RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

The primary requirement for making disaster management plan is the reliable and upto date information about topography and socio- economic and climatic conditions of this region which is described in previous chapter. This will help in identifying the areas vulnerable to environmental and manmade hazards. This chapter deals with the information on geographical aspects of Jhajjar district, its area, population distribution, climatic condition, physiographic divisions as well as geology of the district.

For the last two decades, it has been on the faster pace of the development, and emerged as the industrial and financial hub of Haryana. Hazard Risk in Jhajjar district are further compounded by increasing vulnerabilities related to the high population growth, rapid-urbanization, increasing Industrialization, rapid development within high risk seismic zone (Zone IV), environmental degradation, climate change etc.

The threat (Risk) and possible impact (Vulnerability) which can be actualized from these hazards ranges from minor impacts affecting one village to events impacting more areas.

During last one decade, Jhajjar has undergone major changes and has now developed into Modern Township. Over the years, Disasters have caused damage to life and property and have adversely impacted economic development. The entire region of Jhajjar falls in high risk seismic zone IV and corresponds to MSK intensity VIII making it highly vulnerable to Earthquakes,that may occur due to the following the major tectonics features:

I. The Sohna Fault

II. Junction of Aravali and Alluvium near Delhi

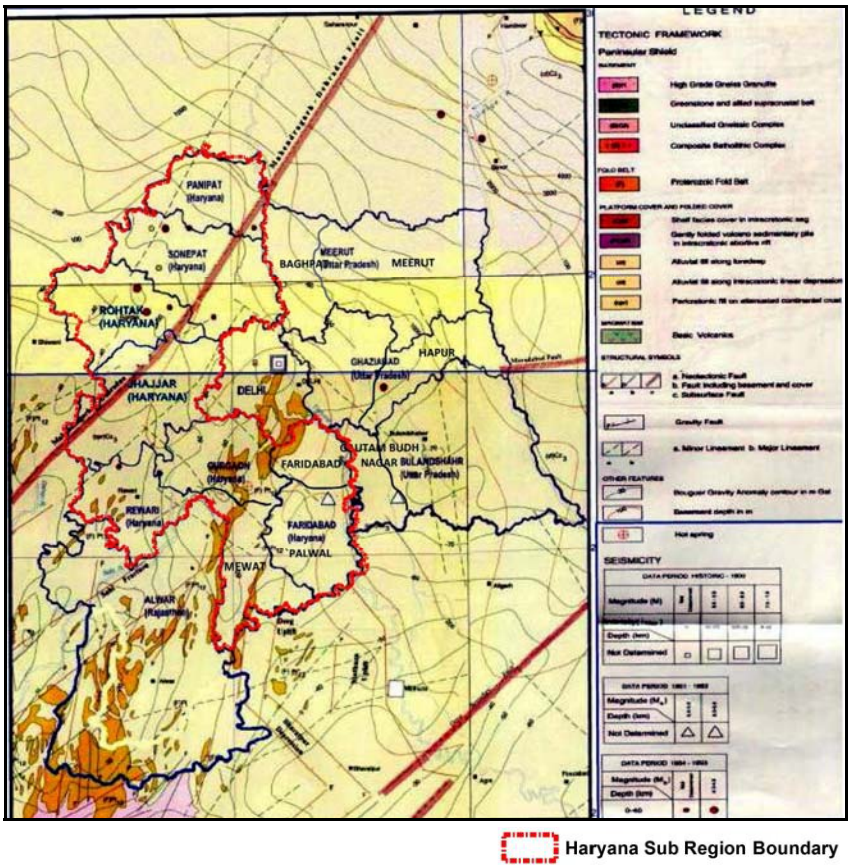
III. Moradabad Fault

IV. Delhi Moradabad Fault

V. Delhi-Haridwar Fault

Earthquakes of intensity lower than four on the Richter scale have originated at about 10 epicenters that lie in the Sub-region

The Mahendragarh-Dehradun Fault line passes through Jhajjar and Rohtak districts.Although no major earthquake have occurred in Jhajjar in recent year, yet tremors have been felt whose epicentre of the quake was reportedly at Jhajjar in Haryana.



