UTTAR PRADESH
STATE DISASTER MANAGEMENT AUTHORITY

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Hon'ble Chief Minister of Uttar Pradesh

UTTAR PRADESH
STATE DISASTER MANAGEMENT PLAN-2023
(Part-I)

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Abbreviations

ACS	-	Additional Chief Secretary
ADM	-	Additional District Magistrate
AES	-	Acute Encephalitis Syndrome
ANM	-	Auxiliary Nurse Midwife
ASDM	-	Aerial Services and Digital Mapping
ASHA	-	Accredited Social Health Activist
AQI	-	Air Quality Index
AWC	-	Anganwadi Centre
AWW	-	Anganwadi Worker
BMTPC	-	Building Materials and Technology Promotion Council
BSA	-	Basic Shiksha Adhikari
BSNL	-	Bharat Sanchar Nigam Limited
CAD	-	Computer-Aided Design
CAGR	-	Compounded Annual Growth Rate
CBO	-	Community Based Organization
CBRN	-	Chemical, Biological, Radiological and Nuclear
CCA	-	Climate Change Action
CHC	-	Community Health Centre
COP21	-	21st Conference of the Parties/Paris Climate Conference
CRIDA	-	Central Research Institute for Dryland Agriculture
CSR	-	Corporate Social Responsibility
CWC	-	Central Water Commission
DCPC	-	District Child Protection Committee
DCPU	-	District Child Protection Unit
DDMA	-	District Disaster Management Authority
DGFASLI	-	Directorate General, Factory Advice and Labour Institutes
DIET	-	District Institute of Education and Training
DISH	-	Directorate of Industrial Safety and Health
DM	-	Disaster Management
DMP	-	Disaster Management Plan
DDMP	-	District Disaster Management Plan
DoMHFW	-	Department of Medical Health and Family Welfare

DOT	-	Department of Telecommunications
DRM	-	Disaster Risk Management
DRR	-	Disaster Risk Reduction
DWCD	-	Department of Women and Child Development
EMR	-	Emergency Medical Response
EOC	-	Emergency Operation Centres
ESF	-	Emergency Support Functions
EWS	-	Early Warning System
F&ES	-	Fire And Emergency Services
FAP	-	Flood Action Plan
FCI	-	Food Corporation of India
FMISC	-	Flood Management Information System Centre
GACC	-	Global Agreement on Climate Change
GIS	-	Geographic Information System
GOI	-	Government of India
GP	-	Gram Panchayat
GSDP	-	Gross State Domestic Product
GSI	-	Geological Survey of India
HAZCHEM	-	Hazardous Chemical (Codes)
HAZMAT	-	Hazardous Materials
HRIMS	-	Human Resource Information and Management System
HRVA	-	Hazard Risk Vulnerability Analysis
HRVCA	-	Hazard, Risk, Vulnerability and Capacity Analysis
HSD	-	High Speed Diesel
IC	-	Incident Commander
ICAR-IRVI	-	ICAR-Indian Veterinary Research Institute
ICDS	-	Integrated Child Development Services
IDRN	-	India Disaster Resources Network
IEC	-	Information, Education and Communication
IMD	-	Indian Meteorological Department
IRS	-	Incident Response System
IRT	-	Incident Response Team
ISR	-	Institute of Seismological Research

JE	-	Japanese Encephalitis
JJ	-	Juvenile Justice
KVK	-	Krishi Vigyan Kendra
LCO	-	Labour Commissioner Organization
LDO	-	Low Dropout
LPG	-	Liquid Petroleum Gas
LYD	-	Lower Yamuna Division
MAH	-	Major Accident Hazardous
MGD	-	Middle Ganga Division
MHA	-	Ministry of Home Affairs
MIS	-	Management Information System
MPLADS	-	Members of Parliament Local Area Development Scheme
MSIHC	-	Manufacture, Storage, and Import of Hazardous Chemicals
MTO	-	Mineral Turpentine Oil
NADCP	-	National Animal Disease Control Programme
NDMA	-	National Disaster Management Authority
NDMP	-	National Disaster Management Plan
NDRF	-	National Disaster Response Force
NDRF	-	National Disaster Response Fund
NDRMF	-	National Disaster Risk Management Fund
NERS	-	National Emergency Response System
NFS	-	National Food Security Act
NGO	-	Non-Governmental Organization
NIDM	-	National Institute of Disaster Management
NPDM	-	National Policy on Disaster Management
NRSC	-	National Remote Sensing Centre
NSS	-	National Service Scheme
NYKS	-	Nehru Yuva Kendra Sangathan
ODR	-	Owner-Driven Reconstruction
PDNA	-	Post-Disaster Need Assessment
PHC	-	Primary Health Centre
PMAY	-	Pradhan Mantri Awas Yojana
PMFBY	-	Pradhan Mantri Fasal Bima Yojana

PMJAY	-	Pradhan Mantri Jan Arogya Yojana
PMMVY	-	Pradhan Mantri Matru Vandana Yojana
PPP	-	Public-Private Partnership
PRI	-	Panchayati Raj Institution
PSU	-	Public Sector Undertaking
PWD	-	Persons with Disability
R&D	-	Research and Development
RCO	-	Relief Commissioner's Office
ROIP	-	Radio Over Internet Protocol
RRT	-	Rapid Response Team
RSAC	-	Remote Sensing Application Centre
SCERT	-	State Council of Educational Research and Training
SDM	-	Sub-Divisional Magistrate
SCPS	-	State Child Protection Society
SDGs	-	Sustainable Development Goals
SDMA	-	State Disaster Management Authority
SDMP	-	State Disaster Management Plan
SDRF	-	State Disaster Response Force
SDRF	-	State Disaster Response Fund
SDRMF	-	State Disaster Risk Management Fund
SEC	-	State Executive Committee
SEOC	-	State Emergency Operation Centre
SEZ	-	Special Economic Zone
SFDRR	-	Sendai Framework for Disaster Risk Reduction
SHG	-	Self-Help Group
SIDCC	-	State Integrated Disaster Control Centre
SIHFW	-	State Institute of Health and Family Welfare
SKO	-	Superior Kerosene Oil
SMEs	-	Small and Medium-Sized Enterprises
SOP	-	Standard Operating Procedure
STAA	-	Sub Thematic Areas for Action
SUDA	-	State Urban Development Authority
TAA	-	Thematic Areas for Action

UAV	-	Unmanned Aerial Vehicle
UHI	-	Urban Heat Island
ULB	-	Urban Local Bodies
UPPCB	-	Uttar Pradesh Pollution Control Board
UPPCL	-	Uttar Pradesh Power Corporation Limited
UPID	-	Uttar Pradesh Irrigation Department
UPSDMA	-	Uttar Pradesh State Disaster Management Authority
UPSTDC	-	Uttar Pradesh State Tourism Development Corporation
UYD	-	Upper Yamuna Division
VHF	-	Very High Frequency
VSAT	-	Very Small Aperture Terminal

Part I

1 Introduction

1.1 Need for the Plan

Section 23 of the Disaster Management Act 2005 (DM Act)[1] mandates every State to develop a State Disaster Management Plan and update it annually. The State Disaster Management Plan (SDMP) is a strategic document developed based on features of the National Disaster Management Plan (NDMP 2019) and provides the framework and guidelines for departmental action plans and the District Disaster Management Plans (DDMPs).

1.2 Hon'ble Chief Minister's Vision for Disaster Management

"To build a disaster resilient State within the framework of Prime Minister's 10 Point Agenda for Disaster Risk Reduction and post-2015 Global Frameworks on Disaster Management and to empower communities for disaster prevention, mitigation, preparedness and response".

1.3 Main Pillars of the State Disaster Management Plan

The five pillars of SDMP are aligned to the NDMP 2019. The five pillars are:

I. Conforming to the national legal mandate – the DM Act 2005 and the National Policy on Disaster Management (NPDM) 2009;

II. Participating proactively to realize the global goals as per agreements to which India is a signatory – Sendai Framework for Disaster Risk Reduction (SFDRR), Sustainable Development Goals (SDGs) and Paris Agreement on Climate Change – consistent with the international consensus for achieving mutual reinforcement and coherence of these frameworks;

III. Prime Minister's Ten-Point Agenda for Disaster Risk Reduction (DRR) articulating contemporary national priorities;

IV. Social inclusion as a ubiquitous and cross-cutting principle; and

V. Mainstreaming DRR as an integral feature.

1.4 Legal Framework

Under Section 23 (1) of the DM Act 2005[2] – it is mandatory for every State to have a SDMP. The SDMP is supposed to be a guiding document for all State-level departments with respect to their roles and responsibilities across all phases of Disaster Management (DM). According to Section

[1] Government of India. (2005). *The Disaster Management Act 2005* [Ebook] (p. 10). Retrieved from https://ndma.gov.in/sites/default/files/PDF/DM_act2005.pdf
[2] Government of India. (2005). *The Disaster Management Act 2005* [Ebook] (p. 10). Retrieved from https://ndma.gov.in/sites/default/files/PDF/DM_act2005.pdf

23 (2) of the DM Act 2005, the "State Plan shall be prepared by the State Executive Committee (SEC) having regard to the guidelines laid down by the National Authority." Section 23 (3) states that "the State Plan shall be approved by the State Authority."[3]

1.5 Scope of SDMP

As per the DM Act 2005, the SDMP shall include[4]:

a. Vulnerabilities of different parts of the State;
b. Measures to be adopted for prevention and mitigation of disasters;
c. Integration of mitigation measures into development plans and projects;
d. Capacity building and preparedness measures;
e. Roles and responsibilities of different departments of the State Government in the context of the above-mentioned (a), (b), (c) and (d); and
f. Roles and responsibilities of different departments of the State Government in response to any threatening disaster situation or disaster.

According to Section 23 (5) of the DM Act 2005, "the State Plan shall be reviewed and updated annually." In line with Section 23 (6), "appropriate provisions shall be made by the State Government for financing the measures to be carried out under the State Plan." Section 23 (7) states that "copies of the State Plan referred to in Sub-Section (2) and (5) of Section 23 shall be made available to the departments of the State Government and such Departments shall draw up their own plans in accordance with the State Plan."

1.6 Objectives of the Plan

The key objectives of SDMP are to:

- Assess various hazards, risks, vulnerabilities, and capacities in the State;
- Promote DRR for resilience building through structural and non-structural measures;
- Strengthen disaster risk governance across all levels;
- Mainstream Disaster Risk Management (DRM) in development schemes and programmes;
- Implement rapid and effective disaster response and relief mechanisms in the State; and
- Ensure 'Build Back Better' in recovery, rehabilitation and reconstruction.

1.7 Time Frames: Short, Medium and Long-Term[5]

The measures listed in the Plan are set in line to be implemented by 2030 i.e. with the end of the three post-2015 international agreements – Sendai Framework (SFDRR), SDGs, and Conference of Parties (COP). They will be implemented within short (T1), medium (T2), and long (T3)

[3] Government of India. (2005). *The Disaster Management Act 2005* [Ebook] (p. 10). Retrieved from https://ndma.gov.in/sites/default/files/PDF/DM_act2005.pdf
[4] Government of India. (2005). *The Disaster Management Act 2005* [Ebook] (p. 10). Retrieved from https://ndma.gov.in/sites/default/files/PDF/DM_act2005.pdf
[5] *National Disaster Management Plan, 2019*. [ebook] New Delhi: National Disaster Management Authority, Government of India, p.11. Available at: https://ndma.gov.in/sites/default/files/PDF/ndmp-2019.pdf [Accessed 22 July 2022].

terms, ending by 2024, 2027, 2030 respectively. To compensate for the time lost amidst the COVID-19 pandemic, the time frame of the short-term has been altered from 2022 to 2024. While some of the measures listed are already being implemented, few need upgradation, and many are yet to be started. Also, the short, medium and long term measures do not need to be taken up sequentially always. Depending upon the priority and completion time, the measures will require to be taken up parallelly or sequentially.

Table 1: Time Frames envisaged in SDMP

Short-Term (T1)	2024
Medium-Term (T2)	2027
Long-Term (T3)	2030

1.8 Multi-Hazard Approach

SDMP will not only address natural hazards but will also take care of human-induced disasters. It will enable the departments to assess a composite risk from all hazards so that integrated planning can be undertaken and mitigation measures planned such that one hazard may not create vulnerability for another hazard.

1.9 Stakeholders of the State Disaster Management Plan[6]

All major line departments of the State Government, District Disaster Management Authorities (DDMAs), technical institutions, academia, local self-governments, UN agencies, Non-Governmental Organizations (NGOs), communities, etc. are key stakeholders for the effective implementation of SDMP.

Detailed roles and responsibilities are depicted in the Thematic Areas for Action (TAA) along with the Sub Thematic Areas for Action (STAA).

1.10 Implementation of State Disaster Management Plan

The DM Act states that every Department of the State Government shall make provisions, in its annual budget, for funds to carry out the activities and programmes set out in its DM Plan. The SDMP sets out the priorities and time frames, and defines the TAA along with STAA, that must be implemented in a coordinated but decentralized manner by the State and District Governments.

[6] UPSDMA. (2017). Uttar Pradesh State Disaster Management Plan. Lucknow.

2 DRR Coherence and Mutual Reinforcement of Three Post-2015 Global Frameworks and its Integration with UP SDMP

2.1 Background[7]

The adoption of three landmark global agreements – Sendai Framework for Disaster Risk Reduction (UNISDR 2015), Sustainable Development Goals (UN 2015) and Paris Agreement on Climate Change – COP21 (UNFCC 2015) – all in the same year, 2015 – has opened a significant opportunity to build coherence across DRR, sustainable development and the response to climate change. Later during the COP26 (UNFCC 2021), agreement was sought to accelerate action on the goals set up during COP21.

The SDGs adopted by the UN on the theme "Transforming Our World: The 2030 Agenda for Sustainable Development" is a global transformative plan of action, keeping poverty eradication as the overarching aim. It has, at its core, the integration of the economic, social and environmental dimensions of sustainable development. The Paris Agreement on Climate Change points to the importance of averting, minimizing and addressing damage and loss associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of damage and loss.

DRR and resilience are the common recurring themes in the three global agreements mentioned. All three agreements share a common aim of making development sustainable. The most significant shift recognized in the SFDRR is a strong emphasis on DRM in contrast to DM. These three agreements recognize the desired outcomes in DRR as a product of complex and interconnected social and economic processes, which overlap across the agendas of the three agreements intrinsic to sustainable development in DRR and building resilience to disasters. Further, effective DRM contributes to sustainable development.

2.2 Sendai Framework for Disaster Risk Reduction (2015–2030)

The SFDRR (2015–2030) was adopted at the Third World Conference on Disaster Risk Reduction held in Sendai, Japan, in March 2015.

