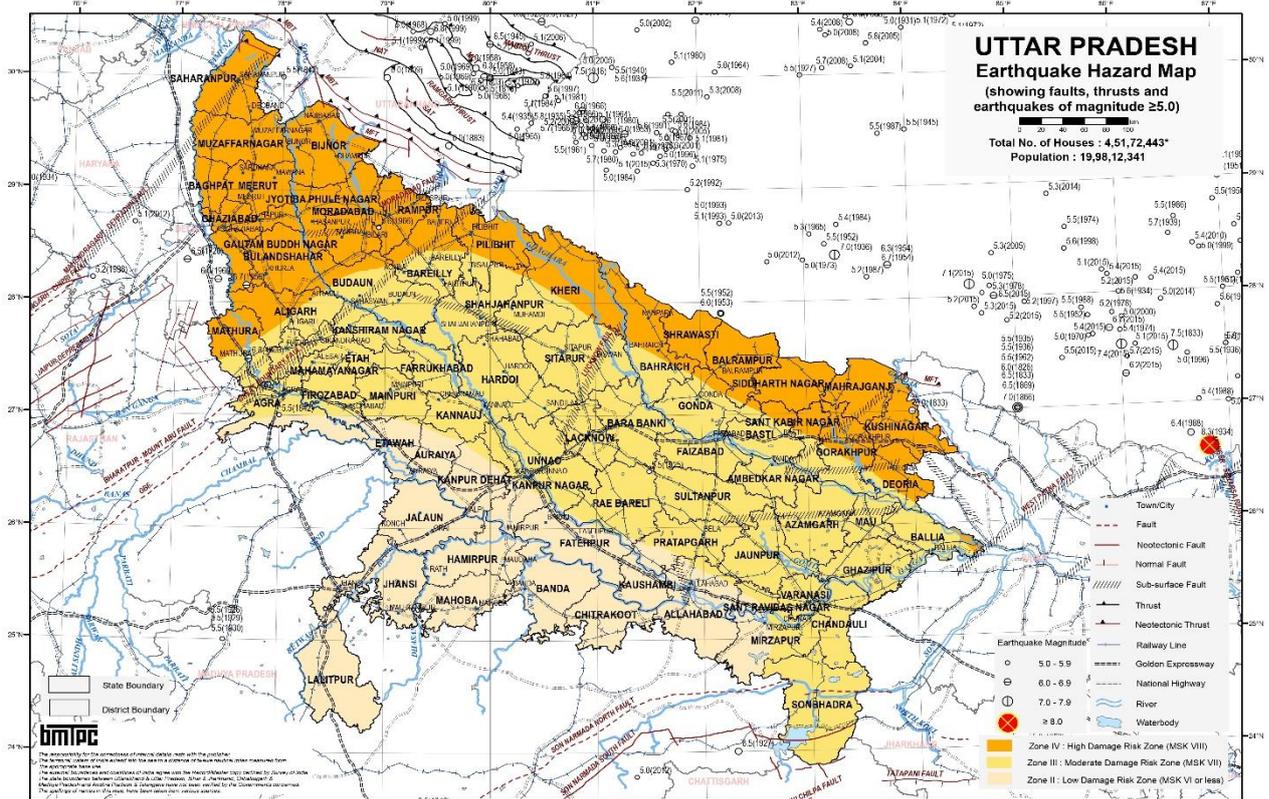


After Action Report - Mock Exercise on Earthquake & Fire Safety 06th - 20th Sept 2024