Seismic Tectonic Features in Haryana Sub-Region

For above mentioned point, **National Cancer Institute (NCI)** development project falls in Jhajjar district and required risk assessment and disaster management plan are the following:

EMERGENCY PREPAREDNESS PLAN

A state of "Emergency" is defined as any event that disrupts normal operations or poses a serious threat to persons or property, requires a quick or immediate response and may require support beyond the abilities of the company. Generally good design, regular inspection and preventive maintenance of the equipment(s) reduce the probability of occurrence of emergencies. However, as it is not possible to totally eliminate such eventualities and random failures of equipment or human errors, omissions and unsafe acts, it is important to have an Emergency Response Plan (ERP), which focuses on mitigating the effects of such an Emergency and restoration of normalcy at the earliest. The overall objective of an ERP is to make use of the combined resources on-site and outside services to achieve the following:

- To localize the emergency and, if possible, eliminate it;
- To minimize the effects of the accident on the people and property on-site;
- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Evacuate people to safe areas/assembly points;
- Informing and collaborating with statutory authorities to tackle the emergency;

- Initially contain and ultimately bring the incident under control;
- Preserve relevant records and equipment for subsequent enquiry into the cause and circumstances of the emergency; and
- Investigating and taking steps to prevent recurrence.

The ERP can identify only some possible events that could occur during an emergency and the ERP therefore designates areas of authority and responsibility and defines the framework within which emergency decisions will be made. The ERP defines the levels of emergencies and focuses on the most serious of incidents. The ERP has to be related to the identification of sources from which hazards can arise and the maximum credible loss scenario that can take place in the concerned area. The ERP takes into account the maximum credible loss scenario - actions that can successfully mitigate the effects of losses/emergency need to be well planned so that they would require less effort and resources to control and terminate emergencies, should the same occur.

Main hazards identified for the **National Cancer Institute (NCI)** include:

- Fire hazard;
- Earthquake;
- LPG/Natural Gas leakage;
- Flood hazard;
- Radiation
- Chemical

A detailed ERP for the above mentioned emergencies will be prepared for the **National Cancer Institute (NCI)**. All resident, guests, and visitors shall be made aware of the ERP through regular training/awareness programmes, signages, etc. The ERP related to hazards pertaining to fire, earthquake and LPG/Natural Gas leakage, Health Injuries, Electrical, Mechanical, Radiation, Thermal, Chemical is briefly described in the following section.

FIRE HAZARD

Fire Protection System

The fire protection system for the proposed **National Cancer Institute (NCI)** building is to be designed as per the provisions of National Building Code - 2005 and the directions of local fire service authority.

Classification of the Building

The following provisions will be made available as required in the building which, it is expected, would provide a reasonable degree of protection from fire hazards and at the same time satisfy the local fire authority, if any:

i) Wet risers with hose reels at each floor.
ii) Yard hydrants on the periphery of the building.
iii) Manual call alarm system on each floor.
iv) Automatic fire detection & alarm system.

v) Public Address and Communication System.
vi) Good Housekeeping & Maintenance and training of staff.

Static Storage of Water for Fire Fighting Purposes

An underground static water storage tank and terrace tank are for firefighting purpose. The details of the fire tanks are provided in the **Table-7.1** below:

Table-7.1: Details of Fire water Tank

Under Ground Tank			
S.No.	**Description**	**Capacity (CUM)**	**Proposed Capacity(CUM)**
1.	Fire Tank (Institutional)	200	200
2.	Fire Tank (Residential)	50	50
Terrace Tank			
Institutional Building			
3.	Hospital Block A	20	20
4.	Hospital Block B	20	20
5.	OPD & Day Care	10	10
6.	Service Zone	10	10
7.	Clinical Research	20	20
8.	Admn. Block	10	10
9.	Research Associate Hostel	25	25
10.	Basic Science Research and seminars/PC Teaching	20	20