2.2.1 SDMP and SFDRR

In order to imbibe the global frameworks and principles in achieving the global targets, the Government of Uttar Pradesh issued specific guidelines in line with Sendai Seven Targets Campaign in November 2015 to integrate these frameworks in the implementation activities of State and District-level line departments. The table below gives an outline of the activities covered in various sections of the SDMP to achieve the targets of SFDRR.

[7] *National Disaster Management Plan, 2019*. [ebook] New Delhi: National Disaster Management Authority, Government of India. Available at: https://ndma.gov.in/sites/default/files/PDF/ndmp-2019.pdf [Accessed 22 July 2022].

Table 2: SFDRR Targets and corresponding activities in SDMP

Targets	Indicators	SDMP
Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015	Reduce State disaster mortality by 2030 (per 100,000) compared to last decade (2011–2020)	The SDMP charts out specific measures for each disaster type in the State. These measures are covered in detail across all areas of preparedness, for example, vulnerability assessment, early warning systems, community engagement, communications, and resource mobilization, which promote better response to disasters, leading to better coping capacity among the communities, thus contributing to reduction in mortality across the State.
Substantially reduce the number of people affected globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015	Reduction in the number of people affected in the State by disasters compared to last decade (2011–2020)	The SDMP of Uttar Pradesh is a comprehensive strategy document, wherein preparedness, response coordination, mitigation and early warning activities are provided for each line department with the objective of reducing the impact of various disasters.
Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030	Infrastructure and basic services	The SDMP details structural measures in Chapter 9 across different types of disasters for both private and public properties.
Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for the implementation of the present framework by 2030	International cooperation	India and Nepal established a three-tier bilateral mechanism in 2008, for issues relating to cooperation in water resources, flood management, inundation and hydropower between the two countries. However, SDMP suggests executing MoU between State Uttar Pradesh and Nepal.
Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030	Infrastructure and basic services	Multi-hazard early warning system for effective disaster risk information communication is proposed.
Reduce direct economic losses in relation to global domestic product by 2030	Reduce direct economic losses by 2030 compared to last decade (2011–2020)	SDMP addresses immediate relief in direct economic losses due to disasters in categories of livelihood, agriculture, sericulture, animal husbandry through the State Disaster Response Fund (SDRF). It also chalks out a plan in the chapter on recovery and restoration of livelihood, agriculture through wage employment and risk transfer mechanism by convergence of various Government programmes.

2.3 Sustainable Development Goals and Disaster Resilience

To achieve the SDGs, it is imperative that resilience of communities be built. The increasing magnitude of losses due to disasters over the past decades indicates an elevated risk to development projects from disasters. The inclusion of disaster risk reduction measures in development planning not only helps reduce the risk, but also strengthens the lead to long-lasting development gains. Hence, disaster resilience is an integral part of the 2030 Agenda for Sustainable Development.[8]

The SDMP has also attempted to integrate the SDGs in plans. The chapter on social inclusion addresses the aspects of differentiated vulnerabilities of women, socially and economically weaker section of society and elderly and also laid responsibility matrix. APDA Mitra is gradually gaining larger participation of women. The Niti Aayog Indicators have been used to examine the social and structural vulnerability of the State, which when addressed will contribute achieving the SDGs. The plan aims to also bring the aspects of Climate Change, one of the goals of SDG being Climate Action, by including Climate Change Risk Management as one the thematic area, with various sub-themes, under all applicable disasters.

The following figure shows how the SFDRR leads to direct impacts on multiple goals and targets of SDGs.

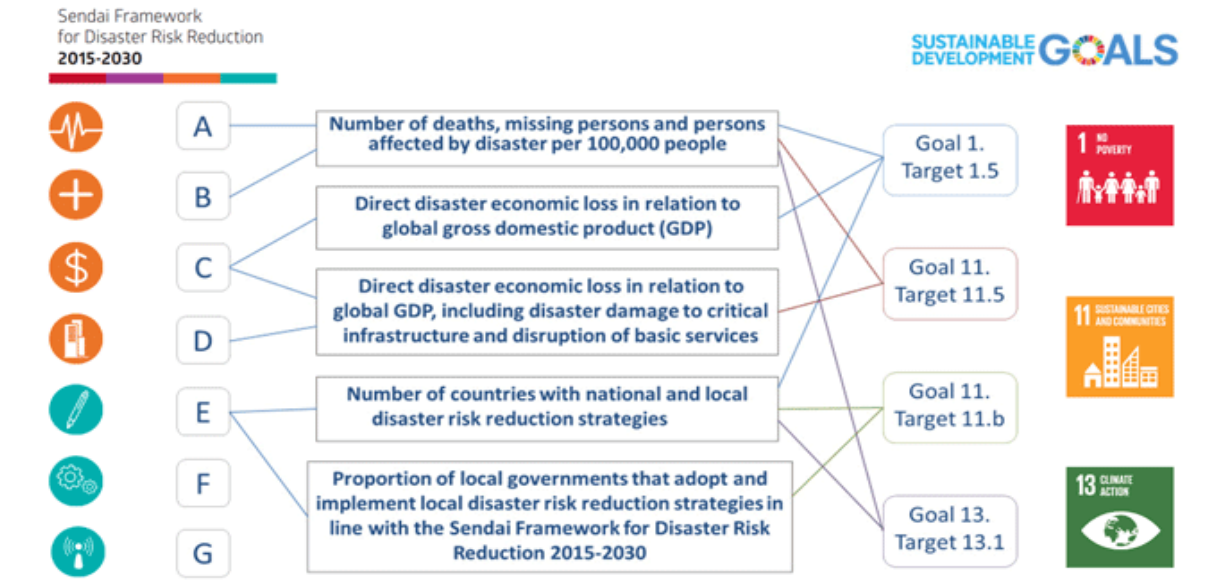


Figure 1: Coherence and Mutual Reinforcement of SDGs and SFDRR

Source: Integrated monitoring of the global targets of the Sendai Framework and the Sustainable Development Goals (https://www.preventionweb.net/sendai-framework/sendai-framework-monitor/common-indicators)

2.4 International Agreements on Climate Change (Conference of Parties) and DRR

The Paris Agreement on Climate Change was adopted on 12 December 2015 at the twenty-first session of the Conference of the Parties (COP21).

[8] UNDRR. (2015). *DISASTER RISK REDUCTION AND RESILIENCE IN THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT* [Ebook]. Retrieved from https://www.unisdr.org/files/46052_disasterriskreductioninthe2030agend.pdf

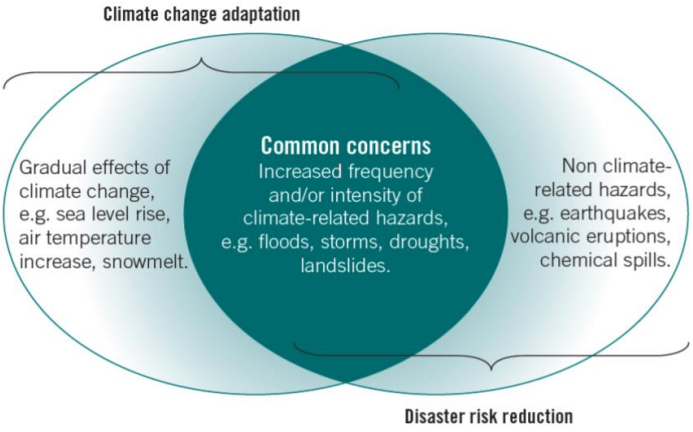


Figure 2: Convergence between CCA and DRR (Turnbull et al. 2013)

Later in 2021, the COP26 summit held in Glasgow, United Kingdom, brought parties together to accelerate action towards the goals of the Paris Agreement (COP21) and the UN Framework Convention on Climate Change.[9] It set out the following goals:

i. To achieve global net-zero by the middle of the century and keep 1.5 degrees within reach;

ii. To adapt to protect communities as well as natural habitats from the impact of climate change;

iii. To mobilize finances for the stated goals; and

iv. To work together so that the rules could be listed out in detail and help in the fulfilment of the Paris Agreement.

India is a signatory to COP26 goals and had presented the following five nectar elements (*Panchamrit*) of India's climate action:[10]

i. Reach 500 GW non-fossil energy capacity by 2030;

ii. 50 per cent of its energy requirements from renewable energy by 2030;

iii. Reduction of total projected carbon emissions by one billion tonnes from now to 2030;

iv. Reduction of the carbon intensity of the economy by 45 per cent by 2030, over 2005 levels; and

v. Achievement of the target of net zero emissions by 2070.

The significant initiative of COP 27 at Sham-el-Shaeikh, Egypt on "Loss and Damage" Fund is likely to have implication for National as well as State policy and plans.

The Government of Uttar Pradesh through its Directorate of Environment, Forest and Climate Change (DoEFCC) is working towards contributing to these goals. The SDMP lays out detailed

[9] COP26 Goals - UN Climate Change Conference (COP26) at the SEC – Glasgow 2021. (2021). Retrieved 22 July 2022, from https://ukcop26.org/cop26-goals/
[10] India's Stand at COP-26. (2021). Retrieved 22 July 2022, from https://www.pib.gov.in/PressReleasePage.aspx?PRID=1795071

institutional arrangements for the DoEFCC for taking preparedness and response measures during disasters.

2.5 Prime Minister's Ten-Point Agenda (www.pib.gov.in/newssite 09th January 2017) and UPSDMP

The UPSDMA envisions imbibing the Prime Minister's Ten-Point Agenda into all parts of the prospective UPSDMP. Agenda-wise suggested actions as reflected in the SDMP are mentioned below.

S. No.	Agenda	Suggested Actions	SDMP
1	All development sectors must imbibe the principles of DRM.	All stakeholders including relevant line departments to mainstream DRM in routine development programmes and schemes.	Part II
2	Work towards risk coverage for all – starting from poor households to Small and Medium-Sized Enterprises (SMEs) to multinational corporations to nation-States.	DM plans of departments and Districts to focus on all sectors of people and institutions, and implement according to the roles and responsibilities assigned in the SDMP. Involvement of SMEs, private sector, Public-Private Partnership (PPP), involvement of the corporate sector in capacity building and resource development and knowledge management should be focused on.	Part II
3	Encourage greater involvement and leadership of women in DRM.	Role of women during reconstruction and recovery programmes after disasters are to be given due consideration. Owner-Driven Reconstruction (ODR) is one method whereby women can take a leadership role in monitoring the implementation of safe housing technology. Women can also be empowered by creating their Self-Help Groups (SHGs) for livelihood opportunities. It needs to go beyond traditional income-generating activities and aim at enhancing skills as masons, carpenters, trading of local products, developing local shops for housing, sanitation and other materials, among others. Chapter on Social Inclusion in DRR addresses the differentiated vulnerability of women.	Part II & III
4	Invest in risk mapping globally to improve global understanding of nature and disaster risks.	Hazard, Risk, Vulnerability and Capacity Analysis (HRVCA) to be carried out in an intensive way by all Districts and relevant State-level line departments. Understanding risk is one of the six thematic areas in the SDMP for all disasters, which includes risk mapping/zonation.	Parts I and II
5	Leverage technology to enhance the efficiency of DRM efforts.	Deploying advanced technology and equipment to be included in the capacity building themes for DRR. Use of information and communications technologies and advanced technologies for early warning systems.	Part II
6	Develop a network of	Ensure academic and technical	Part II

S. No.	Agenda	Suggested Actions	SDMP
	universities to work on disaster issues as they also have social responsibilities.	institutions/universities are given the responsibilities of documentation, training and research in the field of DRR concerning various disasters. UP SDMA has executed MoU with five leading universities of the State.	
7	Utilize the opportunities provided by social media and mobile technologies, recognize the potential of social media, and develop applications for all aspects of DRM.	Extensive behaviour changes communication/Information, Education and Communication (IEC) campaigns to create awareness through print, electronic and social media.	Part II
8	Build on local capacity and initiative.	Ensure strengthening of disaster risk governance at all levels from 'local to centre' and empower both local authorities and communities as partners to reduce and manage disaster risks. Emphasis on building and strengthening local capacities with a focus on local issues, resources, and people.	Part II
9	Ensure that the opportunity to learn from a disaster must not be wasted.	Documentation of lessons learnt, best practices and success stories as part of knowledge management.	Part III
10	Bring about greater cohesion in international response to disasters.	Ensure participation in international efforts and fostering partnerships.	Part I & II

3 State Profile

3.1 Background

Uttar Pradesh is the fourth largest State in India covering an area of 2,40,928 sq. km, which is 7.33 per cent of the geographical area of the country.[11] It lies between 23°52'N and 31°28'N latitudes and 77°3' and 84°39'E longitudes.[12] It borders Nepal and Uttarakhand in the North; Himachal Pradesh in the North-west; Haryana, Delhi and Rajasthan in the West; Madhya Pradesh in the West and South-west; Chhattisgarh and Jharkhand in South and South-east, and Bihar in the East.