Earthquake Hazard in UTTAR PRADESH

1. Introduction

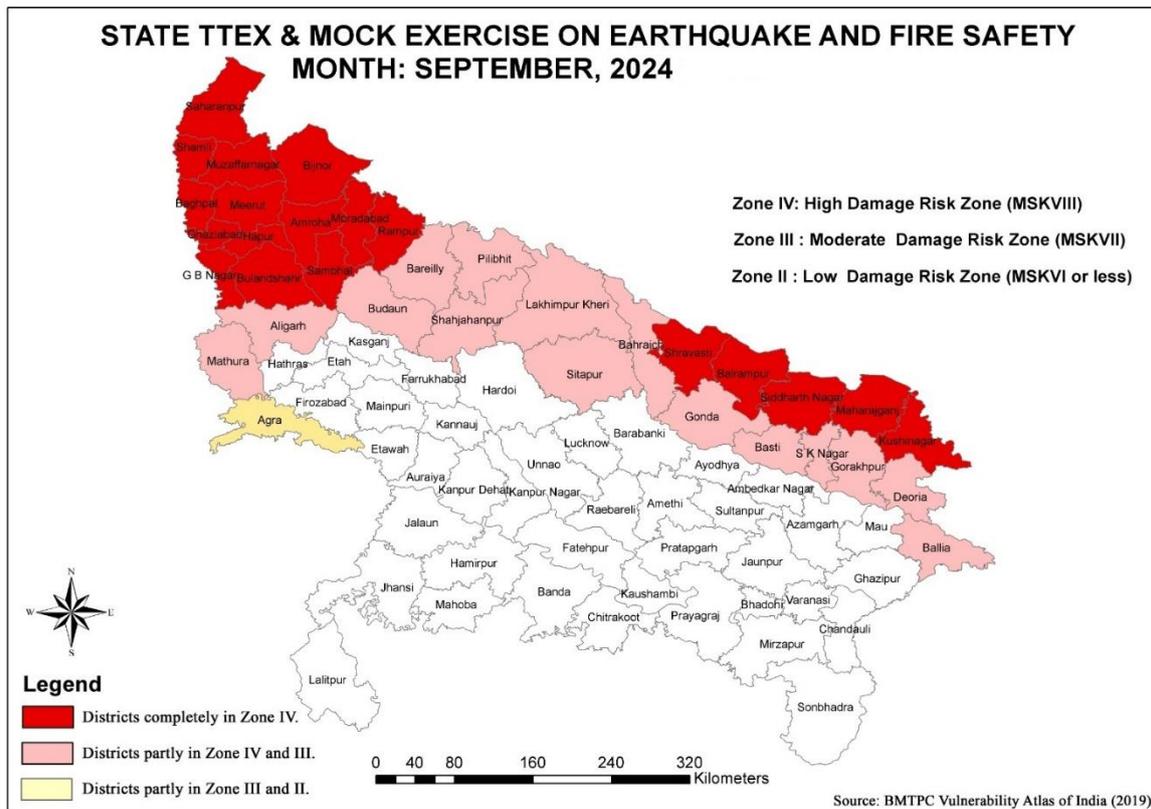
Uttar Pradesh is classified into three Seismic Zones, viz, II, III & IV based on the expected maximum earthquake intensity. A significant portion of the State lies within Zones III and IV, where the anticipated earthquake magnitude can reach up to 5.5 on the Richter scale.



BMPFC : Vulnerability Atlas - 3rd Edition : Peer Group, MOHUA, GOI; Map is Based on digressed data of SOI; Seismic Zones of India Map IS: 1693 (Part I): 2002, BIS; Earthquake Epicentre from IMD; Seismotectonic Atlas of India and its Environs, GSI; Houses/Population as per Census 2011; *Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

Source: BMPFC

The State is intersected by various fault lines and ridges, including the Delhi-Haridwar Ridge (DHR), which extends in an NNE-SSW direction from New Delhi to the Garhwal region, and the Delhi-Muzaffarnagar Ridge (DMR), which runs east-west from New Delhi to Kathgodam in Nepal.



Of the 75 districts in the State, 34 districts lie in Seismic Zones III and IV. In light of the State's vulnerability to seismic activity, a comprehensive state-level mock exercise was conducted, integrating both earthquake and fire hazard scenarios. Given that fire hazards often accompany earthquakes, these drills were aimed at reviewing and refining the preparedness, response, and relief mechanisms for disaster management. 35 districts participated in the simulations to ensure that efficient disaster mitigation strategies are in place both for earthquake and fire-related emergencies.

2. Earthquake Seismicity in Uttar Pradesh

Earthquakes have impacted nearly all regions of Uttar Pradesh, with tremors often originating from significant seismic events in neighbouring states such as New Delhi, Uttarakhand, Bihar and across the Indo-Nepal border. These external earthquakes have frequently echoed through various parts of Uttar Pradesh, contributing to the State's seismic vulnerability.

Within Uttar Pradesh, there are a total of **ten major fault lines** that play a critical role in influencing the region's seismic hazards. These fault lines, detailed in the table below, are key contributors to the seismic activity experienced in the State.