Hydrant System

Hydrant system will be provided at each floor and also on the periphery of the building (Yard hydrants). The water supply to hydrants would be by means of wet riser piping system connected to the static storage in the underground reservoir through a set of automatic pumps installed in the pump room. The system is also fitted with inlet connection (fire brigade breaching inlet) at ground level for charging with water by pumping from the fire service appliances and an air release valve at roof level to release trapped air. The Fire Hose Cabinets would be placed at conspicuous locations preferably near staircase and lift lobby, ensuring that no part on the floor is more than 30 m away from it.

Automatic Sprinkler System

The entire building except electric substation and plant room is to be provided with automatic sprinkler system. The system will be designed as per IS: 15105 – design and Installation of fixed automatic sprinkler Fire Extinguishing system/NFPA 13 - standard for the Installation of Sprinkler System. Sprinkler system shall incorporate an alarm system also. The Sprinkler Annunciation Panel located in the fire control room will indicate the operation of the sprinklers on the particular floor with an audio visual alarm.

Fire Pumping System

Water sumps are provided in the pump room in the underground reservoir so that always immersed suction is available for the pumps. The pumps are designed to cater for the flow and pressure requirement at any point of the fire fighting system. The system will comprise of following pumps:

- Electric Fire Hydrant pump
- Electric Sprinkler pump
- Electric Jockey Pump
- Diesel Standby pump

Portable Fire Extinguishes

ISI marked portable fire extinguishers of specified type and capacities shall be provided at all levels including electric substations, meter rooms and lift machine rooms as per the provisions of IS : 2190 - 1979.

Machinery/Components to be installed for Fire Fighting:

- Fire Brigade Connection;
- Under ground fire water tank;
- Over head fire water tank;
- Sprinklers line;
- Fire line;
- Fire Hose cabinet;
- Hose Reel;
- Single headed External Fire Hydrant;
- Smoke Detector;
- Fire detector;
- Alarm system;
- Electric pump;
- Diesel pump;
- Jockey pump;
- Air Release Valve;
- Butterfly valve;
- Non return Valve;
- Strainer;
- Landing valve;
- Floor drain;
- Pendent Sprinklers;
- 4.5 Kg CO_2 Type portable fire extinguisher;
- 5.0 kg ABC Type Portable Fire extinguisher;

- 9.0 liters Water CO_2 Type portable fire extinguisher.

Response in Case of Fire

- Required response in the event of a fire should be described in signs/labels displayed in the relevant areas of the **National Cancer Institute (NCI).**
- On sighting a fire, it should be immediately informed to the concern person or authority at the site **National Cancer Institute (NCI)** giving the details about the exact location and the type of fire.
- Intimate the Emergency Response Team for fire.
- If the fire is small, get engaged in extinguishing the fire using the nearest fire extinguisher
- The response team should immediately move to the point of fire and take all necessary steps to stop the fire. If the fire is not controllable and spreads, then the manager in charge should inform the district authorities and call for external help.

- The Emergency Response Team should immediately inform the nearest Hospital, Fire Station and Police. If required, a Fire Tender should be summoned.

- The Emergency Response Team shall provide immediate relief to the injured people at the scene of incident. Any injured persons should be evacuated on priority to the dispensary or one of the nearest hospitals based on their condition.

Instructions for residents

- Get out of the buildings as quickly and as safely as possible.
- Use the stairs to escape. When evacuating, stay low to the ground.
- If possible, cover mouth with a cloth to avoid inhaling smoke and gases.
- Close doors in each room (after escaping) to delay the spread of the fire.
- Do not use elevators to evacuate, use stairs. Be patient, do not panic or push.