Figure 3: Administrative Map of Uttar Pradesh State

Topographically, the State is divided into three regions, namely the Shivalik region in the north, Gangetic plains in the centre, and Vindhyan hills and plateau in the south. Many rivers – Ganga, Yamuna, Gandak, Gomti, Ghagra, Chambal, Betwa, Kosi, Son and Sharda – flow through the State. As per the India State of Forest Report,[13] Uttar Pradesh has a forest cover spread across

[11] Forest Survey of India. (2019). *Indian State of Forest Report* [Ebook]. Dehradun. Retrieved from https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-uttar-pradesh.pdf

[12] | About UP | Official Website of NRI Department, Government of Uttar Pradesh, India | UPNRI. Retrieved from https://nri.up.gov.in/en/page/getting-to-up?brd=2

[13] Forest Survey of India. (2019). *Indian State of Forest Report* [Ebook]. Dehradun. Retrieved from https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-uttar-pradesh.pdf

14,805.65 sq. km, which is 6.15 per cent of the State's geographical area.[14] The climate of Uttar Pradesh is generally defined as a sub-tropical monsoon type. Three seasons are experienced in the State: summer (March–June), monsoon (June–September) and winter (October–February).[15]

3.2 Administrative Structure

At present, Uttar Pradesh is administratively divided into 18 divisions, 75 Districts and 822 development blocks. There are 915 urban bodies, 13 municipal corporations, 226 municipal boards, 59,163 gram sabhas, 8,135 nyaya panchayats, 1,07,040 villages and 650 cities and towns.[16]

3.3 Demographic Profile

Table 3: Demographic Profile of Uttar Pradesh

Area	2,40,928 sq. km
Population (as per Census 2011: provisional data)	19,95,81,477
Males (as per Census 2011)	10,45,96,415
Females (as per Census 2011)	9,49,85,062
Child Population (0–6 years) (as per Census 2011)	29,728,235
Child Sex Ratio (0–6 years) (as per Census 2011)	899 per 1,000
Decennial Growth Rate (2001–2011) (as per Census 2011)	20.09%
Sex Ratio (as per Census 2011)	908 per 1,000
Density (persons per sq. km) (as per Census 2011)	828 per 1,000
Total Literacy Rate	69.72%
Male Literacy	79.24%
Female Literacy	59.26%

[14] Forest Survey of India. (2019). *Indian State of Forest Report* [Ebook]. Dehradun. Retrieved from https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-uttar-pradesh.pdf
[15] About UP | Weather | Official Website of NRI Department, Government of Uttar Pradesh, India | UPNRI. Retrieved from https://nri.up.gov.in/en/page/weather
[16] About Us | Social Demography | Welcome to the Official Web Site of Government of Uttar Pradesh. Retrieved from https://up.gov.in/en/page/social-demography

Districts	75
Cities and Towns	915
Development Blocks	82
Nagar Nigams	14
Members of Lok Sabha from UP	80
Members of Rajya Sabha from UP	30
Members of UP Legislative Assembly	404
Members of UP Legislative Council	100
Principal Crops	Paddy, wheat, barley, millet, maize, urad (black gram), moong (green gram), arhar
Principal Fruits	Mango, guava
Principal Minerals	Limestone, dolomite, soap stone, gypsum, bauxite, glass-sand, manganese, non-plastic fire clay
Principal Handicrafts	Chikan work, embroidery, wood work, wooden toys and furniture, clay toys, carpet weaving, silk and brassware work
Principal Folklores	Birha, Chitee, Kajri, Phaag, Rasia, Alha, Pooran Bhagat, Bhartrahari
Principal Rivers	Ganga, Yamuna, Gomti, Ram Ganga, Ghagra, Betwa, Ken
Principal Folk Dances	Charkula, Karma, Pandav, Pai-danda, Tharu, Dhobia, Raai, Shaira, etc.
Tourist and Historical Places	Piparhava, Kaushambi, Shravasti, Sarnath (Varanasi), Kushinagar, Chitrakoot, Lucknow, Agra, Jhansi, Meerut

Source: **Statistical Department, UP and Directorate Census, Lucknow (2011)**

3.4 Social Profile

Religion[17]

Hinduism is the predominant religion in the State, with 79.73 per cent of the State's population adhering to it, followed by Islam (19.26 per cent), Sikhism (0.32 per cent), Christianity (0.18 per cent), Jainism (0.11 per cent), Buddhism (0.10 per cent) and others (0.30 per cent).

Caste and Tribes

[17] Uttar Pradesh Religion Census 2011. Retrieved from https://www.census2011.co.in/data/religion/state/9-uttar-pradesh.html

The population of Uttar Pradesh is divided into multiple castes and sub-castes and the State is also home to many tribal communities. As per the Socio-Economic and Caste Census 2011, Scheduled Castes (SCs) constitute 23.80 per cent of the State's total rural households, while Scheduled Tribes (STs) form 0.68 per cent of the total rural population.

Prominent tribes in the State include Agariya, Aheria, Baiga, Bind and Patari. Besides this, the Government of India has recognized five of the tribal communities as disadvantaged STs, namely the Harus, Boksas, Bhotias, Jaunswaris and Rajis.

3.5 Economic Profile

Main Occupation

Uttar Pradesh is the second-largest economy in India after Maharashtra. The State is divided into four economic zones: Western, Central, Eastern and Bundelkhand regions. Agriculture is the main source of income followed by the services sector, industries and manufacturing and tourism.

Income Patterns

The Gross State Domestic Product (GSDP) of Uttar Pradesh grew at a Compounded Annual Growth Rate (CAGR) of around 8.43 per cent between 2015–16 and 2021-22 to reach INR 21.74 trillion (US$ 294.90 billion).[18] The Net State Domestic Product grew at a CAGR of around 8.42 per cent between 2015–16 and 2020–21 to reach INR 15.12 trillion (US$ 208.34 billion). According to the Periodic Labour Force Survey 2017–18, Uttar Pradesh has an unemployment rate of 6.4 per cent, which is higher than the all-India unemployment rate of 6.1 per cent.

3.6 Sectors of the Economy

Agriculture

Uttar Pradesh's economy is predominantly based on agriculture. Several major efforts have been made to boost agriculture, including the extension of irrigation facilities, timely delivery of fertilizers, herbicides and high-yielding seeds, promotion of high-yielding kinds of seed use, and the provision of continual agricultural counselling services by experts.

Accounting for nearly 18 per cent share in the country's total food grain output in 2016–17, Uttar Pradesh produces the largest amount of food grains (major being rice, wheat, maize, millet, gram, pea, lentils); and is also the largest producer of vegetables (10,02,64,000 metric tonnes in 2018–19) in India. [19]

Industries

There are a number of industrial activities such as information technology, agro-processing, tourism, textiles, leather goods, carpets, cotton yarn, handloom and handicrafts, food processing, sports goods, dairy products, and glassware production.

[18] GSDP of Uttar Pradesh, Economic Growth of Uttar Pradesh | IBEF. (2022). Retrieved 1 August 2022, from https://www.ibef.org/states/uttar-pradesh-presentation
[19] About Uttar Pradesh: Tourism, Agriculture, Industries, Economy & Geography. Retrieved 1 August 2022, from https://www.ibef.org/states/uttar-pradesh

According to data supplied by the Department for Promotion of Industry and Internal Trade, the State received US$ 560.74 million in foreign direct investment equity inflow between October 2019 and December 2020. In Uttar Pradesh, 147 investment intentions of INR 16,799 crore (US$ 2.40 billion) were declared in 2019. As of October 2020, Uttar Pradesh had 21 notified Special Economic Zones (SEZs), 13 operational SEZs and 24 formally approved SEZs.

Services

Uttar Pradesh's economy is heavily reliant on the service sector. In 2017–18, it contributed about 49 per cent of the GSDP. Uttar Pradesh remains North India's 'IT hub', with a percentage of software exports second only to Karnataka. However, unlike South Indian States, IT businesses are restricted to specific locations, such as Noida, Greater Noida and Ghaziabad, all of which are located in the western region of the State.

Tourism

Taj Mahal, which is one of the famous tourist destinations, is located in Agra, Uttar Pradesh[20]. In 2019, domestic tourist arrivals in the State reached 535.8 million. Foreign tourist arrivals crossed 4.74 million. The Government of Uttar Pradesh has devised a new tourism policy to invite INR 5,000 crore worth of investments, which is expected to provide a further boost to the State's economy. Varanasi, Allahabad, Mathura-Vrindavan, Ayodhya, Lucknow and Sarnath are the other major cities attracting tourists.

[20] About Uttar Pradesh: Tourism, Agriculture, Industries, Economy & Geography. Retrieved 1 August 2022, from https://www.ibef.org/states/uttar-pradesh

4 Institutional Framework

4.1 Disaster Management: Basic Institutional Framework

As per the DM Act of 2005, each State in India shall have its own institutional framework for Disaster Risk Management (DRM). It mandates the setting up of a State Disaster Management Authority (SDMA). Each State shall prepare its own SDMP.

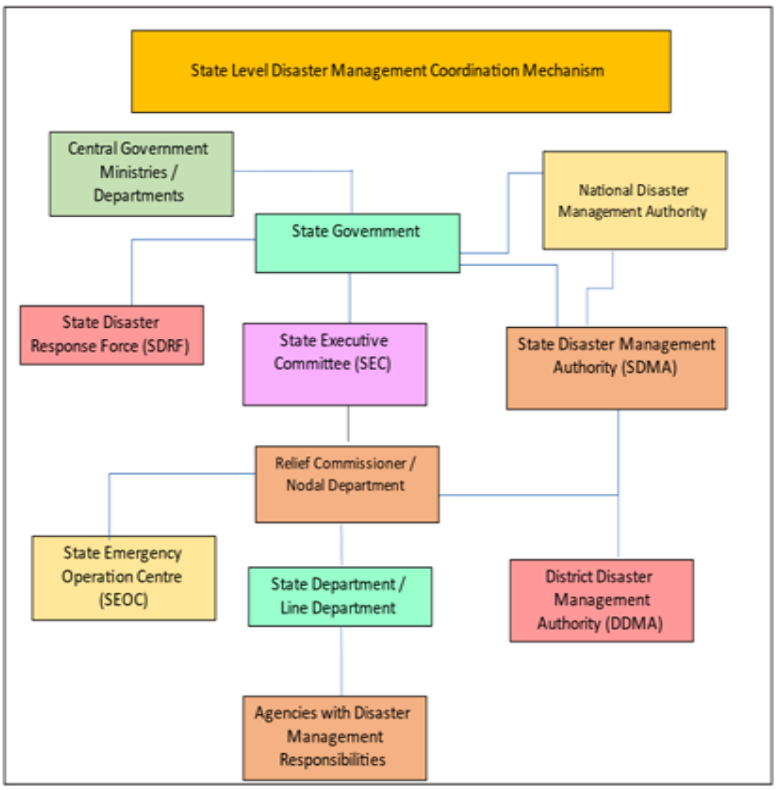


Figure 5: State Level Disaster Management Coordination Mechanism

4.2 State Disaster Management Authority

Section 14 of the DM Act 2005 mandates each State to establish an SDMA. At the State level, the SDMA headed by the Chief Minister lays down the policies and plans for DM. It is also responsible for coordinating the implementation of the State Plan, recommending the provision of funds (under State Disaster Mitigation Fund) for mitigation and preparedness measures and reviewing the developmental plans of the different departments of the State to ensure integration of prevention, preparedness and mitigation measures. The Chairperson of the State Authority shall, in the case of an emergency, have the power to exercise all or any of the powers of the State Authority, but the exercise of such powers shall be subject to *ex post facto* ratification of the State Authority.

For the State of Uttar Pradesh, the establishment of SDMA was notified vide notification Order No. 628/1-11-2017-02(G)/2013 dated 18 July 2017 under Section-14 (1) of the DM Act. The constitution of the SDMA is as follows:

Table 4: SDMA Chairperson and Members

S. No.	Members	Designation
1	Hon. Chief Minister, Uttar Pradesh	Chairperson
2	Designated by Chairperson	Vice Chairperson
3	Hon. Minister, Urban Development	Member
4	Hon. Minister, Agriculture	Member
5	Hon. Minister, Irrigation	Member
6	Hon. Minister, AYUSH	Member
7	Hon. Minister Flood Control	Member
8	Chief Secretary, Uttar Pradesh	Member
9	Principal Secretary, Revenue	Member
10	Principal Secretary, Home	Member
Special Invitees		
11	Agriculture Production Commissioner	Member
12	Principal Secretary, Finance	Member

4.3 Roles and Responsibilities of UPSDMA (Chapter III Disaster Management Act 2005[21])

4.4 State Executive Committee

For the State of Uttar Pradesh, the establishment of the SEC was notified vide notification Order No. 418/1-10-2016-14(15)/2009, dated 6 April 2016 under Section 20(1) of the DM Act[22]. The constitution of the SEC is as follows:

[21] Government of India. (2005). *The Disaster Management Act 2005* [Ebook] (p. 8). Retrieved from https://ndma.gov.in/sites/default/files/PDF/DM_act2005.pdf
[22] Government of India. (2005). *The Disaster Management Act 2005* [Ebook] (p. 8). Retrieved from https://ndma.gov.in/sites/default/files/PDF/DM_act2005.pdf

Table 5: SEC Chairperson and Members

S. No.	Members	Designation
1	Chief Secretary	Chairperson
2	Agriculture Production Commissioner	Member
3	ACS Finance	Member
4	ACS Home	Member
5	ACS Revenue	Member
6	ACS Medical Health and Family Welfare	Member
7	Relief Commissioner	Member Secretary

4.5 State Relief Commissioner

Section 11 of the Uttar Pradesh DM Act 2005 mandates the appointment of the State Relief Commissioner for the whole of the State, not below the rank of Secretary to the Government.[23]

Sections 21 and 22 outline the powers and functions of the Relief Commissioner[24], wherein the Commissioner may issue directions to the District Magistrate and local authority having jurisdiction over the affected area to provide emergency relief in accordance with DM plans.

4.6 State Disaster Response Force

Uttar Pradesh is a multi-hazard State. It is vulnerable to natural hazards such as floods, heat waves, earthquakes, drought, lightning and cold waves, as well as human-induced disasters such as fire or building collapse. The State Disaster Response Force has been constituted at the State level for effective response to such disasters.

4.7 State Emergency Operations Centre

The Emergency Operations Centre (EOC) has been set up at the State and District levels and acts as the coordination and communication hub during a disaster situation. This is, however, not to underestimate its normal-time activities.

4.8 District Disaster Management Authority

As per provisions in Chapter IV of the DM Act, each State Government shall set up a DDMA in every District headed by the District Magistrate, with the elected representative of the local authority as the co-chairperson.

[23] GoUP. (2022). *The Uttar Pradesh Disaster Management Act 2005* [Ebook] (p. 30). Retrieved from https://lawsofindia.blinkvisa.com/pdf/uttar_pradesh/2005/2005UP20.pdf
[24] GoUP. (2022). *The Uttar Pradesh Disaster Management Act 2005* [Ebook] (p. 32-33). Retrieved from https://lawsofindia.blinkvisa.com/pdf/uttar_pradesh/2005/2005UP20.pdf

The DDMA will act as the planning, coordinating and implementing body for DM at the District level, and take all necessary measures for the purposes of DM in accordance with the guidelines laid down by UPSDMA. The DDMA will prepare the DM Plan for the District and ensure that the guidelines for prevention, mitigation, preparedness, and response measures laid down by the UPSDMA are followed by all the District-level offices of the various departments of the State Government.

Table 6: DDMA Structure

S. No.	Members	Designation
1	District Magistrate	Chairperson (ex officio)
2	Zila Panchayat President	Co-Chairperson (ex officio)
3	Superintendent of Police/ Senior Superintendent of Police	Member (ex officio)
4	Additional District Magistrate (ADM F/R)	CEO (ex officio)
5	Chief Medical Officer	Member (ex officio)
6	Executive Engineer, Irrigation Department	Member
7	Executive Engineer, Public Works Department	Member

5 Hazard, Risk, Vulnerability and Capacity Analysis

5.1 Uttar Pradesh at a Glance

The State of Uttar Pradesh falls under three agro-climatic zones[25], which are as follows:

1. Agro-climatic Zone IV

This zone is further divided into three sub-zones:

(i) North-Eastern Plains covering the Districts of Bahraich, Gonda, Balrampur, Basti, Gorakhpur, Siddharthnagar, Maharajganj, Kushinagar and Deoria, receives an annual rainfall of 1,210 mm and the climate is moist sub-humid to dry sub-humid. About 73 per cent of the land area is cultivated and about half of the cultivated land is irrigated. Tube wells are the major source of irrigation.

