing ourselves better for landslides. The Government of India has made plans to identify the areas where landslides occur repeatedly. This is achieved through Landslide Hazard Zonation (LHZ) maps which shows or demarcates areas by different colors. NDMA has published a guideline on Landslides and Snow Avalanches as given on its website. Following are the precautionary measures for landslides in the form of do's and dont's as given below:

Do's

- Prepare tour to hilly region according to information given by weather department or news channel.
- Move away from landslide path or downstream valleys quickly without wasting time.
- Keep drains clean,
- Inspect drains for - litter, leaves, plastic bags, rubble etc.
- Keep the weep holes open.
- Grow more trees that can hold the soil through roots,
- Identify areas of rock fall and subsidence of buildings, cracks that indicate landslides and move to safer areas. Even muddy river waters indicate landslides upstream.
- Notice such signals and contact the nearest Tehsil or District Head Quarters.
- Ensure that toe of slope is not cut, remains protected, don't uproot trees unless re-vegetation is planned.
- Listen for unusual sounds such as trees cracking or boulders knocking together.
- Stay alert, awake and active (3A's) during the impact or probability of impact.

- Locate and go to shelters,
- Try to stay with your family and companions.
- Check for injured and trapped persons.
- Mark path of tracking so that you can't be lost in middle of the forest.
- Know how to give signs or how to communicate during emergency time to flying helicopters and rescue team.

Don'ts

- Try to avoid construction and staying in vulnerable areas.
- Do not panic and loose energy by crying.
- Do not touch or walk over loose material and electrical wiring or pole.
- Do not built houses near steep slopes and near drainage path.
- Do not drink contaminated water directly from rivers, springs, wells but rain water if collected directly without is fine.
- Do not move an injured person without rendering first aid unless the casualty is in immediate danger.