If in a room with a closed door, please follow the instructions as mentioned below:

- If smoke is pouring in around the bottom of the door or if it feels hot, keep the door closed.
- Partially open a window to escape or for fresh air while awaiting rescue and stand near it.
- If there is no smoke at the bottom or top and the door is not hot, then open the door slowly.
- If there is too much smoke or fire in the hall, slam the door shut.
- Pack the space under the door with wet clothing or other material to keep the smoke out.
- Let someone know you are trapped. Call Security and stay on the line until he tells you to hang up. If there are no phones available, yell out the window (if you have one), kick on the door, do anything to make noise and draw attention to yourself. Hang a sheet, jacket or other article out of the window to signal your location.
- Stay low to the floor as the smoke will fill higher areas first.

- Do not attempt to jump from windows above the ground level as this can cause serious injury or death.
- If you are physically unable to evacuate, proceed to a safe place and inform Security of your location.
- You may assist a disabled but mobile individual in an evacuation. However, attempts to carry immobilized individuals are discouraged. Once the location of the disabled individual is received, trained and equipped emergency personnel will evacuate the individual depending upon the site of the fire and the potential hazard.
- All personnel should know where primary and alternate exits are located, and be familiar with the various evacuation routes available. Floor plans with escape routes, alternate escape routes, exit locations and designated assembly points shall be displayed.
- Stay out of damaged buildings.
- Check that all wiring and utilities are safe.

EARTHQUAKE

An Earthquake is a series of underground shock waves and movements on the earth's surface caused by natural processes of writhing of the earth's crust.

Earthquake History:- Eastern parts of Haryana along with Delhi lie in the Gangetic Plain. It is a down warp of the Himalayan foreland, of variable depth, converted into flat plains by long-vigorous sedimentation. This is known as a geosynclines and the Gangetic Plain is the Indo-Gangetic Geosynclines. It has shown considerable amounts of flexure and dislocation at the northern end and is bound on the north by the Himalayan Frontal Thrust. The floor of the Gangetic trough (if seen without all the sediments) is not an even plain, instead shows corrugated inequalities and buried ridges (shelf faults). The region sits atop the Delhi-Haridwar ridge, which is a sub-surface ridge, trending NE-SW. There are numerous faults in this region, like the Moradabad, Panipat and Sohna faults. Delhi, Chandigarh and many parts of Haryana lie in Zone IV and thus they are extremely vulnerable to earthquakes. Most earthquakes in this region are shallow, though a few earthquake of intermediate depth have been recorded in Haryana. The alluvial cover of the Indo-Gangetic plain makes even distant earthquake felt here quite strongly. This region often feels deep-seated earthquakes that are centered on the Pakistan-Afghanistan Border and in the Hindukush mountains in Afghanistan. However, it must be stated that proximity to faults does not necessarily translate into a higher hazard as compared to areas located further away, as damage from earthquakes depend on numerous factors such as subsurface geology and adherence to the building codes.