Fault lines running through Uttar Pradesh

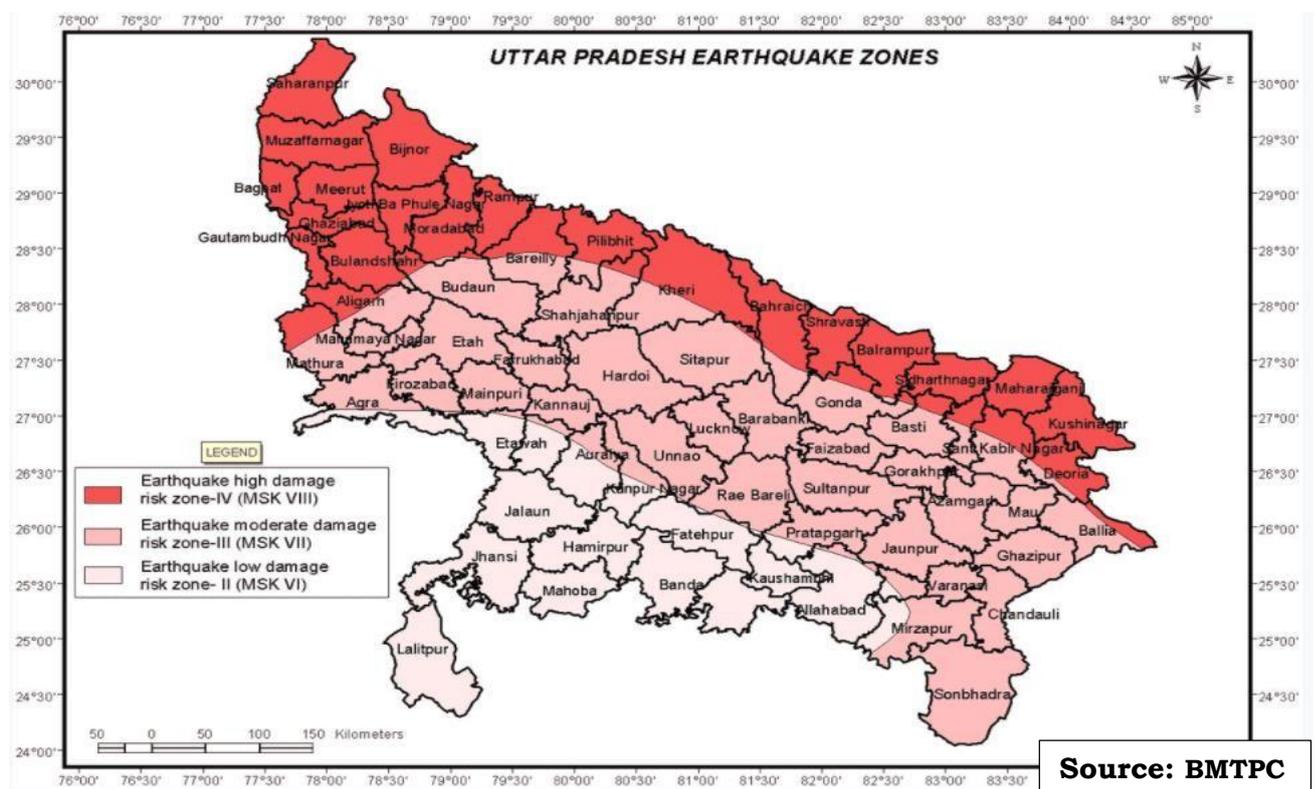
S.No.	Name of Fault	Length (KM)
1.	Lucknow Fault	100
2.	Prayagraj Fault	60
3.	Great Boundary Fault	300
4.	Moradabad Fault	120
5.	Azamgarh Fault	170
6.	Gorakhpur Fault	120
7.	Shahjahanpur Fault	130
8.	Deoria Fault	110
9.	Main Central Thrust (MCT)	854
10.	Main Boundary Thrust (MBT)	1144

3. Earthquake Sensitivity in Uttar Pradesh

The districts of Uttar Pradesh falling in Earthquake Seismic Zones IV – II are as under:-

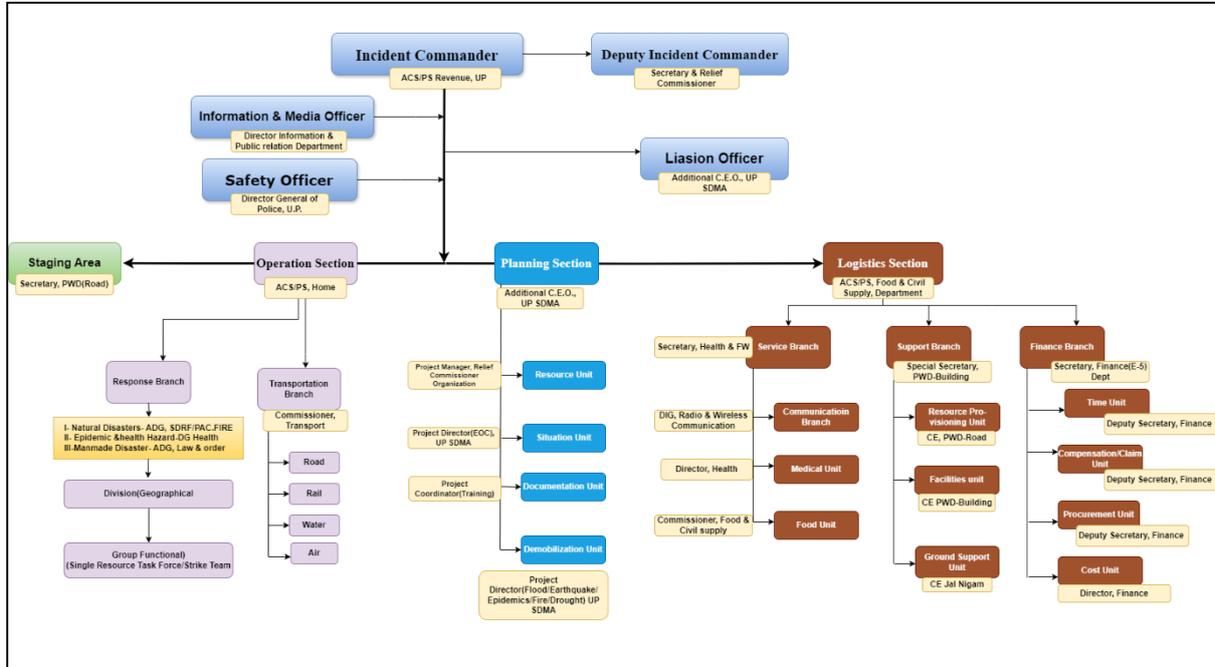
Sr No.	Districts completely in Zone IV	Districts partly in Zones IV & III	Districts completely in Zone III	Districts partly in Zone III & II	Districts completely in Zone II
01	Amroha	Aligarh	Ambedkar Nagar	Agra	Banda
02	Baghpat	Bahraich	Ayodhya	Amethi	Chitrakoot
03	Balrampur	Ballia	Azamgarh	Auraiya	Hamirpur
04	Bijnor	Bareilly	Barabanki	Bhadohi	Jalaun
05	Bulandshar	Basti	Chandauli	Etawah	Jhansi
06	G.B. Nagar	Budaun	Etah	Fatehpur	Kausambhi