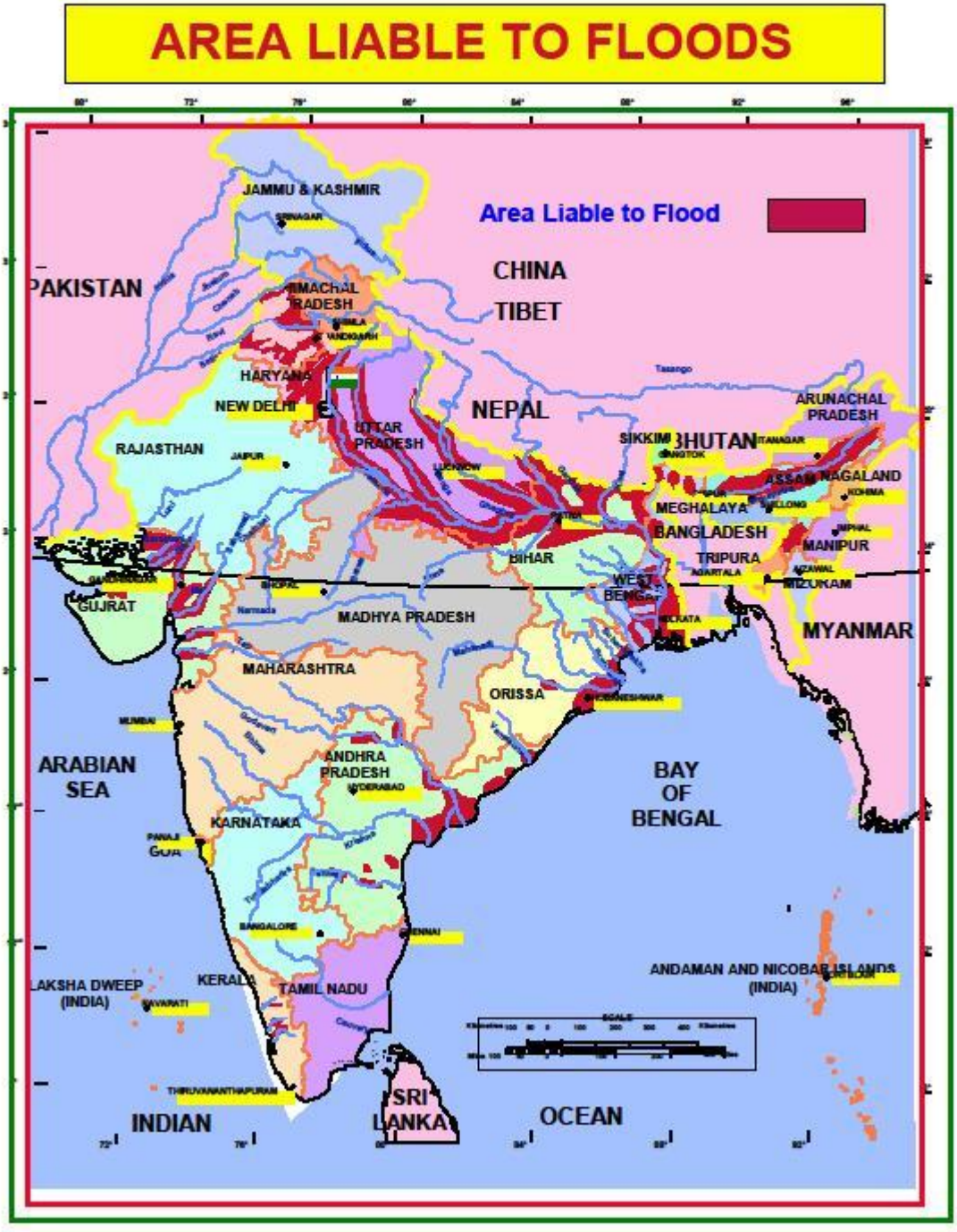
Flood

India is highly vulnerable to floods. Out of the total geographical area of 329 million hectares (mha), more than 40 mha is flood prone. Floods are a recurrent phenomenon, which cause huge loss of lives and damage to livelihood systems, property, infrastructure and public utilities. It is a cause for concern that flood related damages show an increasing trend. The average annual flood damage in the last 10 years period from 1996 to 2005 was Rs. 4745 crore as compared to Rs. 1805 crore, the corresponding average for the previous 53 years. This can be attributed to many reasons including a steep increase in population, rapid urbanization growing developmental and economic activities in flood plains coupled with global warming.

An average every year, 75 lakh hectares of land is affected, 1600 lives are lost and the damage caused to crops, houses and public utilities is Rs.1805 crores due to floods. The maximum number of lives (11,316) was lost in the year 1977. The frequency of major floods is more than once in five years.

Floods have also occurred in areas, which were earlier not considered flood prone. An effort has been made in these Guidelines to cover the entire gamut of Flood Management. Eighty per cent of the precipitation takes place in the monsoon months from June to September. The rivers a bring heavy sediment load from catchments. These, coupled with inadequate carrying capacity of rivers are responsible for causing floods, drainage congestion and erosion of river-banks. Cyclones, cyclonic circulations and cloud bursts cause flash floods and lead to huge losses. It is a fact that some of the rivers causing damage in India originate in neighboring countries; adding another complex dimension to the problem. Continuing and large-scale loss of lives and damage to public and private property due to floods indicate that we are still to develop an effective response to floods. NDMA's Executive Summary Guidelines have been prepared to enable the various implementing and stakeholder agencies to effectively address the critical areas for minimising flood damage.

INDIA



Emergency Kit

- Battery operated torch
- Extra batteries
- Battery operated radio
- First aid kit and essential medicines
- Emergency food (dry items) and water (packed and sealed)

- Candles and matches in a waterproof container
- Knife
- Chlorine tablets or powdered water
- Important documents (Ration card, Voter ID card, Aadhar Card etc.)
- Cash, Aadhar Card and Ration Card
- Thick ropes and cords
- Shoes

Flood: Do's & Dont's:

What to do before a flood

To prepare for a flood, you should:

- Avoid building in flood prone areas unless you elevate and reinforce your home.
- Elevate the furnace, water heater, and electric panel if susceptible to flooding.
- Install "Check Valves" in sewer traps to prevent floodwater from backing up into the drains of your home.
- Contact community officials to find out if they are planning to construct barriers (levees, beams and floodwalls) to stop floodwater from entering the homes in your area.
- Seal the walls in your basement with waterproofing compounds to avoid seepage.

If a flood is likely to hit your area, you should:

- Listen to the radio or television for information.
- Be aware that flash flooding can occur. If there is any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move.
- Be aware of streams, drainage channels, canyons, and other areas known to flood suddenly. Flash floods can occur in these areas with or without such typical warnings as rain clouds or heavy rain.

If you must prepare to evacuate, you should:

- Secure your home. If you have time, bring in outdoor furniture. Move essential items to an upper floor.
- Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.