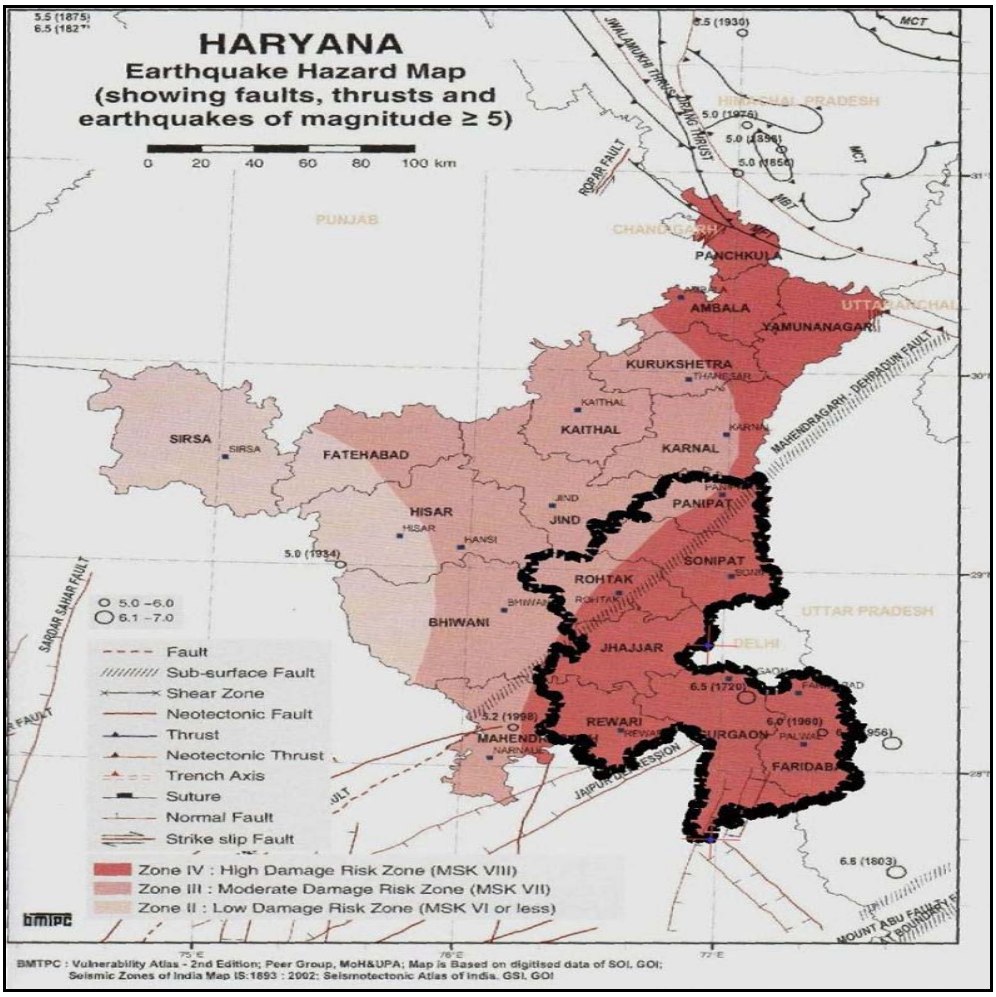


Figure-7.2: Earthquake hazard map of Haryana

a) Seismic Hazard

All districts of Haryana sub-region lie in Zone IV and High damage risk zone (MSK VIII) in respect to earthquakes. Since, the earthquake database is available only for the earthquakes that taken place after the historical period i.e. 1800 A.D., hence, these zones offer a tentative insight of the earthquake hazard and need to be updated regularly.

Table-7.2: Earthquakes felt in the Haryana Sub-Region and surroundings

Date	Place	Intensity	Northing	Easting	Depth	Origin time
27 Aug1960	Gurgaon-Faridabad	6.0	28.20	77.40		15:58:59.20
20 June 1966	Delhi-Gurgaon Border	Mb 4.7	28.50	76.98	053.0 kms	13:42:57
29 July 1980	Western Nepal	Mw 6.8	29.60	81.09		14:58:40

12 Nov 1996	Near Kurukshetra (Haryana-U.P. bdr. region)	Mb 4.5	29.928	77.207	055.0 kms	04:20:58
4 May 1997	Rothak-Sonipat Districts (Haryana)	ML 4.1	28.984	76.588	28.8 kms	07:19:22
30 Mar 1998	Mahendragarh-Bhiwani Districts (Haryana-Rajasthan Border.)	Mb 5.0	28.211	76.240	010.0 kms	23:55:45
22 Mar1999	North of New Delhi, (Haryana-Uttar Pradesh Border region),	Mb 4.1	29.257	76.940	207.6 kms	09:56:16
29 Mar 1999	Near Gopeshwar (Chamoli), Uttaranchal	Mw 6.5	30.492	79.288	19:05:11	
28 April 2001	Sonipat-Delhi region	Mb 4.3	28.591	77.044	15.4 kms	03:06:27
22 Dec 2003	Jind region, Haryana	ML 3.5	29.235	76.401	15.4 kms	20:19:08
27 Nov 2004	Chandigarh-north Haryana region	ML 3.9	30.352	77.129	19 kms	23:53:54
8 Oct 2005	Kashmir-Kohistan, Pakistan-India border	Mw 7.6	34.432	73.537	020.0 kms	03:50:40
25 Nov 2007	Delhi metropolitan area	Mb 4.6	28.677	77.204	10 kms	23:12:17

Response Procedures for residents

- **If indoors:** Take cover under a piece of heavy furniture or against an inside wall and hold on. Stay inside the most dangerous thing to do during the shaking of an earthquake is to try to leave the building because objects can fall on you.