(ii) Eastern Plains covering the Districts of Azamgarh, Mau, Ballia, Ayodhya, Ghazipur, Jaunpur, Sant Ravidas Nagar and Varanasi, receives an annual rainfall of 1,025 mm and the climate is dry sub-humid to moist sub-humid. Over 70 per cent of the land is cultivated and more than 80 per cent of the cultivated area is irrigated.

(iii) Vindhyan sub-zone in the Middle Gangetic Plain covering the Districts of Mirzapur and Sonbhadra in Uttar Pradesh, receives an annual rainfall of 1,134 mm and the climate is similar to the other parts of the eastern plains of Uttar Pradesh. However, the region has a high forest cover, about 40 per cent of the land. Less than one third of this land is cultivated and only a third of this is irrigated.

2. Agro-climatic zone-V

This zone covering 32 Districts of Uttar Pradesh is among the larger and very thickly populated agro-climatic zones that is cultivated and well-irrigated. It is the most developed region in the State as over 70 per cent of the area is sown and nearly 65 per cent of it is irrigated. Characterized by semi-arid and sub-humid conditions, the mean annual rainfall in this zone varies between 700 and 1,000 mm. There are three sub-zones under this Agro-climatic Zone.

(i) Central Plains covering the Districts of Prayagraj, Fatehpur, Pratapgarh, Sultanpur, Raebareli, Unnao, Lucknow, Barabanki, Sitapur, Hardoi, Lakhimpur Kheri and Pilibhit, receives an average annual rainfall of 979 mm, the climate ranges from dry sub-humid to semi-arid, and the soil is alluvium calcareous sandy loam. About 62 per cent of the land is cultivated, of which 56 per cent is irrigated.

(ii) North-Western Plains covering the Districts of Shahjahanpur, Bareilly, Rampur, Moradabad, Bijnor, Saharanpur, Muzaffarnagar, Meerut, Baghpat, Ghaziabad and Bulandshahr, has the highest land productivity in the State. About 70 per cent of the land is under agriculture and another 5 per cent of the land is under forest cover. Around 76 per cent of the net sown area is irrigated with tube wells being the predominant source of irrigation. The zone receives an annual average rainfall of 907 mm, the climate is dry sub-humid to semi-arid, and the soil is loam to sandy loam.

[25] Farmech.dac.gov.in. 2022. *1*. [online] Available at: https://farmech.dac.gov.in/FarmerGuide/UP/UI.htm#:~:text=The%20State%20of%20Uttar%20Pradesh,Central%20Plateau%20and%20Hills%20region.

(iii) South-Western Plains has low land productivity, despite a relatively high proportion of arable and irrigated cropped area. This is due to cultivation of low-value crops, principally wheat and bajra. Covering the Districts of Badaun, Aligarh, Mathura, Agra, Etah, Farrukhabad, Kannauj, Mainpuri, Firozabad, Etawah, Kanpur Dehat, and Kanpur Nagar, this region's climate is semi-arid and the soil type is alluvium calcareous clay. The region receives annual rainfall of 721 mm. More than 74 per cent of the net sown area is irrigated and over 69 per cent land is cultivated.

3. Agro-climatic Zone-VIII

This zone includes five Districts from South-Central Uttar Pradesh: Jalaun, Jhansi, Lalitpur, Hamirpur and Banda, collectively known as the Bundelkhand sub-zone, which receives annual rainfall of about 900 mm. Due to less developed irrigation facilities only 60 per cent of the area is cultivated, out of which 25 per cent is irrigated. Due to high soil erosion, land productivity is low.

In conclusion, the Central Plains are considered to be among the most fertile lands, although the concurrent floods in the Ghaghra and Rapti basin make agriculture vulnerable to floods from June to October. Agro-climatic zone-VIII is also vulnerable to recurrent droughts.

5.2 Hazard Profile of the State

"Hazard is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation".[26]

Natural hazards that cause significant impact in Uttar Pradesh are flood, drought, fire and earthquake. In addition, the State is also vulnerable to various human-induced hazards such as stampede, chemical, radiological and fire accidents.

The Government of Uttar Pradesh has notified 10 State-specific major hazards as disasters, other than those notified by the Government of India. In Uttar Pradesh so far, the following 19 disasters have been notified.

Table 1.1: Notified Disasters in the State

Government of India Notified Disaster	Government of Uttar Pradesh Notified Disaster
Flood	Unseasonal heavy rainfall/excess rainfall
Drought	Lightning
Earthquake	Thunderstorm
Hailstorm	Heat wave
Cold wave	Boat accident
Cloud burst	Snake bite
Fire	Gas leakage/sewer
Landslide	Borewell death
Pest attack	Human and animal conflict
cyclone	Drowning death (recently notified)
Avalanche	Bull and Blue Cow

[26] Hazard. (2022). Retrieved 22 July 2022, from https://www.undrr.org/terminology/hazard

5.3 Hazard, Risk and Vulnerability Analysis (HRVA)

Flood is a major hazard across 40 of the 75 Districts. This is followed by drought, which affects Districts in the Vindhya and Bundelkhand regions. The disaster vulnerabilities are listed in *Table 1.2.* This is based on the Hazard, Risk and Vulnerability Analysis (HRVA) carried out for the SDMP. Details of the same are provided in the subsequent sections.

Table 1.2: Hazard Risk and Vulnerability of the State

S. No.	Hazard	Districts Under Maximum Risk (In Terms of Damage and Loss)	Number of Vulnerable Districts	Severity
1	Flood	Eastern and North-Western parts of Uttar Pradesh	40	Moderate to high
2	Drought	All Districts	75	Low to high
		Bundelkhand Region	11	High to very high
3	Earthquake	North-East, East, Central, North, North-West and West	31	Low to high
4	Lightning	All Districts	75	Low to high
5	Thunderstorm	All Districts	75	Low to high
6	Heat wave	All Districts	75	Low to high
7	Cold wave	All Districts	75	Low to high

Source: **Data compiled from Relief Commissioner's Office, Government of Uttar Pradesh (2021)**

Vulnerability Mapping by Building Materials and Technology Promotion Council (BMTPC)

The vulnerability mapping by BMTPC involves checking whether a building situated in a seismically active area has sufficient robustness to withstand a specific magnitude earthquake, flood or other natural disaster. BMTPC carried out a structural vulnerability assessment of Uttar Pradesh in 2019 in which they found that around 50.7 per cent of rural houses are made up of burnt brick wall and stone packed with mortar, and 18 per cent of houses are made up of mud and unburnt brick wall. These houses are at high risk in earthquake and very high risk in flood-prone areas. Usually, the walls get washed away during heavy rainfall and severe flood situations. Houses built with burnt bricks and stones packed with mortar are less susceptible to earthquakes and have medium vulnerability to floods.

Wall / Roof		Census Houses		Level of Risk under								
				EQ Zone				Wind Velocity m/s				Flood Prone Area in %
		No. of Houses	%	V	IV	III	II	55 & 50	47	44 & 39	33	
				Area in %				Area in %				
STATE - UTTAR PRADESH					29.0	48.3	22.7	43.2	53.4	3.4		26.0
WALL												
A1 - Mud &	Rural	7,671,487	18.0									
Unburnt Brick Wall	Urban	557,829	1.3									
	Total	***8,229,316***	***19.3***		*H*	*M*	*L*	*VH*	*H*	*M*		*VH*
A2 - Stone Wall	Rural	328,497	0.8									
not packed with mortar	Urban	181,046	0.4									
	Total	***509,543***	***1.2***		*H*	*M*	*L*	*H*	*M*	*L*		*VH*
Total - Category - A		***8,738,859***	***20.5***									
B - Burnt Bricks Wall	Rural	21,620,426	50.7									
& Stone wall packed	Urban	8,140,057	19.1									
with mortar	***Total***	***29,760,483***	***69.8***		*M*	*L*	*VL*	*H*	*M*	*L*		*H/M*
Total - Category - B		***29,760,483***	***69.9***									
C1 - Concrete Wall	Rural	147,358	0.3									
	Urban	114,495	0.3									
	Total	***261,853***	***0.6***		*L*	*VL*	*VL*	*L*	*VL*	*VL*		*L/VL*
C2 - Wood wall	Rural	62,424	0.1									
	Urban	20,630	-									
	Total	***83,054***	***0.1***		*L*	*VL*	*VL*	*VH*	*H*	*M*		*H*
Total - Category - C		***344,907***	***0.8***									
X - Other Materials	Rural	3,365,434	7.9									
	Urban	392,676	0.9									
	Total	***3,758,110***	***8.8***		*VL*	*VL*	*VL*	*VH*	*H*	*M*		*VH*
Total - Category - X		***3,758,110***	***8.8***									
TOTAL HOUSES*		**42,602,359**										

Figure 1: Risk analysis of houses in UP

Source: **Building Materials and Technology Promotion Council ATLAS, 2019**

From the perspective of structural vulnerability of wall and roofing of housing structures, 19.3 per cent of the housing structures (both rural and urban) that are made up of mud and unburnt brick wall are highly vulnerable to flood and wind velocity above 55 m/s. Also, housing structures with stone wall not packed with mortar remain highly vulnerable to floods. This shows that the level of risk remains the same even when the structural quality gets better, which still poses a threat to life and property.

About 69.5 per cent of houses with burnt brick (both rural and urban) and stone packed walls are moderately vulnerable to floods and earthquakes as structural quality has improved. Houses with concrete walls are the least vulnerable to earthquakes, storms and floods. This shows that the higher the standards of structural quality of infrastructure, the less vulnerable these would be in case of any disaster.

Trends in Mortality across Various Disasters in Uttar Pradesh

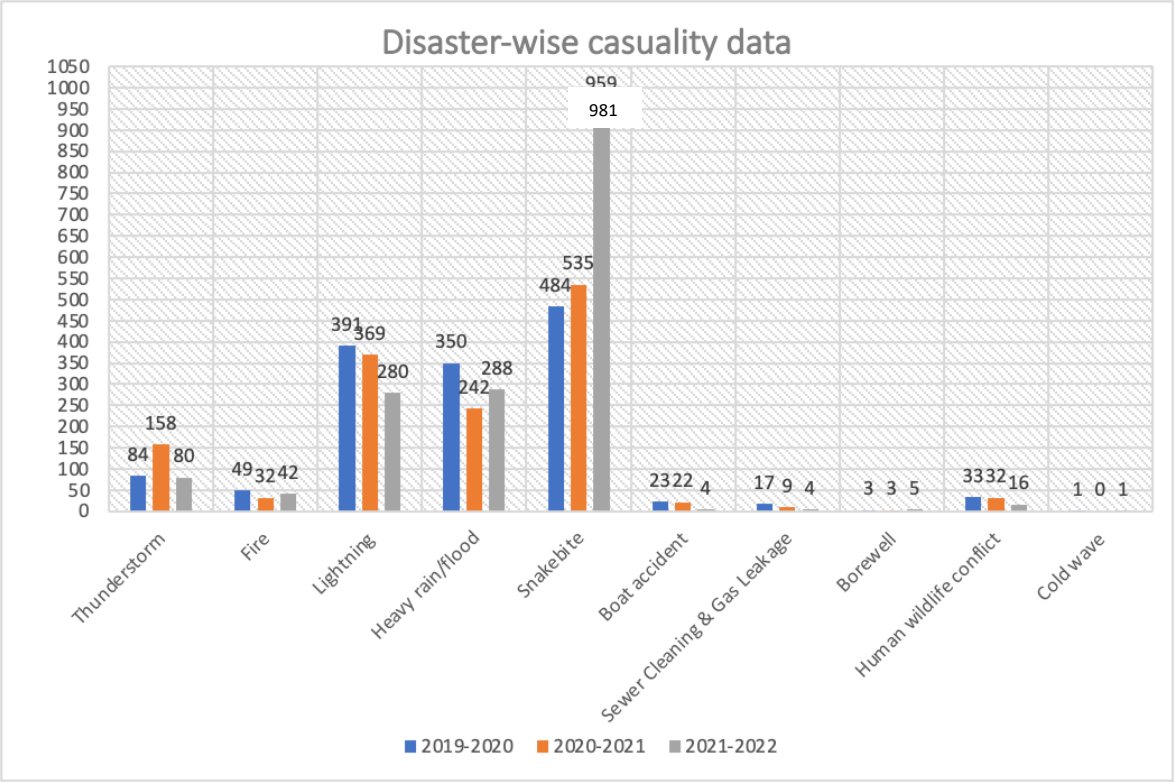


Figure 7: Trends of Deaths in Various Disaster Categories

Source: **Relief Commissioner's Office, Government of Uttar Pradesh, 2022**

In 2021-22, the highest number of deaths were registered in the snakebite category. This was followed by heavy rainfall and floods. Deaths due to lightning and thunderstorms have also been substantially high.

5.3.1 Flood

Flood is a recurrent disaster in the State of Uttar Pradesh. Some of the major rivers that cause floods in the State are the Ganga, Ghaghra, Yamuna, Ram Ganga, Gomti, Rapti, Sharda, and Gandak. The Eastern Districts of Uttar Pradesh are the most vulnerable to floods in comparison to Western and Central Districts.