Sr No.	Districts completely in Zone IV	Districts partly in Zones IV & III	Districts completely in Zone III	Districts partly in Zone III & II	Districts completely in Zone II
07	Ghaziabad	Deoria	Farrukhabad	Firozabad	Lalitpur
08	Hapur	Gonda	Ghazipur	Kanpur Dehat	Mahoba
09	Kushinagar	Gorakhpur	Hardoi	Kanpur Nagar	
10	Maharajganj	Lakhimpur Kheri	Hathras	Mainpuri	
11	Meerut	Mathura	Jaunpur	Mirzapur	
12	Moradabad	Pilibhit	Kannauj	Pratapgarh	
13	Muzaffarnagar	Shahjahanpur	Kasganj	Prayagraj	
14	Rampur	Sitapur	Lucknow	Raebareli	
15	Saharanpur	Sant Kabir Nagar	Mau		
16	Sambhal		Sonbhadra		
17	Shamli		Sultanpur		
18	Shravasti		Unnao		
19	SiddharthNagar		Varanasi		

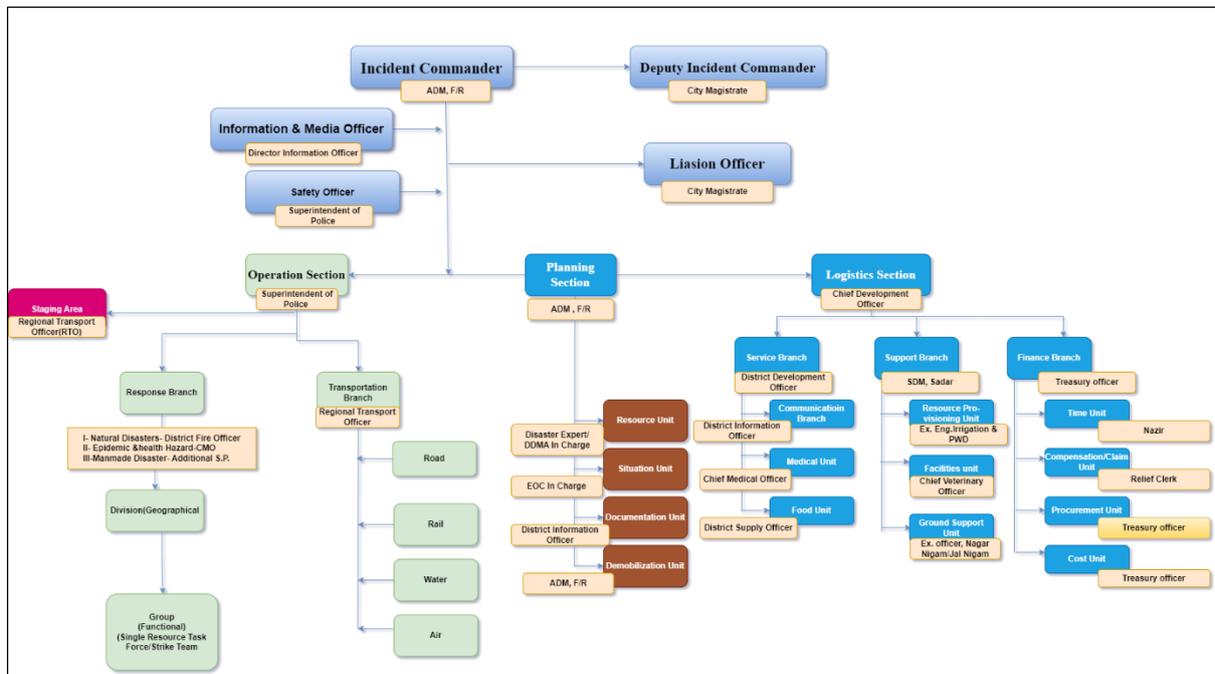


4. Mandated Response Mechanism

The Incident Response System (IRS) serves as the mandated framework for disaster management in India. In line with this, the State has established Incident Response Teams (IRTs) at both the State and District levels with GO