- **If outdoors:** Move into the open, away from buildings, streetlights, and utility wires. Once in the open, stay there until the shaking stops.

- **If in a moving vehicle:** Stop quickly and stay in the vehicle. Move to a clear area away from the buildings, trees, overpasses, or utility wires. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.

After Earthquake

- After the quake, be prepared for aftershocks.
- Although smaller than the main shock, aftershocks cause additional damage and may bring weakened structures down. Aftershocks can occur in the first hours, days, weeks, or even months after a quake.

Help injured or trapped persons

- Give first-aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
- Remember to help those who may require special assistance e.g. infants, the elderly, and people with disabilities.
- Stay out of damaged buildings.

- Use the telephone only for emergency calls.

7.1.3.4 Damage Control

- No attempts are to be made at damage control that involves any degree of risk to life and health of facilities personnel. The following actions can be undertaken by residents to reduce damage potential to the property:
- Shut off gas mains
- Shut off water mains
- Disconnect mains power supply if the isolating devices for these utilities are outside the building

Damage Assessment/Reporting:

After the initial shock, evaluate the situation and if emergency help is necessary, call the emergency response team (ERT) at the designated emergency response number. Report any injuries or damage to facilities to ERT.

Response Procedure for Emergency Team

- Formulate an Emergency Response Team for earthquake response.
- Using the public address system, inform guests, visitors and staff about the response procedures discussed above.
- Inform the necessary authorities for aid.
- Ensure that no residents are stuck beneath any debris, in case of a structural failure.
- Ensure that all residents standing outside/near the buildings are taken to open areas.
- Ensure that the first-aid, ambulance and fire tender vehicles are summoned, if necessary.
- Inform the nearby hospitals if there are any injuries.
- Check the utilities and storage tanks for any damage.

Security:

Secure the areas from being entered by placing a cordon of security guards at a safe distance from the building. These security guards may be supplemented with other suitable facility employees.

Elevator Usage:

Elevator installations in seismic zones are protected with switches to stop all elevator movement as soon as seismic action has reached a certain limit. Should such a device fail and elevators are still operable after an earthquake, nobody must be allowed to make use of elevators.

LPG/Natural Gas Leakage

- The affected area should be evacuated and cordoned off immediately.
- Intimate the Emergency Response Team about LPG/Natural Gas leakage.
- Shut down the main valves in the gas pipeline.

- Ensure that only concerned personnel are present in the affected area and all other residents are moved to the nearest assembly points.
- Rescue trapped personnel. Also, check if any personnel are unconscious in the area and immediately move them outside and provide first aid.
- Ambulance should be summoned to take injured personnel to the nearest hospital.
- Personnel in the nearby buildings shall be asked to close all doors and windows to prevent entry of the leaked gas.
- Source of leakage shall be traced and isolated from all other areas. If required, pedestal fans shall be used to bring down the gas concentration.
- No match box or gas lighter or electric device or switch be operated.