Table 7: Flood history in Uttar Pradesh (1973-2019)

S. No.	Year	Number of Affected Districts	Affected Population (in Thousands)	Affected Villages	Total Affected Area (in Hectares)	Affected Agricultural Land (in Hectares)	Damaged Houses (in Lakhs)	Estimated Financial Loss (in Crores)
1	1973	40	141.5	30004	35	22.23	2.98	296.84
2	1974	39	73.9	14928	19.86	12.24	2.03	173.16
3	1975	36	92.14	18629	23.65	14.21	2.01	192.44
4	1976	36	31.95	32962	33.49	18.49	2.05	234.79
5	1977	31	37	7536	12.87	6.42	0.51	77.04
6	1978	55	225.87	48889	72.5	38.82	11.98	688.34
7	1979	16	21.04	3913	7.03	5.18	0.23	57.57
8	1980	46	303.47	44629	58.57	30.94	19.23	790.67
9	1981	33	146.27	20706	29.91	16.35	4.91	286.38
10	1982	44	232.91	32459	55.38	33.09	10.18	585.65
11	1983	56	155.34	24731	38.6	24.99	5.16	754.03
12	1984	39	65.75	11600	16.68	10.31	0.83	262.15
13	1985	55	195.59	27113	40.28	24.19	6.2	1216.26
14	1986	45	59.19	8925	10.34	6.45	0.51	268.14
15	1987	9	38.24	5807	5.81	3.16	1.8	186.14
16	1988	46	182.04	24721	31.76	17.14	3.71	834.6
17	1989	25	48.62	8281	10.3	6.52	0.78	NA
18	1990	51	85.34	15524	22.03	10.64	1.32	NA

S. No.	Year	Number of Affected Districts	Affected Population (in Thousands)	Affected Villages	Total Affected Area (in Hectares)	Affected Agricultural Land (in Hectares)	Damaged Houses (in Lakhs)	Estimated Financial Loss (in Crores)
19	1991	29	24.19	3372	8.1	2.1	0.78	NA
20	1992	20	29.24	4254	5.91	3.34	0.34	NA
21	1993	34	75.05	11765	15.11	7.91	1..37	NA
22	1994	45	39.07	9627	9.86	5.98	0.66	NA
23	1995	51	36.91	8874	12.79	7.98	0.88	NA
24	1996	44	72.2	8827	11.24	6.78	0.09	NA
25	1997	29	10.21	2284	3.49	1.55	0.03	NA
26	1998	55	121.91	15168	25.23	14.15	3.84	NA
27	1999	11	1.83	2.99	5.39	4.69	0.0049	NA
28	2000	40	63.86	5882	7.84	4.724	0.0089	NA
29	2001	21	27.15	3819	4.63	2.89	0.09	NA
30	2002	14	3.86	770	1.1	0.62	0.0061	NA
31	2003	54	134.8	17011	23.6	15.03	0.35	NA
32	2004	2	14.36	865	2.439	-	-	NA
33	2005	35	24.511	3652	3.597	3.835	0.7732	NA
34	2006	12	4.53	678	-	-	-	NA
35	2007	23	26.53	578	8.49	5.66	0.34	519.88
36	2008	32	41.75	6287	4.988	-	5.3	NA
37	2009	15	2038	1712	4.988	-	0.04	129.3

S. No.	Year	Number of Affected Districts	Affected Population (in Thousands)	Affected Villages	Total Affected Area (in Hectares)	Affected Agricultural Land (in Hectares)	Damaged Houses (in Lakhs)	Estimated Financial Loss (in Crores)
38	2010	44	53.76	6819	-	6.7	1.19	1013.784
39	2011	36	23.06	3587	5.25	3.96	0.0553	1438.44
40	2012	15	6.835	1118	-	1.241	0.796	117.87
41	2013	40	35.44	5785	5.646	3.49	0.7828	3259.53
42	2014	22	15.39	1895	4.72	4.72		754.3284
43	2015	No flood						
44	2016	31	22.34	3078	5.96	4.21	0.4679	812.53
45	2017	33	29.23	3147	4.37	2.28	0.2877	862.9
46	2018	24	5.918	947	NA	1.9	0.2806	556.43
47	2019	40	7.459	1297	NA	60.03	0.5664	842.33

Source: **Flood Book 2019, Flood Management Information System, Department of Irrigation, Government of Uttar Pradesh**

Over time, the number of deaths reported due to floods has shown a declining trend. One reason could be better preparedness for floods as a result of strengthened systems in the State.

Flood-affected Regions of Uttar Pradesh

A detailed analysis of the flood history of the State, supported by the collated data by the Department of Irrigation, Government of Uttar Pradesh, shows that 40 Districts are most vulnerable to floods. Of these, 24 Districts are in the 'very severe' category, while 16 are in the 'severe' category. The severity is defined based on the frequency of floods in the Districts. Lakhimpur Kheri, Shravasti, Sitapur, Bahraich, Barabanki, Gonda, Basti, Siddharthnagar, Ayodhya, Balrampur, Maharajganj, Sant Kabir Nagar, Deoria, Kushinagar, Mau, Azamgarh, Ballia, Gorakhpur, Ghazipur, Ambedkar Nagar, Bijnor, Pilibhit, Badaun, and Farrukhabad Districts are in the 'very severe' category. All the affected Districts are in Sharda, Rapti, and Ghaghra basin, where one of the major reasons for flooding is the release of water from Nepal.

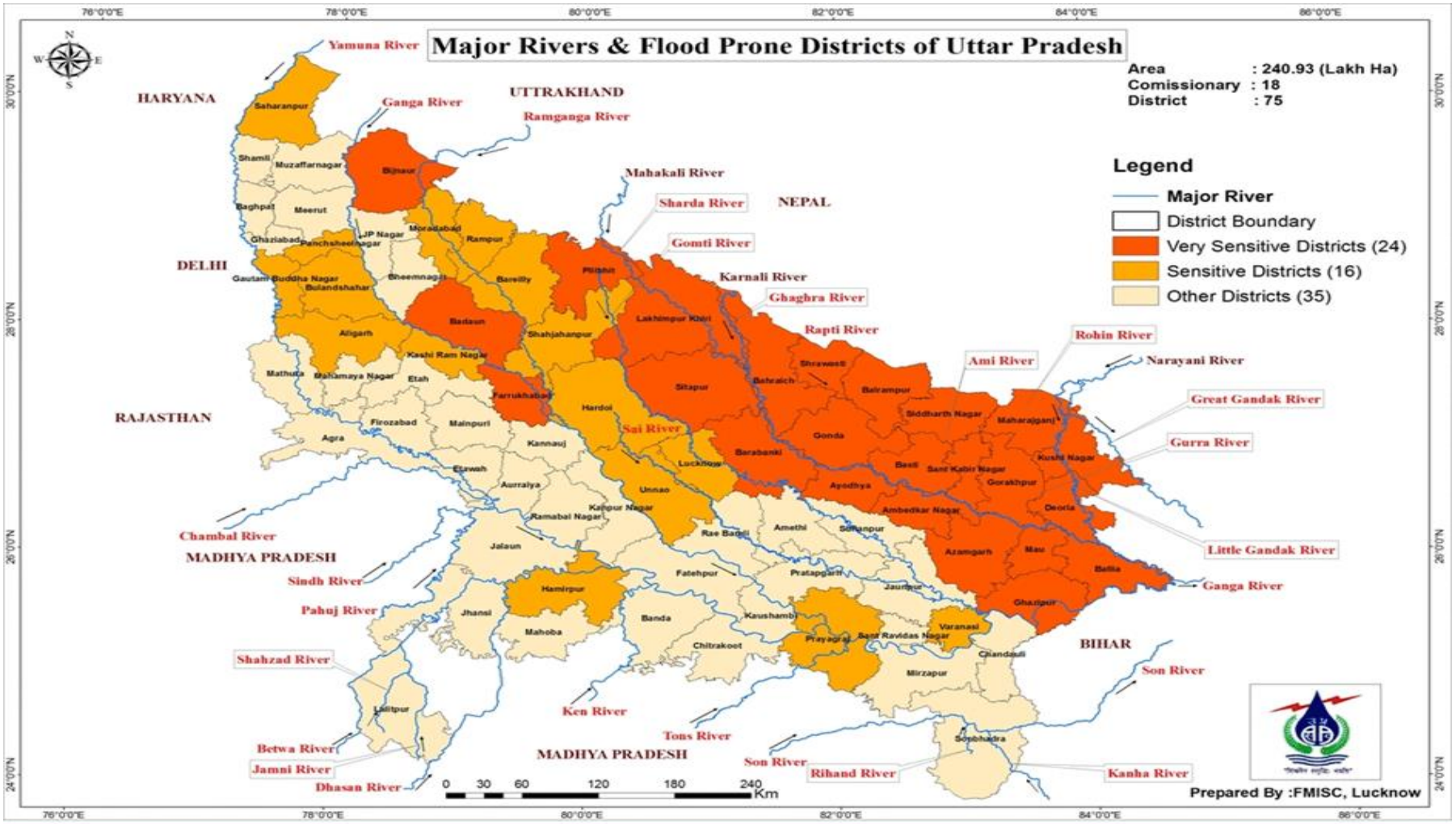


Figure 8: Very Severe and Severe Flood-Prone Districts of Uttar Pradesh[27]

Source: **Flood Book 2019, Flood Management Information System, Department of Irrigation, Government of Uttar Pradesh**

[27] Source: Flood Management Information System Centre, Uttar Pradesh

About 16 Districts have been placed in the 'severe' category. These are mainly in the Ram Ganga and Ganga river basins. These are flooded once in two years due to perennial rainfall in the region. The Districts are Saharanpur, Muzaffarnagar, Bulandshahr, Rampur, Aligarh, Gautam Buddh Nagar, Moradabad, Bareilly, Kasganj, Shahjahanpur, Hardoi, Unnao, Lucknow, Hamirpur, Prayagraj and Varanasi.

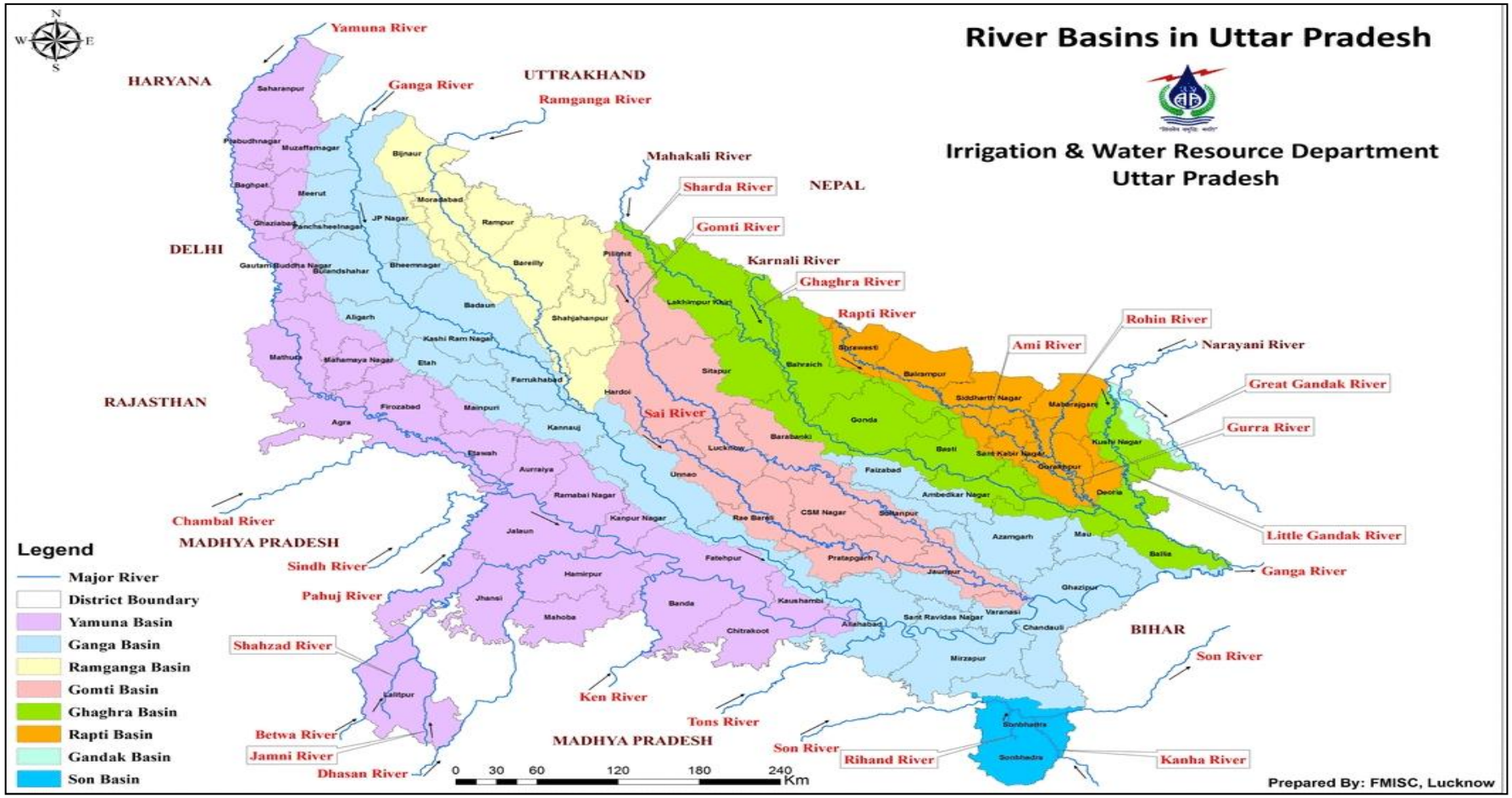


Figure 9: River Basins of Uttar Pradesh

Table 1.3: Flood-Affected Areas in Uttar Pradesh[28]	
Flood-affected Regions	**Affected Districts**
Western	Moradabad, Rampur, Gautam Buddh Nagar, Aligarh, Saharanpur, Bareilly, Bijnor, Pilibhit, Badaun, Shahjahanpur and Bulandshahr
Eastern	Ayodhya, Balrampur, Gorakhpur, Ghazipur, Deoria, Basti, Mau, Ballia, Sant Kabir Nagar, Siddharthnagar, Maharajganj, Kushinagar, Azamgarh, Gonda, Shravasti, Bahraich, Lakhimpur Kheri, Ambedkar Nagar and Varanasi
Central	Lucknow, Farrukhabad, Sitapur, Hardoi, Kasganj, Barabanki, Raebareli, Unnao and Prayagraj
Bundelkhand	Hamirpur

Discharge from Perennial Rivers

Floods have been a commonly recurring phenomenon in the State, affecting almost half of the State almost every year. Yamuna and Ganga, 2 of the 10 perennial rivers of India, follows half its course through Uttar Pradesh, which when precipitated with the extensive rainfall in the monsoon creates a flood situation starting from Bijnor, Farrukhabad, and Kasganj to Varanasi and Prayagraj. Additionally, extensive rainfall in the Terai region of Nepal leads to massive release of water from the Karnali, Mahakali and Narayani River basins (details of trans-boundary rivers are annexed) towards downstream in Ramganga, Gomti, Sharda, Ghaghra, Rapti and Gandak. This results in floods across Eastern Uttar Pradesh. Details of the highest danger levels that have been recorded in the past are listed in *Table 8.*

Table 8: Main Rivers, Gauge Station and Highest Flood Level

S. No.	River	Gauge Site	District	Highest Flood Level (m)	Year	Danger Level (m)
1	Ganga	Bhim Gaura	Haridwar	296.23	1978	294.00
2	Ganga	Narora	Bulandshahr	180.01	2010	178.42
3	Ganga	CHCM Ganga Barrage	Bijnor	220.20	1997	220.00
4	Ram Ganga	Katghar Railway Bridge	Moradabad	193.94	1924	190.60
5	Yamuna	Okhla Barrage	Ghaziabad	201.35	1995	200.60
6	Yamuna	ISBT	Delhi	207.49	1978	204.83
7	Ken	Bariyapur Bandha	Madhya Pradesh	193.40	2005	189.74
8	Gomti	Hanuman Setu Gomti Barrage	Lucknow	110.85	1971	109.50
10	Sharada	Sharada Nagar	Lakhimpur Kheri	136.55	1993	135.49
11	Sharada	Paliakala	Lakhimpur	155.17	2008	153.62

[28] Source: Irrigation & Water Resource Department, Government of Uttar Pradesh

S. No.	River	Gauge Site	District	Highest Flood Level (m)	Year	Danger Level (m)
			Kheri			
12	Ghaghara	Kartania Ghat (Girija Barrage)	Bahraich	137.12	1975	136.78
13	Ghaghara	Elgin Bridge	Barabanki	107.40	2008	106.07
14	Ghaghara	Ayodhya	Ayodhya	93.84	2008	92.73
15	Ghaghara	Turtipar	Ballia	66.00	1998	64.01
16	Rapti	Rapti Barrage	Shravasti	129.55	2006	127.70
17	Rapti	Bardghat	Gorakhpur	77.54	1998	74.98
19	Saryu	Saryu Barrage	Bahraich	134.50	1995	133.50

Source: Department of Irrigation, Uttar Pradesh

Dam/Barrage Flow Discharge

Uttar Pradesh has a large network of dams and barrages. Some of the major dams are listed in *Table 1.5*. Over time, a large number of major barrages have been constructed above rivers such as Ram Ganga, Ghaghra, Rapti, Ganga and Yamuna. These are perennial rivers and receive glacial water along with rainfall during the period from June to September. Barrages above rivers in the lower Ganga basin ensure availability of water during the summer months and help in drought mitigation. On the other hand, rivers in the upper Ganga basin receive excessive rainfall during the said period. This situation is further exacerbated when Nepal releases water into India. This is contributing factor for floods in Eastern Uttar Pradesh. A high level of siltation in the Rapti basin creates multiple drainage channels in the rivers. Because of this situation, when the water is released from Nepal, there is a change in the course of the rivers, resulting in floods in the upper Gangetic basin.