State Level



District Level

The Table Top Exercise and the Mock Exercise were conducted in accordance with the IRS. The objectives of the Earthquake and Fire Safety Mock Ex were outlined as follows:

- a. To engage key disaster management officials of various departments in their designated roles and responsibilities during various simulated emergency scenarios.
- b. To evaluate the Disaster Management (DM) plan and associated Standard Operating Procedures (SOPs) at the State, Departmental, and District levels.
- c. To facilitate effective coordination among Emergency Support Functions at the district level.
- d. To enhance public awareness by actively involving the media, Local Governing Bodies (LGBs), Non-Governmental Organizations (NGOs), and community stakeholders.
- e. To identify any existing gaps in resources, manpower, communication, and response capabilities.

5. Participation

Ex SAMANVAYA, a Table Top exercise at the State level conducted at Meerut Cantt. was chaired by Lt. Gen Yogendra Dimri, PVSM, AVSM, VSM (Retd), Vice Chairperson UP SDMA. The exercise coordinator was Brig. Ajay Gangwar, Sr. Consultant. The Exercise included all line departments, viz, Health, Telecom, Labour & Employment, PWD and Railways. Response forces including the Army, NDRF, SDRF and F& ES, and other Volunteers such as Civil Defence, Home Guards, NCC and NGOs participated in the State level exercise. The early warning agencies such as NCS, GSI and IMD also attended.

- a. The Exercise engaged all 34 districts that lie in Seismic Zones IV & III. Each District Disaster Management Authority (DDMA), in collaboration with their respective line departments, emergency response organizations, NGOs, civil society organizations (CSOs), and other stakeholders, actively participated in the Exercise.
- b. The scenarios were articulated for the 35 districts categorized for Seismic risk as well as Fire hazard, and all participants responded accordingly to the outlined situations.

EXERCISE SETUP

6. Phases

Ex SAMANVAYA on Earthquake and Fire Safety was conducted in Three phases as follows: -

- (a) Phase 1. Orientation & Coordination Conference -06 Sept 2024
- (b) Phase 2. Table Top Exercise -18 Sept 2024
- (c) Phase 3. Physical Conduct of Mock Exercise -20 Sept 2024

7. Exercise Scenario

Multiple Situations were rehearsed during the Table Top and Mock Ex. The general scenario for the Exercise was as under:-

- a. **Time: 10:00 PM, Event Day**: Strong tremors were felt, accompanied by visible damage in the immediate vicinity. Landline communications ceased, and mobile phone connectivity was severely degraded.
- b. **Widespread Destruction and Casualties**: Reports emerged of significant devastation across numerous areas, with many buildings having collapsed, developed deep cracks, and been rendered unsafe.
- c. **Secondary Fire incidents**: A series of fire outbreaks occurred in the district as a secondary consequence of the earthquake. Formal fire fighting resources proved insufficient, and several Major Accident Hazard (MAH) units were affected, leading to chemical incidents and fires in some facilities.
- d. **Infrastructure Damage**: Extensive damage was reported to roadways, resulting in multiple road accidents. Railway tracks sustained damage, disrupting railway traffic.
- e. **Impact on lifeline Infrastructure**: Essential infrastructure, including hospitals and government buildings, was adversely affected.
- f. **Activation of State IRS infrastructure**: The State Emergency Operations Centre (SEOC) and District Emergency Operations Centres (DEOCs) were activated and began assuming command.
- g. **Telecommunication Failures**: There was widespread damage to telecommunication infrastructure, with cellular communication severely impacted in most districts within zone IV. The remaining network became heavily congested, while wireless radio communication systems remained operational.
- h. **Displacement of the population**: A large segment of the population was rendered homeless, necessitating the relocation of individuals to

safe areas and the provision of basic necessities. An evacuation plan required immediate implementation.

- i. **Field Hospital**: As many hospitals have faced infrastructure damage and due to earthquake many serious emergency and injuries with many of these being emergency situation there is a need for establishment of field hospital with resources pooled in from the hospital.
- j. **Debris and Sanitation Issues**: An enormous volume of debris was generated, damaging utilities and posing significant hygiene and sanitation challenges. Efficient disposal of the debris would be crucial.

EXECUTION

8. Phase 1 - Orientation & Coordination Conference

The Orientation & Coordination Conference was conducted via video conferencing from HQ PUPSA, Meerut on 06th Sept 2024. The Meeting was chaired by Lt. Gen Yogendra Dimri PVSM, AVSM, VSM (Retd), Vice Chairperson UPSDMA. The Meeting was attended by the ADM (F/R) of all the 35 districts and all the stakeholders and line dept.