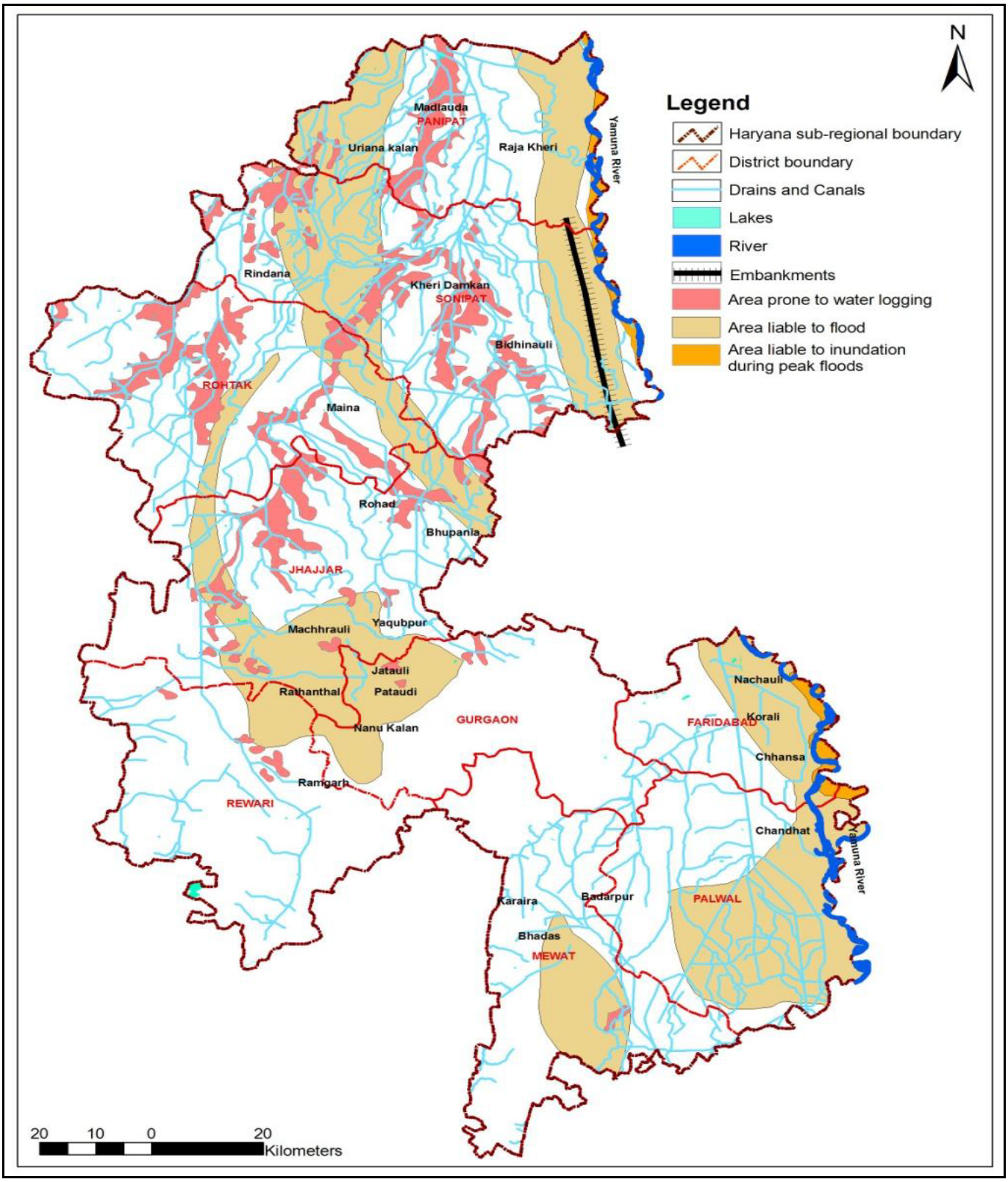
Flood Hazard & Disaster

Flood is a temporary inundation of large region due to increase in reservoir levels, or of rivers flooding their banks because of heavy rains, high winds, cyclones, storm surge along coast, tsunami, melting snow or dam bursts. In the sub-region of Haryana, the propensity of flooding is more as a hazard rather than a disaster. The areas under low-lying contour zone (heterogeneous topography) and along the river of Yamuna are subject to flood hazard. There are number of instances when several districts faced flood hazard primarily due to heavy rain in monsoon and discharge in Yamuna.