If you have to leave your home, remember these evacuation tips:

- Do not walk through moving water. Six inches of moving water can make you fall. If you have to walk in water, walk where the water is not moving. Use a stick to check the firmness of the ground in front of you.
- Do not drive into flooded areas. If floodwaters rise around your car, abandon the car and move to higher ground if you can do so safely. You and the vehicle can be quickly swept away.

Earthquake

An earthquake is a phenomenon that occurs without warning and involves violent shaking of the ground and everything over it. It results from the release of accumulated stress of the moving lithospheric or crustal plates. The earth's crust is divided into seven major plates, that are about 50 miles thick, which move slowly and continuously over the earth's interior and several minor plates. Earthquakes are tectonic in origin; that is the moving plates are responsible for the occurrence of violent shakes. The occurrence of an earthquake in a populated area may cause numerous casualties and injuries as well as extensive damage to property.

The Earthquake Risk in India

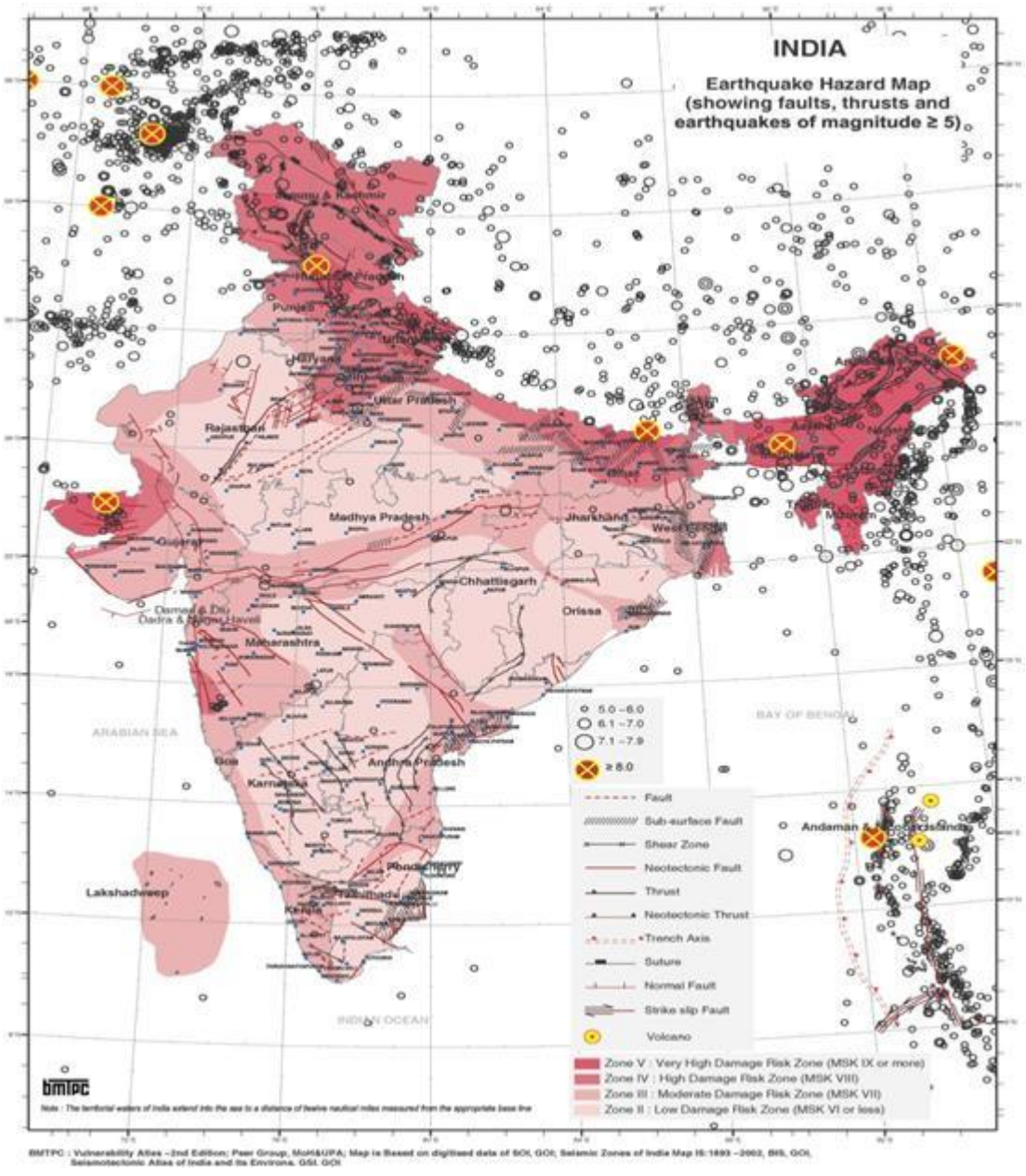
India's increasing population and extensive unscientific constructions mushrooming all over, including multistoried luxury apartments, huge factory buildings, gigantic malls, supermarkets as well as warehouses and masonry buildings keep - India at high risk. During the last 15 years, the country has experienced 10 major earthquakes that have resulted in over 20,000 deaths. As per the current seismic zone map of the country (IS 1893: 2002), over 59 per cent of India’s land area is under threat of moderate to severe seismic hazard-; that means it is prone to shaking of MSK Intensity VII and above (BMTPC, 2006). In fact, the entire Himalayan belt is considered prone to great earthquakes of magnitude exceeding 8.0-; and in a relatively short span of about 50 years, four such earthquakes have occurred: 1897 Shillong (M8.7); 1905 Kangra (M8.0); 1934 Bihar-Nepal (M8.3); and 1950 Assam-Tibet (M8.6). Scientific publications have warned of the likelihood of the occurrence of very severe earthquakes in the Himalayan region, which could adversely affect the lives of several million people in India.