It set the tone for the upcoming Table Top Exercise and Mock Ex dictating the details about the Scenarios and situations of the Table top Ex & Mock Ex and responsibilities regarding the conduct of Exercise. The Conference provided clarity and a unidirectional approach for the conduct of Exercise.

9. Phase 2 - Table Top Exercise

The Table Top Exercise (TTEEx) was conducted on 18th Sept 2024, at Meerut Cantt.

- a. Besides the physical participation of representatives from 34 districts, various Reps from the State departments, as well as all important Stakeholders like IMD, GSI, etc. attended.
- b. Observers from NDMA, NCS and also from neighbouring states including Uttarakhand, Haryana and Delhi attended.
- c. To observe and gain from viewing the proceedings of the Table Top Exercise, online participants from various districts were permitted to connect to the Session from their respective locations on Video Conferencing platform.
- d. All stakeholders actively contributed to the proceedings. District representatives provided updates on their preparedness and response plans and confirmed activation of their Incident Response Teams (IRTs).

- e. During the conduct of Table Top Exercise, Speakers from various organisations and departments such as NDMA, NCS, UP F&ES, SDRF, NDRF, GSDMA, etc. also presented their respective views, capabilities and experience.
- f. Towards the end, participants from districts were given a comprehensive briefing regarding their roles and responsibilities in the Mock Ex. Observers for Mock Ex were briefed on evaluation of the Mock Ex and to put forward their constructive suggestions on any short comings.

10. Phase 3 - Physical Conduct of Mock Exercise

The Conduct of the Mock Exercise was viewed by Lt. Gen Yogendra Dimri PVSM, AVSM, VSM (Retd), Vice Chairperson UPSDMA from HQ PUPSA at Meerut Cantt. He also physically saw all activities in Meerut District. The Mock Exercise was conducted by Senior Consultant Brig. Ajay Gangwar. In attendance were the State Emergency Operation Center (SEOC) and all District Emergency Operations Centers (DEOCs) which were activated in response to the Mock Exercise.

- a. Observers from Response Agencies like Army, NDRF and SDRF were nominated and provided with a specific assessment format. The Observers rendered a valuable feedback.
- b. A self-assessment template was also distributed to all stakeholders for their evaluation. Scenarios were tailored for earthquake as well as Fire hazard for Districts to respond, and the Mock Exercise was executed accordingly.
- c. NDRF 8th Battalion at Ghaziabad demonstrated a Rescue Operation for a building collapse scenario caused by an earthquake, which was broadcasted through video conferencing to all districts.
- d. On ground actions were initiated by relevant stakeholders following directives from the Responsible Officer/Incident Commander which included situations given below :
 - i. Activation of DEOC in response to Earthquake
 - ii. Evacuation drill in Schools.
 - iii. Safety & Fire drill from a multi-storey building showcasing IRS (ICP, Staging Area, Medical Post and Relief Camp)
 - iv. Safety & Rescue drill for a Major Accident Hazard unit (MAH)
 - v. A field hospital demonstration
 - vi. Specialized response was carried out by the National Disaster Response Force (NDRF) 8th Bns for CSS&R.
- e. A debriefing/Hot wash session was conducted via video conference with all districts following the conclusion of the Mock Exercise.

EVALUATION OF EXERCISE

11. Areas of Strength

A number of Strong points and good practices were observed during the TTEEx and the ME. These are summarized below:-

a. Coordination

- i. There was a sense of Responsibility and Motivation in the response forces as well as line Departments.
- ii. The Table Top Exercise yielded valuable and practical insights, which were instrumental in the effective execution of the subsequent mock drill.
- iii. The Table Top Exercise being conducted in physical presence of ADM (F/R) made a significant impact in the conduct of Mock drill.
- iv. Effective Crowd control management and Safety response at most of the site of Mock drill.
- v. There was commendable collaboration and engagement among the various line departments.
- vi. Participation was particularly significant during the exercise, and efforts were also made to involve the local community in the proceedings whether it be evacuation from schools or high rise buildings Community involvement was promoted.

b. Resource Management

- i. A detailed Table Top Exercise resulted in clarity regarding Mock Ex and optimum resource availability and utilization.
- ii. Response regarding fire safety scenarios saw UP F&ES showcasing their skills and equipment.
- iii. Health dept. did a commending job setting up field hospitals with limited resources available to them in districts.
- iv. The ICP, staging area, medical post and relief camp was set up astutely.
- v. Response time of the forces could be decreased with regular mock drills at district level.

c. EOC

- i. The State Emergency Operations Center (SEOC) and District Emergency Operations Center (DEOC) were promptly activated and remained on alert throughout the exercise.