Table 1.5: Major Dams of Uttar Pradesh

S. No.	Name of Dams	Main River	District
1	Parichha Dam	Betwa River	Jhansi
2	Matatila Dam	Betwa River	Lalitpur
3	Govind Ballabh Pant Sagar Dam	Rihand River	Sonbhadra
4	Jamni Dam	Jamni	Lalitpur
5	Kalagarh Dam	Ram Ganga River	Bijnor
6	Rohini Dam	Rohini River	Lalitpur
7	Shahzad Dam	Shahzad River	Lalitpur District
8	Govind Sagar Dam	Shahzad River	Lalitpur District
9	Sajnam Dam	Sajnam River	Lalitpur
10	Sukma-Dukma Dam	Betwa River	Jhansi
11	Jirgo Reservoir	Jirgo River	Mirzapur
12	Musa Kahand	Karmnasa River	Chandauli and Varanasi

Source: Uttar Pradesh State Disaster Management Plan 2018–19

Siltation

Siltation across the Ganga and Yamuna Rivers has been one of the challenges for change of flow from the normal course of the river. Downstream of the Rishikesh and Bhigauda Barrages, the Ganga flows through braided channels during the lean season. The width of the river changes from 1 to 3 km. The river forms chute channels and multiple channels in the upstream.

When the Ganga River reaches Prayagraj, it flows mostly in single channels, except at a few places, where siltation is present. The channels get distributed mainly at the Ram Ganga confluence, where a large part of sediment is received. Similarly, the confluence of the Ganga and Yamuna also creates congestion in discharge due to siltation in Prayagraj, which leads to floods in the region.

The Remote Sensing Application Centre (RSAC), Uttar Pradesh has initiated the study of rejuvenation, desilting and storage capacity of the Manorama, Tamsa and Varuna rivers of Uttar Pradesh. The analysis is to be used in the preparation of detailed integrated development plans for rejuvenation, desilting and increasing the flow of these rivers.

Flood Hazard, Risk, Vulnerability and Capacity Analysis (HRVCA)

Hazard/Location	• Flood is the main disaster faced by the State each year. Historically, most of the Districts experienced floods. However, since the 2000s, this climatic pattern has changed due to climate change, and the predominantly flood-prone Districts are also witnessing drought or drought-like conditions • Lakhimpur Kheri, Shravasti, Sitapur, Bahraich, Barabanki, Gonda, Basti, Siddharthnagar, Ayodhya, Balrampur, Maharajganj, Sant Kabir Nagar, Deoria, Kushinagar, Mau, Azamgarh, Ballia, Gorakhpur, Ambedkar Nagar, Bijnor, Pilibhit, Badaun and Farrukhabad Districts are in the 'very severe' category • The 17 Districts Ghazipur, Saharanpur, Muzaffarnagar, Bulandshahr, Rampur, Aligarh, Gautam Buddh Nagar, Banda, Shamli, Bareilly, Kasganj, Shahjahanpur, Hardoi, Unnao, Lucknow, Prayagraj and Varanasi on the Ram Ganga and Ganga River basins have been categorized in the 'severe' category • Since the past couple of years, Jalaun, Chitrakoot and Hamirpur Districts of the Bundelkhand region, which were known for drought, are also experiencing sporadic floods
Vulnerability Indicators	Vulnerability is high due to the topography and geometry of water channels. The two main reasons for floods include high precipitation and water logging. • Eastern Uttar Pradesh experiences 1,000–1,200 mm of rainfall annually. The main reasons for floods include heavy rainfall, low gradient, high subsoil water level, and silting of river beds. The Western parts of the State experience 600–1,000 mm of rainfall annually, and because of poor drainage systems, face flood like situations • The *bund* structures are quite vintage and need extensive maintenance • Heavy rainfall in Nepal and Uttarakhand cause downstream flooding in Uttar Pradesh which is aggravated by lack of early warning and information sharing • Economically weaker section people form a large section of the population of Uttar Pradesh is and most live below the poverty line. When a disaster strikes, the resilience to 'Build Back Better' is lower in the such population. • The elderly account for 7.7 per cent of the total State population. Of this, 80 per cent live in the rural areas and support their families in agricultural practices. Flood exacerbates livelihood conditions of the elderly.
	Health: • Disruption of routine services including health infrastructure occur as the health facilities are submerged in water or damaged during floods • There is an increase in the number of cases and deaths from water-borne

	diseases such as cholera, dysentery, diarrhoea as a result of contaminated water • There is also an increase in the number of cases and deaths from vector-borne diseases such as dengue, chikungunya and malaria • Vulnerabilities are further exacerbated due to the ongoing COVID-19 pandemic **Nutrition:** • Crop damage results in reduced food availability. Food consumption of people may be compromised • There is a possibility of shortage in food supplies • Anganwadi Centres (AWCs) in the flood-affected areas may be either inaccessible or damaged, resulting in disruption of services that are provided through the AWCs **Education:** • Schools may be inaccessible due to water logging • Schools may be inundated resulting in closure • Schools may be used as relief shelters resulting in disruption of education • There may be a loss in the number of school days because of closure of schools • Absenteeism may occur due to the inability to reach schools, or the need for helping at home, or engaging in child labour or migration • There may be an increase in school dropout rates • Reading and learning materials may be damaged and result in children losing interest in studies **WASH:** • Poor sanitary conditions may result in child morbidity and mortality • Water quality may be an issue due to which water-borne diseases may increase **Child Protection:** • Livelihoods of caregivers may be affected, resulting in an increase in child labour, child abuse and trafficking • There is a possibility of increased psychological stress among children • There is a possibility of children drowning and losing their lives **Livelihood:** • There could be a possibility of people losing their livelihood and being pushed into poverty • Daily wagers may not be able to work during floods as their time is spent in saving their own lives, property, household goods and livestock • Agricultural losses may occur due to crop damage • Loss of livestock affects the economy of rural communities
Gaps in Existing Capacities	• Flood Atlas for the State is required to be prepared. • Enhanced set-up for real-time monitoring system of water level of the rivers and reservoir levels is required. • Enhanced set-up for early warning systems in the State for flood risks and release of water from reservoirs to the people residing in low-lying areas needs

	to be established. • Studies on flood zonation and river migration change of the major rivers are lacking. • Set-up for digital risk mapping for public information and research purposes is required. • Documentation and lessons learnt from major floods in the State on management, prevention and mitigation measures needs upgradation. • Studies on flood-related problems such as river course changes, agriculture land and soil losses caused by flooding of rivers, and appropriate use of embankments should be taken up. • Studies on land use and hydrological changes relevant to flood management in river basins and reservoir command areas should be entrusted to academic institutions. • Network of flood gauge and rainfall gauge in un-gauged flood-prone areas that pose significant threat to at-risk communities needs to be set up. • Geographic Information System (GIS)-based mapping of all the essential services needed for rescue, response and relief phases viz. medical and health, civil supply, WASH, shelter and other emergency services requires upgradation. • Lack of Artificial Intelligence-based Decision Support Systems. The SEOC/DEOCs should integrate latest scientific/technological tools for Decision Support. • Lack of coordination between early warning agencies like CWC, IMD, Irrigation Department and RSAC. • Strict enforcement regime for regulation on inhabitation of low-lying areas along the rivers, canal and drains. • Though, a Hazard, Risk, Vulnerability and Capacity Analysis (HRVCA) has been undertaken for the State, this is quite traditional, and the changing climate scenarios are not given due attention, nor are technological and scientific studies taken into consideration for comprehensive HRVCA

5.3.2 Drought

"Drought is mainly caused due to variability of rainfall leading to rainfall deficiency and water shortage". [29] The impact, response, and interventions to such conditions would vary depending on the point of time in a crop calendar when there is acute water or soil moisture deficit. Generally, three situations are recognized:

i. Early season: delayed rainfall (delayed onset of monsoon), prolonged dry spells after onset;

ii. Mid-season: inadequate soil moisture between two rain events; and

iii. Late season: early cessation of rains or insufficient rains.

The Indian Meteorological Department recognizes five drought situations:

[29] NDMA. (2022). Retrieved 22 July 2022, from https://ndma.gov.in/kids/drought.html

i. Drought Week, when the weekly rainfall is less than half of the normal;

ii. Agricultural Drought, when four drought weeks occur consecutively between mid-June and September;

iii. Seasonal Drought, when seasonal rainfall is deficient by more than the standard deviation from the normal;

iv. Drought Year, when annual rainfall is deficient by 20 per cent of the normal or more; and

v. Severe Drought Year, when annual rainfall is deficient by 25 to 40 per cent of the normal or more.

Drought can be devastating, as water supplies dry up, crops fail to grow, animals die, and malnutrition and ill health become widespread.

History of Drought in Uttar Pradesh

Farming in Uttar Pradesh is mainly rain-fed during the rainy season and irrigation-based during the post-rainy season. However, in the upland, during scanty rainfall, canals and tube wells supplement water needs.

Uttar Pradesh faced droughts in 2002, 2004, 2006, 2007, 2009, 2014 and 2015. This resulted in loss of crops, livestock and property. The successive deficient rains in 2006 and 2007 caused calamitous conditions in the nine southern Districts of the State comprising the Bundelkhand and Vindhyan regions.

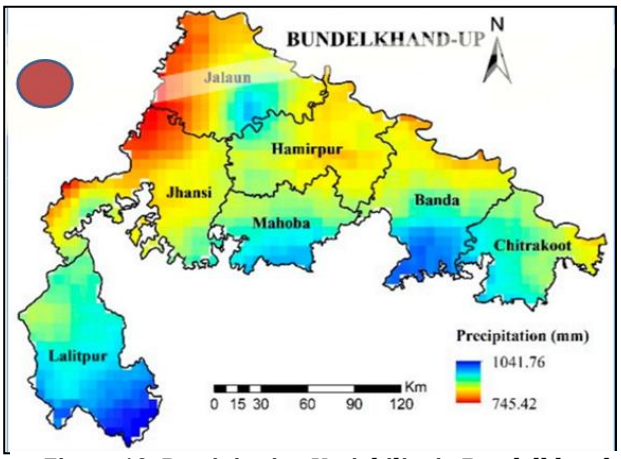


Figure 10: Precipitation Variability in Bundelkhand

Source: Journal article "Drought Identification and Trend Analysis Using Long-Term CHIRPS Satellite Precipitation Product in Bundelkhand, India (2021)"

In 2015, the State faced severe drought conditions, in which almost 50 Districts were affected. The State received 56 per cent less rainfall than normal during the monsoons. Due to scanty rainfall, drought was declared in 50 Districts of Uttar Pradesh.

In 2016, eight Districts were affected: Lalitpur, Kanpur Nagar, Banda, Hamirpur, Chitrakoot, Mahoba, Jalaun and Jhansi.

In 2018, five Districts were affected by drought: Lalitpur, Mahoba, Jhansi, Sonbhadra and Mirzapur. The year-wise drought history is mentioned below.