At one time regions of the country away from the Himalayas and other inter-plate boundaries were considered to be relatively safe from damaging earthquakes. However, in the recent past, even these areas have experienced devastating earthquakes, albeit of lower magnitude than the Himalayan earthquakes. The Koyna earthquake in 1967 led to revision of the seismic zoning map, resulting in deletion of the non-seismic zone from the map. The areas surrounding Koyna were also re-designated to Seismic Zone IV, indicating high hazard. The occurrence of the Killari earthquake in 1993 resulted in further revision of the seismic zoning map in which the low hazard zone or Seismic Zone I was merged with Seismic Zone II, and some parts of Deccan and Peninsular India were brought under Seismic Zone III consisting of areas designated as moderate hazard zone areas. Recent research suggests that as understanding of the seismic hazard of these regions increases, more areas assigned as low hazard may be re-designated to higher level of seismic hazard, or vice-versa.

The North-Eastern part of the country continues to experience moderate to large earthquakes at frequent intervals including the two great earthquakes mentioned above. Since 1950, the region has experienced several moderate earthquakes. On an average, the region experiences an earthquake with a magnitude greater than 6.0 every year. The Andaman and Nicobar Islands are also situated on an inter-plate boundary and frequently experience damaging earthquakes.

The increase in earthquake risk is due to a spurt in developmental activities driven by urbanization, economic development and the globalization of India’s economy. The increase

in use of high-technology equipment and tools in manufacturing and service industries has also made them susceptible to disruption due to relatively moderate ground shaking. As a result, loss of human life is not the only determinant of earthquake risk any more. Severe economic losses leading to the collapse of the local or regional economy after an earthquake may have long-term adverse consequences for the entire country. This effect would be further magnified if an earthquake affects a mega-city, such as Delhi or Mumbai.



What to Do After an Earthquake

- Keep calm, switch on the radio/TV and obey any instructions you hear on it.
- Keep away from beaches and low banks of rivers. Huge waves may sweep in.
- Be prepared to expect aftershocks.
- Turn off the water, gas and electricity.
- Do not smoke and do not light matches or use a cigarette lighter. Do not turn on switches. There may be gas leaks or short-circuits. Use a torch.
- If there is a fire, try to put it out. If you cannot, call the fire brigade.

- If people are seriously injured, do not move them unless they are in danger.
- Immediately clean up any inflammable products that may have spilled (alcohol, paint, etc).
- If you know that people have been buried, tell the rescue teams. Do not rush and do not worsen the situation of injured persons or your own situation.
- Avoid places where there are loose electric wires and do not touch any metal object in contact with them.
- Do not drink water from open containers without having examined it and filtered it through a sieve, a filter or an ordinary clean cloth.
- If your home is badly damaged, you will have to leave it. Collect water containers, food, and ordinary and special medicines (for persons with heart complaints, diabetes, etc.)
- Do not re-enter badly damaged buildings and do not go near damaged structures.