- ii. The Department of Telecom actively participated in the Table Top Exercise (TTEEx), discussing alternative communication strategies to address such large-scale disasters.
- iii. The Bhookamp and Sachet apps were employed effectively, to disseminate information to community and helped in creating awareness about these important Mobile applications.

d. Media and Awareness

- i. The execution of the exercise generated significant awareness within the communities and instilled a strong sense of confidence.
- ii. Media coverage at the district level was notably positive, with extensive reporting by electronic media, which greatly contributed to widespread public awareness.
- iii. Effective use of various media channels—print, electronic, and social—enhanced public knowledge, engagement & Awareness.
- iv. Newcomers at the district level gained valuable insights through their participation in the exercise.
- v. Radio broadcast voice message, in collaboration with local service providers, conveyed messages about the Mock Exercise in the designated districts, furthering community outreach.
- vi. As a result, communities are now better mentally prepared for Earthquake and Fire hazard and are willing to cooperate with the administration.

e. Participation

- i. The TTEEx and The Mock drill saw comprehensive participation by DDMA's, Stakeholders at state level as well as central levels participated actively, line departments were also present in TTEEx and Mock drill.
- ii. Urban Population where the population density is high was taken as an ideal demonstrator for the Mock Ex. As it is more prone to destruction in scenario of Earthquake as well as Fire Hazard.
- iii. Participation of Schools, high rise building and MAH units enhanced the productivity of the Mock Ex by manifold.
- iv. Aapda Mitra, NCC Cadets, Civil Defence etc. participated in the mock drill as a major help to the Response forces showing appreciable coordination (samanvaya).

12. Areas of Improvement

a. Training

- i. Officials from line departments, alongside members of the National Cadet Corps (NCC) and Scout Guide organizations, require comprehensive training to fit their roles and responsibilities within

the Incident Response System (IRS), as many were unfamiliar with essential technical knowledge.

- ii. Officials from line department were mixed among the crowd. They need training regarding roles and responsibilities of each line department officials.
- iii. Co-ordination can be better amongst the line departments increasing efficiency of response.
- iv. Response forces should routinely assess and refine their skills to ensure ongoing proficiency and readiness for emergencies.
- v. Training required for proper response to save as many lives as possible adhering to the golden Hour.

b. Resource Management

- i. List of equipment used for CSS&R, Heavy earth movers etc. needs to be updated on IDRN portal of the Districts.
- ii. List of human resources should also be updated like NCC, NYKS, AAPDA MITRA, Civil Defence, Police Personnel and Fire & Emergency Services etc.
- iii. A list of NGOs that are present in the district and their expertise in case of Earthquake and Fire hazard must be kept updated.

c. Early Warning & Communication

- i. The telecom department must actively engage in strategic planning to establish a more effective alert system during emergencies.
- ii. Satellite phone connectivity should be enhanced.
- iii. HAM radio sets should be utilized as they can be essential for communication in case of TSP network failure due to disasters.
- iv. PA systems in Malls and shopping complex need to be installed.
- v. RWAs should be given training on Earthquake and Fire fighting.
- vi. The Google Android Earthquake Early Warning System is a feature built into Android devices that provides real-time earthquake alerts to users and should be advertised to the community.

d. EOC

- i. EOCs should be activated at more decentralized levels, such as the sub-divisional level, to improve coordination and resource mobilization.
- ii. The use of satellite phones and wireless radio sets, integrated into a well-established communication network that includes Police and Army as outstations, is essential for the efficient operation of the Emergency Operations Center (EOC).
- iii. Equipped and trained staff for EOC operations is necessary.

e. Plan and SOPs

- i. A detailed plan for conducting a Mock exercise should be developed.
- ii. A state-level Standard Operating Procedure (SOP) for fire hazards needs to be developed.
- iii. Crowd control at the sites of mock exercise needs to be done and movement should be restricted.

f. Use of Technology

- i. Use of Drones in case of Fire hazard could be a monumental addition.
- ii. Mapping with Proper study and identification of Critical lifeline structures for areas falling in seismic zone IV.
- iii. Use of digital platforms and social media to increase awareness amongst the community.

g. Miscellaneous

- i. It is essential that industries especially MAH units, hospitals, schools, and government buildings maintain up-to-date Disaster Management Plans that are rehearsed regularly in collaboration with district administration.
- ii. Empowering local communities can serve as a significant force multiplier, as community being the first responder demonstrates that local populations often play a pivotal role in initial search and rescue operations during crises.
- iii. Traffic management and crowd control with separate escape routes and entry & exit points were missing at some of the mock drill sites and needs to be rectified.
- iv. At some of the mock drill sites, the Incident Commanders (IC) were not particularly informed about their roles. It's essential to provide training to ensure they understand their responsibilities with clarity.
- v. The police department, due to its close proximity to the community during a disaster, is often underutilized compared to other response forces and should play a more active role in such situations.
- vi. SOPs/Guidelines for the conduct of Mock exercise should be prepared for Flood, Earthquake & Fire mock drills.
- vii. Aapda Mitra, Civil Defence, NCC etc. were unclear on their roles they can be an asset with clarity in their roles and responsibilities.