Table 8: History of drought in Uttar Pradesh

Year	No. of Districts Affected	Names of Districts Affected
1979	9	Banda, Chitrakoot, Hamirpur, Jalaun, Jhansi, Lalitpur, Mahoba, Mirzapur, Sonbhadra

Year	No. of Districts Affected	Names of Districts Affected
2002	68	Agra, Aligarh, Allahabad, Ambedkar Nagar, Azamgarh, Budaun, Baghpat, Bahraich, Ballia, Balrampur, Banda, Barabanki, Bareilly, Basti, Bijnor, Bulandshahr, Chandauli, Chitrakoot, Deoria, Etah, Etawah, Ayodhya, Farrukhabad, Fatehpur, Firozabad, Gautam Buddh Nagar, Ghaziabad, Ghazipur, Gonda, Gorakhpur, Hamirpur, Hardoi, Jalaun, Jaunpur, Jhansi, Jyotiba Phule Nagar, Kannauj, Kanpur Nagar, Kanpur Dehat, Kaushambi, Lakhimpur Kheri, Kushinagar, Lalitpur, Lucknow, Maharajganj, Mahoba, Mainpuri, Mathura, Mau, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Pilibhit, Pratapgarh, Raebareli, Rampur, Saharanpur, Sant Kabir Nagar, Sant Ravi Das Nagar, Shahjahanpur, Shravasti, Siddharthnagar, Sitapur, Sonbhadra, Sultanpur, Unnao, Varanasi
2004	60	Agra, Aligarh, Allahabad, Ambedkar Nagar, Auraiya, Azamgarh, Budaun, Baghpat, Bahraich, Ballia, Balrampur, Banda, Barabanki, Basti, Bulandshahr, Chandauli, Chitrakoot, Deoria, Etah, Etawah, Ayodhya, Farrukhabad, Fatehpur, Firozabad, Gautam Buddh Nagar, Ghaziabad, Ghazipur, Gonda, Hamirpur, Hardoi, Jalaun, Jaunpur, Jhansi, Kannauj, Kanpur Nagar, Kanpur Dehat, Kaushambi, Lucknow, Mahrajganj, Mahoba, Mainpuri, Mathura, Mau, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Pratapgarh, Raebareli, Saharanpur, Sant Kabir Nagar, Sant Ravi Das Nagar, Shahjahanpur, Shravasti, Siddharthnagar, Sitapur, Sonbhadra, Sultanpur, Unnao, Varanasi
2007	9	Banda, Chitrakoot, Hamirpur, Jalaun, Jhansi, Lalitpur, Mahoba, Mirzapur, Sonbhadra
2009	56	Agra, Aligarh, Allahabad, Ambedkar Nagar, Auraiya, Azamgarh, Budaun, Ballia, Balrampur, Banda, Bareilly, Basti, Bijnor, Bulandshahr, Chandauli, Chitrakoot, Deoria, Etah, Etawah, Ayodhya, Farrukhabad, Fatehpur, Firozabad, Gautam Buddh Nagar, Ghaziabad, Ghazipur, Jalaun, Jaunpur, Jhansi, Jyotiba Phule Nagar, Kannauj, Kanpur Nagar, Hamirpur, Kaushambi, Kushinagar, Lucknow, Lalitpur, Mahoba, Mainpuri, Mathura, Mau, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Pilibhit, Raebareli, Rampur, Saharanpur, Sant Kabir Nagar, Shahjahanpur, Siddharthnagar, Sitapur, Sultanpur, Unnao, Varanasi
2014	43	Agra, Aligarh, Amethi, Auraiya, Azamgarh, Budaun, Banda, Bareilly, Bulandshahr, Chitrakoot, Deoria, Etah, Etawah, Ayodhya, Farrukhabad, Fatehpur, Firozabad, Gautam Buddh Nagar, Ghaziabad, Hamirpur, Hapur, Hardoi, Jalaun, Jaunpur, Jhansi, Kannauj, Kanpur Nagar, Kanpur Dehat, Kaushambi, Kushinagar, Maharajganj, Mahoba, Mainpuri, Mathura, Mau, Meerut, Muzaffarnagar, Pilibhit, Rampur, Saharanpur, Shamli, Sonbhadra, Unnao
2015	50	Agra, Amethi, Allahabad, Ambedkarnagar, Auraiya, Baghpat, Ballia, Balrampur, Banda, Barabanki, Basti, Chandauli, Chitrakoot, Deoria, Etah, Etawah, Firozabad, Ayodhya, Farrukhabad, Fatehpur, Ghaziabad, Gonda, Gorakhpur, Hamirpur, Jalaun, Jaunpur, Jhansi, Kannauj, Kanpur Nagar, Kanpur Dehat, Kaushambi, Kushinagar, Lalitpur, Lucknow, Mahoba, Maharajganj, Mainpuri, Mau, Mirzapur, Pilibhit, Pratapgarh, Raebareli, Rampur, Sant Kabir Nagar, Sant Ravidas Nagar, Shahjahanpur, Siddharthnagar, Sonbhadra, Sultanpur, Unnao

Year	No. of Districts Affected	Names of Districts Affected
2016	8	Mahoba, Chitrakoot, Banda, Jalaun, Jhansi, Lalitpur and Hamirpur and Kanpur Nagar
2018	5	Mahoba, Lalitpur, Jhansi, Sonbhadra, Mirzapur

Source:

Severity of Drought in Uttar Pradesh

Many of the Districts were affected in the years 1979, 2002, 2004, 2007, 2009, 2014, 2015, 2016 and 2018. The severity of drought in the Districts is reflected in *Table 1.6.*

Table 1.6: Districts Affected at least Five Times or more in the Period from 2002 to 2018

S. No.	District	Categories	Number of Times Affected during 2002 to 2018	Year
1	Jhansi	Severe	8	2002, 2004, 2007, 2009, 2014, 2015, 2016, 2018
2	Lalitpur	Severe	8	2002, 2004, 2007, 2009, 2014, 2015, 2016, 2018
3	Mahoba	Severe	8	2002, 2004, 2007, 2009, 2014, 2015, 2016, 2018
4	Hamirpur	Severe	7	2002, 2004, 2007, 2009, 2014, 2015, 2016
5	Banda	Severe	7	2002, 2004, 2007, 2009, 2014, 2015, 2016
6	Chitrakoot	Severe	7	2002, 2004, 2007, 2009, 2014, 2015, 2016
7	Jalaun	Severe	7	2002, 2004, 2007, 2009, 2014, 2015, 2016
8	Agra	Moderate	5	2002, 2004, 2009, 2014, 2015
9	Mainpuri	Moderate	5	2002, 2004, 2009, 2014, 2015
10	Etah	Moderate	5	2002, 2004, 2009, 2014, 2015
11	Fatehpur	Moderate	5	2002, 2004, 2009, 2014, 2015
12	Kaushambi	Moderate	5	2002, 2004, 2009, 2014, 2015
13	Sonbhadra	Moderate	5	2002, 2004, 2009, 2015, 2018
14	Mirzapur	Moderate	5	2002, 2004, 2009, 2015, 2018
15	Etawah	Moderate	5	2002, 2004, 2009, 2014, 2015
16	Kanpur Dehat	Moderate	5	2002, 2004, 2009, 2014, 2015
17	Mathura	Moderate	5	2002, 2004, 2009, 2014, 2015
18	Prayagraj	Moderate	5	2002, 2004, 2009, 2014, 2015

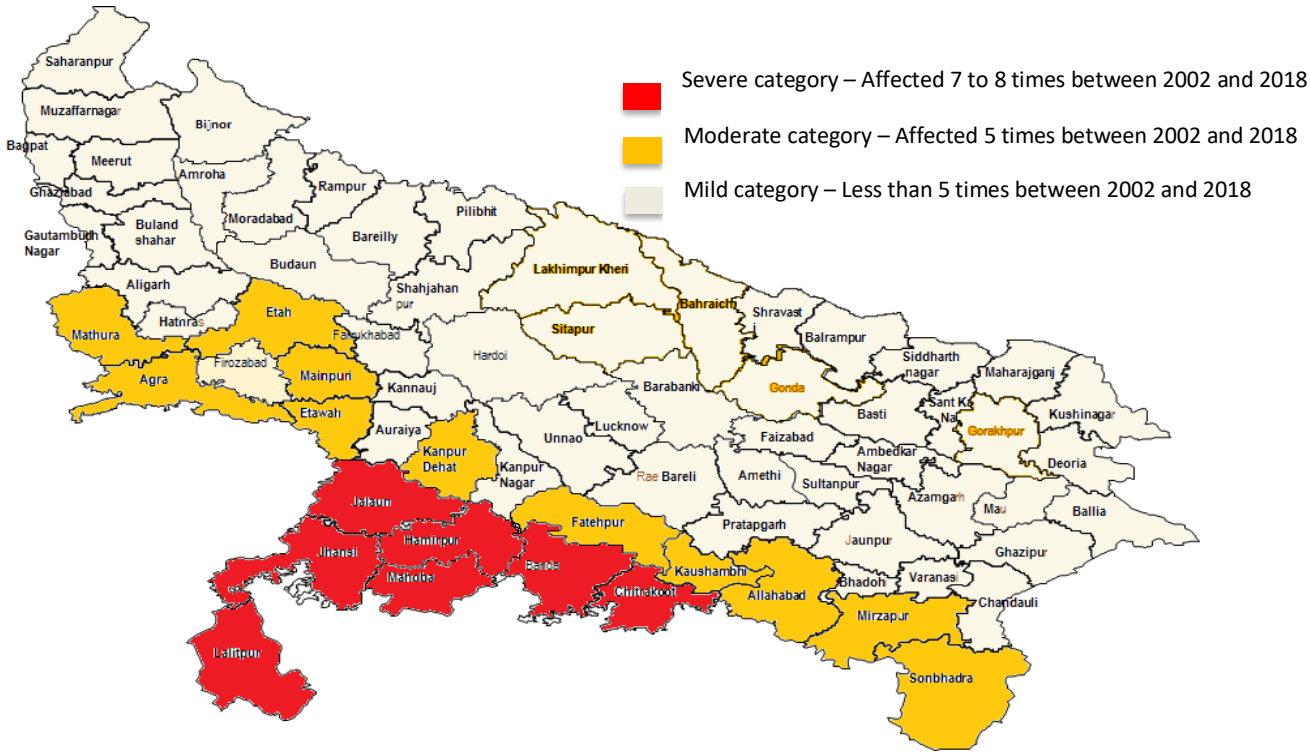


Figure 11: Drought-Affected Districts Experiencing Drought Five to Eight Times between 2002 and 2018

Primarily, the Bundelkhand region in Uttar Pradesh is affected by drought or drought-like conditions. In this region, crops grown during the post-rainy season are usually based on residual moisture conserved during the rainy season. Rainfall occurs both from Bengal and South-West monsoons during the period from July to September each year.

Bundelkhand: Overview of Monsoons in 2018 Resulting in Drought

Bundelkhand is known as a drought-prone region. It comprises seven Districts of Uttar Pradesh. Monsoon rains are of critical importance to this region. However, in the past several years, the region has faced deficit rains leading to water scarcity, particularly for agriculture-related activities. The situation of rainfall in 2018 is depicted in *Table 1.7.*

Table 1.7: Cumulative District-wise Rainfall Distribution in 2018

S. No.	District	Normal Rainfall (Jun–Sep)	Actual Rainfall (Jun–Sep)	Deficient %
1	Banda	840.4	772.7	- 8%
2	Chitrakoot	885.9	911.3	3%
3	Hamirpur	796.9	810.4	2%
4	Jalaun	774.9	600.4	-23%
5	Jhansi	837.9	775.0	-8%
6	Lalitpur	939.3	835.5	-11%
7	Mahoba	776.4	340.4	-56%

Source IMD, 2021

Following the deviation in rainfall and other indices such as availability of water, the Government of Uttar Pradesh declared seven Bundelkhand Districts as drought-affected in the year 2018.

Socio-Economic Impact of Drought in Uttar Pradesh

Uttar Pradesh, with 29.43 per cent (one in four) of its population living below the poverty line, is an agrarian State. Drought and its effect on agricultural outputs makes the poor vulnerable to financial shocks, thereby leading to poverty traps. Inequality, a high in Uttar Pradesh and is a major bottleneck to achieving national priorities. As per the NITI India Index 2020, Uttar Pradesh was the poorest performer on Goal 11 (reduced inequalities). The State score was 41, while the national score was 67.

Drought Hazard, Risk, Vulnerability and Capacity Analysis

Hazard/Location	• Uttar Pradesh is divided into two meteorological sub-divisions: Uttar Pradesh East and Uttar Pradesh West • Since 2000, climate variability has been witnessed with a higher number of Districts facing drought-like conditions • The recurrence period of highly deficient rainfall in Bundelkhand region is seven to eight times in 15 years • The recurrence for the Districts in Vindhya region is five– to six times between 2002 and 2018 • Chitrakoot, Banda, Hamirpur, Jhansi, Jalaun Lalitpur and Mahoba are severely vulnerable to drought • Agra, Etah, Etawah, Fatehpur, Kaushambi, Kanpur Dehat, Prayagraj, Mirzapur, Mathura, Mainpur and Sonbhadra are moderately vulnerable to drought
Vulnerability	• Overpopulation (relative to current productivity, income and natural resources) in Bundelkhand and Vidhya region • Debilitated ecological base leading to land degradation and fragmentation due to excessive use of quarrying and mining • High dependence on climate-sensitive sectors: agriculture, forestry, fisheries • High number of dark zones for ground water
Risk	**Social:** • Damage to crops results in a greater number of farmers slipping below the poverty line • Population without access to (improved) sanitation and water supply • Low access to fodder for animals during drought • Loss of crop affects the livelihood of the farmers and leads to large-scale migration **Economic:** • Loss of crops, leads to reduced purchasing power among the farmers, which leads to economic losses **Health and Nutrition**: • Crop damage and loss of livelihoods leads to food insecurity affecting nutritional status and health of children • Distance to. health centres leads to difficulty of access during extreme weather conditions

	• Water contamination causes water-borne diseases such as jaundice and diarrhoea among children and other vulnerable groups • Shortage of food may lead to an increase in malnourishment and under-nourishment of people **Education**: • School education is affected and the percentage of dropouts increases. Either children migrate with their parents or they contribute to the household income as child labour • Mid-day meals are affected • Schools can be closed due to unavailability of safe drinking water • Poor sanitary conditions • Adolescent girls dropout of schools and participate in household work **WASH**: • Unavailability of safe drinking water affects people and livestock • Poor sanitary conditions • Children and women walk longer distances to draw water for household consumption **Child protection:** • Child trafficking and child abuse increase because of migration of parents or need for additional income
Gap in Existing Capacities	• Low level of awareness among farmers on social protection schemes such as Pradhan Mantri Fasal Bima Yojana (PMFBY) • Lack of technical know-how on monitoring of rainfall and water resources at ground level • Lack of drought forecast, and assessment of water deficit, drought-prone, and dryland farming areas • Lack of awareness on water conservation methods such as rainwater harvesting • Limited resources for institution-building specific to drought mitigation and response • Lack of availability of less water-intensive seeds • Lack of awareness among farmers on crop rotation methods • Lack of proper repair of dysfunctional water sources • Inadequate Rapid Response Teams (RRTs) for managing any outbreak of water-borne diseases • Inadequate guidelines for hiring private tankers in case of inadequate availability of Government tankers • Inadequate establishment of fodder banks at strategic locations using improved fodder/feed storage methods for supply of fodder to deficit areas • Inadequate pilot studies in drought-prone areas for suggesting long-term mitigation measures • Lack of programme convergence on lessons learnt from studies carried out by various research institutions • Inadequate promotion and subsidy on water-efficient irrigation systems (sprinklers, drip, etc.) • Lack of tracking mechanism on village-level information systems for natural resource management • Inadequate coverage on credit and financing products relevant to the

	drought-prone areas

5.3.3 Earthquake

Uttar Pradesh falls under the four seismic zones – II, III and IV – according to the maximum intensity of earthquake expected. A major part of the State falls under zones III and IV.