Emergency Kit

- Battery operated torch
- Extra batteries
- Battery operated radio
- First aid kit and manual
- Emergency food (dry items) and water (packed and sealed)
- Candles and matches in a waterproof container
- Knife
- Chlorine tablets or powdered water purifiers
- Can opener.
- Essential medicines
- Cash, Aadhar Card and Ration Card
- Thick ropes and cords
- Sturdy shoes

Earthquakes: Do’s & Dont’s:

What to Do Before an Earthquake

- Repair deep plaster cracks in ceilings and foundations. Get expert advice if there are signs of structural defects.
- Anchor overhead lighting fixtures to the ceiling.
- Follow BIS codes relevant to your area for building standards
- Fasten shelves securely to walls.
- Place large or heavy objects on lower shelves.
- Store breakable items such as bottled foods, glass, and china in low, closed cabinets with latches.
- Hang heavy items such as pictures and mirrors away from beds, settees, and anywhere that people sit.
- Brace overhead light and fan fixtures.
- Repair defective electrical wiring and leaky gas connections. These are potential fire risks.
- Secure water heaters, LPG cylinders etc., by strapping them to the walls or bolting to the floor.

- Store weed killers, pesticides, and flammable products securely in closed cabinets with latches and on bottom shelves.
- Identify safe places indoors and outdoors.
    - Under strong dining table, bed
    - Against an inside wall
    - Away from where glass could shatter around windows, mirrors, pictures, or where heavy bookcases or other heavy furniture could fall over
    - In the open, away from buildings, trees, telephone and electrical lines, flyovers and bridges
- Know emergency telephone numbers (such as those of doctors, hospitals, the police, etc)
- Educate yourself and family members
- PSHA Table at Grid Points

Have a disaster emergency kit ready

- Battery operated torch with extra batteries
- Battery operated radio
- First aid kit and manual
- Emergency food (dry items) and water (packed and sealed)
- Candles and matches in a waterproof container
- Knife
- Chlorine tablets or powdered water purifiers
- Can opener.
- Essential medicines
- Cash and credit cards
- Thick ropes and cords
- Sturdy shoes

Develop an emergency communication plan

- In case family members are separated from one another during an earthquake (a real possibility during the day when adults are at work and children are at school), develop a plan for reuniting after the disaster.
- Ask an out-of-state relative or friend to serve as the 'family contact' after the disaster; it is often easier to call long distance. Make sure everyone in the family knows the name, address, and phone number of the contact person.

Help your community get ready

- Publish a special section in your local newspaper with emergency information on earthquakes. Localize the information by printing the phone numbers of local emergency services offices and hospitals.
- Conduct week-long series on locating hazards in the home.
- Work with local emergency services and officials to prepare special reports for people with mobility impairment on what to do during an earthquake.
- Provide tips on conducting earthquake drills in the home.
- Interview representatives of the gas, electric, and water companies about shutting off utilities.
- Work together in your community to apply your knowledge to building codes, retrofitting programmes, hazard hunts, and neighborhood and family emergency plans.

What to Do During an Earthquake

Stay as safe as possible during an earthquake. Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur. Minimize your movements to a few steps that reach a nearby safe place and stay indoors until the shaking has stopped and you are sure exiting is safe.

If indoors

- DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture; and HOLD ON until the shaking stops. If there is no a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Protect yourself by staying under the lintel of an inner door, in the corner of a room, under a table or even under a bed.
- Stay away from glass, windows, outside doors and walls, and anything that could fall, (such as lighting fixtures or furniture).
- Stay in bed if you are there when the earthquake strikes. Hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall. In that case, move to the nearest safe place.
- Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load bearing doorway.
- Stay inside until the shaking stops and it is safe to go outside. Research has shown that most injuries occur when people inside buildings attempt to move to a different location inside the building or try to leave.
- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.

If outdoors

- Do not move from where you are. However, move away from buildings, trees, streetlights, and utility wires.
- If you are in open space, stay there until the shaking stops. The greatest danger exists directly outside buildings; at exits; and alongside exterior walls. Most earthquake-related casualties result from collapsing walls, flying glass, and falling objects.

If in a moving vehicle

- Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that might have been damaged by the earthquake.

If trapped under debris

- Do not light a match.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.