Table-7.3: - History of Flood

Duration/Year	District Affected with in Sub-Region	Primary cause/Remarks
1978	Sonipat, Faridabad and adjoining areas of Delhi	Heavy rainfall and discharge in Yamuna
1983	Rohtak, Sonipat, Gurgaon, Faridabad	Intensive rainfall
22-26th September, 1988	Faridabad, Sonipat	Heavy rainfall and discharge in Yamuna
5-15 September, 1995	Haryana	Heavy rainfall and discharge in Yamuna
June, 1996	Gurgaon, Mewat, Rewari, Faridabad	Intensive rainfall
16-20th October, 1998	Sonipat, Rohtak, Jhajjar	Intensive rainfall
5-8th August, 2008	Rohtak, Jhajjar, Sonipat	Intensive rainfall

Flood history of Haryana sub-region from 1978-2010, reveals that whenever heavy rainfall has taken place, it has resulted in flooding of district of Rohtak, Sonipat, Gurgaon & Faridabad. Strengthening of flood embankments along the river Yamuna may help, but has to be commensurate with the hydrology of the area, so that rainfall does not get trapped in the district.



Source: BMTPC , State natural Resources data Management System Centre & CWC (Central Water Commission)

Figure-7.3:- Flood Prone areas in the sub-region

Preparedness Plan for Flood:-

Before Flood:-

- Develop a Household Emergency Plan
- Prepare an Emergency Kit and an Evacuation Kit
- Ask your local council about flood plans which detail problem areas and evacuation routes and centres
- Keep a list of emergency phone numbers stored in your mobile phone and on display
- Remove items such as leaves and debris that can cause localised flooding
- Consider tiled floors in ground-level rooms
- Ensure your home has a safety switch installed
- Ensure everyone knows where, how and when to turn off the main power, water and gas supply in case of emergency and evacuation

During Flood:-

- Tune into Warnings - stay tuned into additional warnings and updates
- The best option when you are not required to evacuate, is to shelter in a safe and secure structure at home or with family and friends
- Don’t allow children to play in, or near flood waters
- Avoid entering floodwaters.
- Be aware of the increase likelihood of contact with wildlife such a snakes and spiders
- Stay away from drains, culverts and any flowing water
- Store drinking water in a clean and covered bathtub or in the hot water tank. If the hot water tank valves are turned off and no heat is supplied to the tank, flood water cannot enter the tank
- Any water you suspect may be contaminated—should be treated before drinking
- Do not run generators in a confined space that may lead to the build up of Carbon Dioxide fumes
- Do not use any electrical items - consider alternatives for food preparation and hygiene.
- Avoid driving or walking/wading in flooded areas at all costs
- Enter only if absolutely essential and safe to do so, and proceed slowly and steadily
- Don’t enter flood waters before checking depth and current. Beware of wash-outs, fallen power lines and floating objects
- If your vehicle becomes stranded in flood water, leave it and move to higher ground before the water rises further
- If you are in a boat, keep away from power lines and power poles and wear you life jacket.

After Flood:-

- For any situation where someone is seriously injured or in need of urgent medical help
- For non life threatening emergency assistance refer to your emergency phone numbers or contact your local council
- Do not go sightseeing
- Check on your neighbours
- Don’t use gas or electrical appliances which have been in flood water until checked for safety
- Check with electricity, gas and water authorities to determine whether supplies to your area have been interrupted and are safe to be turned on by you.
- Don’t eat food which has been in flood waters. This includes food from fruit trees and vegetable gardens.
- Wait until flood water has fallen below floor level before returning to a flood affected house.
- Stay safe and healthy during storms and flood recovery
- Wear rubber boots (or at least rubber-soled shoes) and rubber or leather gloves.
- When cleaning up your house and yard following a flood, remove any stagnant pools of water to help prevent mosquito-borne diseases.
- Stay away from damaged powerlines, fallen trees and flood water
- Keep children out of drains, creeks or rivers
- Watch animals closely - Keep all your animals under your direct control. If there has been damage to boundary fences pets may be able to escape from your home. Be aware of hazards at nose, paw or hoof level, particularly glass or downed power lines