OBSERVATIONS AND SUGGESTIONS

13. Conduct of Mock Exercise

- a. This was the first time Earthquake Mock Exercise was conducted for all 34 seismic zone IV and III districts.
- b. This Practice should be done on yearly basis to keep the awareness and check the preparations of the districts against earthquake.
- c. Around 40 % of the districts were active in the mock drills and the rest 60% need a lot of improvement as Mock drills of this level is monumental in preparations against Disasters.
- d. Information regarding IRS is still unknown to many stakeholders and officials and needs to be exercised more and more in the districts to make them aware of IRS at lower levels.
- e. Presence of Incident Commander was not on Mock drill sites and that resulted in chaos and unregulated crowd management scenarios.
- f. Districts should conduct regular mock drills at their own capacity and keep a check on preparedness and awareness.
- g. The roles and responsibilities of line departments regarding disaster management need to be clearly defined and coordinated to ensure an effective response
- h. Interagency coordination needs to be done more frequently.
- i. The role of aapda mitra needs to be identified so they can be of better use if divided to agencies for deployment with specific roles.
- j. Districts should conduct Mock Exercises like this regularly on their own capacity to keep up the readiness and preparedness against disasters.
- k. Civil Defence did a commendable job in the mock ex and should be given more engagement by districts to be utilized as a defining force.

14. Resource Management

- a. Alternate mode of communication rather than telecom should be available for communication like satellite phones or HAM in every DEOC.
- b. IDRN portal should be updated regularly.
- c. NGOs and their specialty regarding disaster response should be updated with the DEOC and a meeting with NGOs should be done on Quarterly basis to increase coordination.
- d. A list of available Human resource like police personnel, SDRF, NCC etc.

15. Coordination

- a. Districts should conduct Civil-Military Liaison Conferences (CMLCs) frequently to enhance coordination.
- b. Collaboration with NGOs and CSOs for relief efforts is crucial and should be updated regularly.

- c. Participation of agencies such as the RAILWAYS, NCS, GSI, is essential in mock exercise simulations.
- d. Drones can play a crucial role in relief as well as rescue operations.
- e. Inter departmental coordination is of utmost importance so proper Liaison can be done in case of Disaster.

16. Participation

- a. There is a pressing need for more active involvement from senior leadership at both the state and district levels. In some districts, the entire coordination and execution of various mock exercise activities were solely managed by the DDMA disaster expert.
- b. It is essential that all State and District Incident Response Team (IRT) officials participate fully in both the Table Top Exercise (TTE_x) and the Mock Exercise (ME), actively practicing their designated roles in disaster scenarios.
- c. A number of line departments, and Essential Support Function (ESF) organizations were absent from the Tabletop and Mock Exercise sessions. It is important that each participating department, and organization formally designate representatives and communicate the details of those nominated to attend and actively participate in the exercise.
- d. ESF agency teams must actively engage in the mock exercise, practicing their roles, mobilizing resources, and rehearsing disaster response drills and Standard Operating Procedures (SOPs).
- e. Key teams that should participate includes: Telecommunications Service Provider (TSP), Electricity Dept., PWD, Municipal Corporations, Animal Husbandry, Health Dept., etc.
- f. Police is a major dept. which goes underutilized in these Mock exercises and should be actively used.

17. EOC

- a. Emergency Operations Centers (EOCs) at the district level must be upgraded with robust communication infrastructure and sufficient staffing.
- b. They should be equipped with adequate space to enable full operational capacity during emergency situations.

18. Capacity Building for Emergency Responders

- a. A systematic assessment of the training needs for emergency responders, including community volunteers, is essential.
- b. Additional specialized courses covering various aspects of disaster management should be introduced as needed.

- c. Key resources, such as the Police dept., State Disaster Response Force (SDRF), Civil Defence (CD) volunteers, Home Guard personnel, and Aapda Mitras, must have their capabilities continuously enhanced.
- d. Incident Response System (IRS) training programs are necessary for district-level Incident Response Teams (IRTs) and associated line departments to ensure comprehensive preparedness.

CONCLUSION

- 19.** The Mock Exercise on Earthquake & Fire safety in the 35 Districts has highlighted critical learnings that require immediate attention, particularly for the industrial sector MAH units. Such mock exercises present valuable opportunities to identify and address existing gaps.
- 20.** The Incident Response System (IRS) has proven to be an effective mechanism for responding to such emergencies with minimal delay, owing to clearly defined roles. IRS needs to be promoted more at lower levels of the administration to enhance capabilities regarding disaster response efficiently.
- 21.** Ex SAMANVAYA was conducted in coordination with HQ Paschim Uttar Pradesh Sub Area which along with the Civil Administration contributed extensively, Thereby enhancing the capabilities of State to undertake Mock Exercises in the future.