Earthquake Zones in Uttar Pradesh

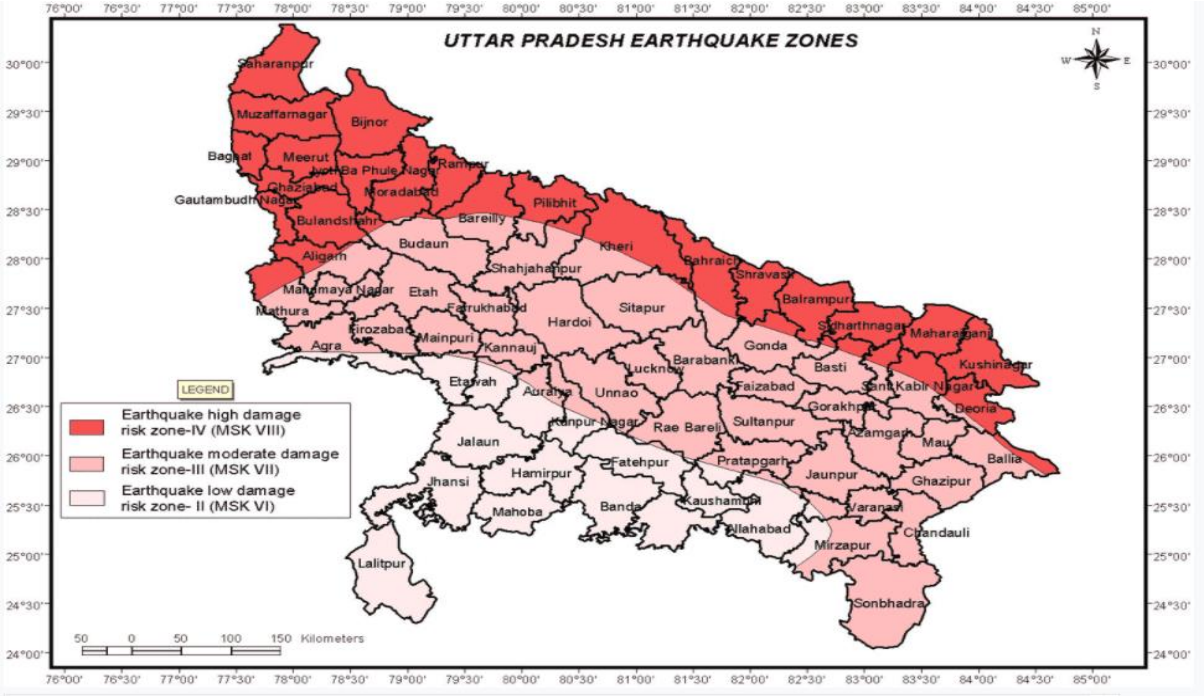


Figure 12: Earthquake Zone Map of Uttar Pradesh

Source: BMPTC Vulnerability Atlas of India (2019)

List of Districts of Uttar Pradesh in Earthquake Seismic Zones II to IV

Table 1.8: List of Districts of Uttar Pradesh in Earthquake Seismic Zones II to IV

S. No.	Districts completely in Zone IV	Districts partly in Zones IV and III	Districts completely in Zone III	Districts partly in Zones II and III	Districts completely in Zone II
1	Amroha	Aligarh	Ambedkar Nagar	Agra	Banda
2	Baghpat	Bahraich	Ayodhya	Amethi	Chitrakoot
3	Balrampur	Ballia	Azamgarh	Auraiya	Hamirpur
4	Bijnor	Bareilly	Barabanki	Etawah	Jalaun
5	Bulandshahr	Basti	Chandauli	Fatehpur	Jhansi
6	Gautam Buddha Nagar	Budaun	Etah	Firozabad	Kaushambi
7	Ghaziabad	Deoria	Farrukhabad	Kanpur Dehat	Lalitpur
8	Hapur	Gonda	Ghazipur	Kanpur Nagar	Mahoba
9	Kushinagar	Gorakhpur	Hardoi	Mainpuri	
10	Maharajganj	Lakhimpur Kheri	Hathras	Mirzapur	
11	Meerut	Mathura	Jaunpur	Pratapgarh	
12	Moradabad	Pilibhit	Kannauj	Prayagraj	
13	Muzaffarnagar	Shahjahanpur	Kasganj	Raebareli	
14	Rampur	Sitapur	Lucknow	Sant Ravidas Nagar	
15	Saharanpur	Sant Kabir Nagar	Mau		
16	Sambhal		Sonbhadra		
17	Shamali		Sultanpur		
18	Shravasti		Unnao		
19	Siddharthnagar		Varanasi		

Source: BMTPC Vulnerability Atlas of India (2019)

History of Earthquakes in Uttar Pradesh, Including Bordering States

The history of earthquakes in Uttar Pradesh, including bordering States, is provided in *Table 1.9.* Uttarakhand was carved out of Uttar Pradesh in 2000.

Table 1.9 Earthquake History of Uttar Pradesh

Year	Epicentre	Magnitude	No. of Districts Affected	Damage
1 Sep 1803	Chamoli	7.0	Chamoli and other Districts	200–300 deaths
28 Aug 1916	Western Nepal	7.3	Dharchula	NA
6 Nov 1925	Raebareli-Sultanpur District Border	6.0	Raebareli and Sultanpur	NA
15 Jan 1934	India-Nepal Border Region	8.0	Eastern Uttar Pradesh, Allahabad, Lucknow	10,500
8 Nov 1952	Nepal	6.0	Bahraich-Gonda	NA
10 Oct 1956	Jahangirpur	6.2	Bulandshahr	NA
27 Aug 1960	Ghagot, Haryana	6.0	Gurgaon-Faridabad	50 deaths
24 Dec 1961	Salkot, Nepal	6.0	Pilibhit and Lakhimpur Kheri	NA
1 Jun 1965	Sant Kabir Nagar	5.7	Gorakhpur and Basti	NA
15 Sep 1966	Raunda Mustahkam	5.8	Moradabad	NA
29 Jul 1980	Surma, Nepal	6.8	Pithoragarh	The quake also caused damage in Pithoragarh area, nearly 50 km away from the epicentre. About 13 persons were killed here and 40 were injured.
21 Oct 1991	Uttarkashi	6.8	Uttarkashi and Uttar Pradesh	Reported number of deaths: 768 Number of people affected: 0.4 million
29 Mar 1999	Gopeshwar	5.8	Chamoli	NA
18 Oct 2007	Gautam Buddh Nagar	3.8	Gautam Buddh Nagar	Nil
26 Apr 2015	Barpak, Nepal	7.3	Entire Uttar Pradesh	Nil

Source: ASC, Seismicity of Uttar Pradesh (http://asc-india.org/seismi/seis-uttar-pradesh.htm)

Earthquake Hazard, Risk, Vulnerability and Capacity Analysis

Many Districts of the State are in seismic zones IV and III. Although the Government of Uttar Pradesh has amended its building bye-laws and codes to incorporate earthquake safety features in buildings, the compliance mechanisms for the implementation of these bye-laws needs stricter enforcement.

Hazard/Location	• Surrounded by various fault lines and ridges • Beneath Uttar Pradesh, runs the Delhi-Haridwar ridge, North Jahangirpur East-South South-West along New Delhi to the Garhwal region. The Delhi-Muzaffarnagar ridge, which goes from East to West, runs from New Delhi to Kathgodam in Nepal • Amroha, Baghpat, Balrampur, Bijnor, Bulandshahr, G.B. Nagar, Ghaziabad, Hapur, Kushinagar, Maharajganj, Meerut, Moradabad, Muzaffarnagar, Rampur, Saharanpur, Sambhal, Shamli, Shravasti and Siddharthnagar lie in the high-damage risk zone IV
Vulnerabilities	• Dilapidated and un-retrofitted lifeline infrastructure • High-rise buildings are vulnerable based on their structural type, material used, maintenance, etc. • Elevated corridors and old flyovers/bridges remain vulnerable during an earthquake, unless their structural safety is ensured. • Major railway lines pass through the State and old railway bridges are more vulnerable.
Risks	• Houses made of mud, unburnt brick walls, burnt brick walls and stone walls are vulnerable to earthquake • Collapse of public infrastructure such as schools, hospitals, AWCs may result in disruption of services • Collapse of buildings will result in accidents and maybe deaths • Disruption of water and electricity supply • Fire outbreaks may occur • In case of damage in and around Narora nuclear reactor, possibility of death of people or long-term health risks among people living in areas close by • Oil refinery in Mathura lies in seismic zone IV. This area is highly vulnerable • There may be an increase in psychological stress and trauma for prolonged periods **Health:** • Disruption of routine services in case health centres/hospitals are damaged or inaccessible • Increase in number of cases and deaths from water-borne diseases such as cholera, dysentery or diarrhoea as a result of contaminated water • Increase in the number of cases and deaths from vector-borne diseases such as dengue, chikungunya, malaria, etc. • Supply systems for essential services may be affected **Nutrition:** • AWCs may be damaged or inaccessible • Food supplies may be short in a post-earthquake scenario **Education:** • Schools may be closed due to damage or inaccessibility

	• Closure of schools may lead to loss in number of school days • Inability to reach schools or need for helping at home or engaging in child labour or migration may lead to absenteeism **WASH:** • Poor sanitary conditions may result in child morbidity and mortality • Water supply and quality may be an issue in a post-earthquake scenario **Child Protection:** • Livelihood of caregivers may be affected • Child labour, child abuse and child trafficking may increase • Increased psychological stress among children may occur **Power supply:** • Damage in transmission lines and power sources may affect power supply Short circuits may lead to major fire incidents **Gas pipeline:** • Gas pipeline may get damaged and create a major hazard to locals **Oil refinery:** • Oil refinery may be damaged and cause loss of lives or lifelong health effects **Nuclear reactor in Narora:** • Nuclear reactor may be damaged resulting in loss of lives or lifelong health effects
Gaps in Existing Capacities	• Lack of awareness of seismic knowledge and implications among the communities. • Inadequate data on disaster damage and loss. • Lack of studies on vulnerabilities and capacities covering social, physical, economic, ecological, gender, social inclusion and equity aspects • Remote sensing-based studies that can provide inputs for micro-seismic zonation should be taken up. • Inadequate capacities for implementing robust mechanisms for monitoring construction of earthquake-resilient houses. • Lower level of compliance to relevant building codes in high-rise buildings. • Moderate level of compliance to adoption of building bye-laws for rural and urban areas. • Lack of adequate number of trainings and orientation sessions of the State Government staff, and other direct stakeholders such as civil society, media persons, elected representatives and professionals on earthquake preparedness and response measures • Structured random audits needs to be carried out for high-rise multistoried buildings • Lack of knowledge related to earthquakes and seismicity among common people

5.3.4 Fire

Fire is the most frequent disaster in urban as well as rural areas. Rapid urbanization, overcrowding and unregulated commercial activities are frequently responsible for urban fires. Also, unplanned structures and improper electrical installations lead to fire events in urban areas.

In Uttar Pradesh, a majority of the population lives in rural areas and many of them still live in thatched roof houses. During the summer season, fire incidents are very common because of the use of fossil fuel for cooking purposes and behaviours such as throwing of cigarette butts and bidis in the fields. Also, electrical short circuits during the summer season may result in fires in fields having crops that are ready to be harvested.

Major Fire Incidents in Uttar Pradesh

Sr. No	Year	Place	Losses/Damage Incurred
1	April 2006	Brand India Fair, Meerut	65 dead and 150 injured
2	December 2010	Wooden Seasoning Plant, Mathura	Property worth INR 2 crores damaged
3	April 2013	Dargah Fire, Bahraich	80 shops gutted in fire
4	June 2015	Goyal Residency, Pratapgarh	10 killed and 13 injured
5	June 2015	Sitapur	100 houses gutted in fire, 1 dead
6	October 2015	Sabzi Mandi, Banda	400 shops gutted in fire
7	May 2017	Bus Fire, Banda	4 killed and 20 injured
8	March 2017	Glass Factory Fire, Rasulpur, Firozabad	1 killed and 12 injured
9	May 2017	Pandav Nagar Chemical Factory, Ghaziabad	NA
10	November 2017	Thermal Power Plant Fire and Blast, Unchahar	43 dead and 100 injured
11	January 2018	BRD Hospital, Gorakhpur	-
12	May 2018	Anpara thermal Power Plant, Sonbhadra	-
13	May 2018	Godown Fire, Allahabad	-
14	October 2018	Obra Thermal Power Plant, Sonbhadra	-
15	September 2020	Chemical Factory, Agra	-
16	March 2021	Fire Godown, Colonelganj, Kanpur	Plastic godown gutted
17	April 2021	JJ Cluster, Gautam Buddha Nagar	2 killed and 50 shanties gutted in fire

Source: Information collated from various media articles

Fire Hazard, Risk, Vulnerability and Capacity Analysis

Hazard/Location	• Industrial units, thatched houses, shopping malls, LPG godowns/petrol

	pumps, industries, chemical handling units
Vulnerability Indicators	• In the summer season, thatched houses are highly prone to fire • Loss of livestock in fire incidents makes the situation worse as it contributes to a large part of the rural economy • Usually, fire destroys the entire crop and causes massive economic loss as most of the rural economy is based on agriculture • Congested urban areas and unplanned urbanization has enhanced fire vulnerability in cities • Highly populous settlements living in thatched huts or huts made with plastic sheets • Non-adherence of building bye-laws in commercial and industrial units • Unauthorized electricity connections
Risks	• Community in the vicinity of the industrial units may be exposed to fire events • Hospitals, schools, business units, which work on electrical supply systems • Thatched houses, huts and mud houses with tin sheds could be damaged in fire • Infrastructure could be disrupted, such as electric power, water supply system, etc. • Structures such as glass and plastic could be damaged due to heat and temperature released during the chemical and industrial events • Agriculture land could be impacted due to fire events
Gaps in Existing Capacities	• Lack of penetration of Fire Stations across the State • Lack of trained Firemen, Sub Officers in all the Fire Stations • Lack of Systematic data management on disaster damage and loss assessments and reporting of relief granted in various cases • Lack of online information system on Hazardous Chemical (Codes) (HAZCHEM) conforming to national standards • Lack of State-specific Fire Incident Reporting System in Districts for fire events with specific features and response provided to understand the type of risk for other events • Lack of system of simulation of worst-case scenarios for industrial units • Lack of Action Plan for modernization and meeting future needs • Lack of equipment for firefighting, urban search and rescue as per the requirements • Lack of trained women staff in Government response task forces, volunteers and specialized division • Inadequate documentation of lessons learnt from major fire events in the State on management, prevention and mitigation measures • Inadequate number of training programmes on various aspects such as firefighting, managing collapsed structure, and search and rescue • Lack of GIS-based mapping of all the essential services needed for rescue, response and relief phases viz. medical and health, civil supply, WASH, shelter and other emergency services • Lack of proper mock drills on a regular basis • Low level of fire alarm systems coverage from various industrial and

	residential buildings • Low level of individual protection equipment in public buildings with • At almost all levels, inability to handle firefighting equipment • Lack of random audits for high-rise multistoried buildings

5.3.5 Lightning and Thunderstorm

Lightning and thunderstorm are other major hazards in the State of Uttar Pradesh. Not only does lightning result in loss of human and animal lives, but it can also result in forest fires as well as local and large-scale power cuts that can damage the communication and electrical systems including computers other electrical appliances.

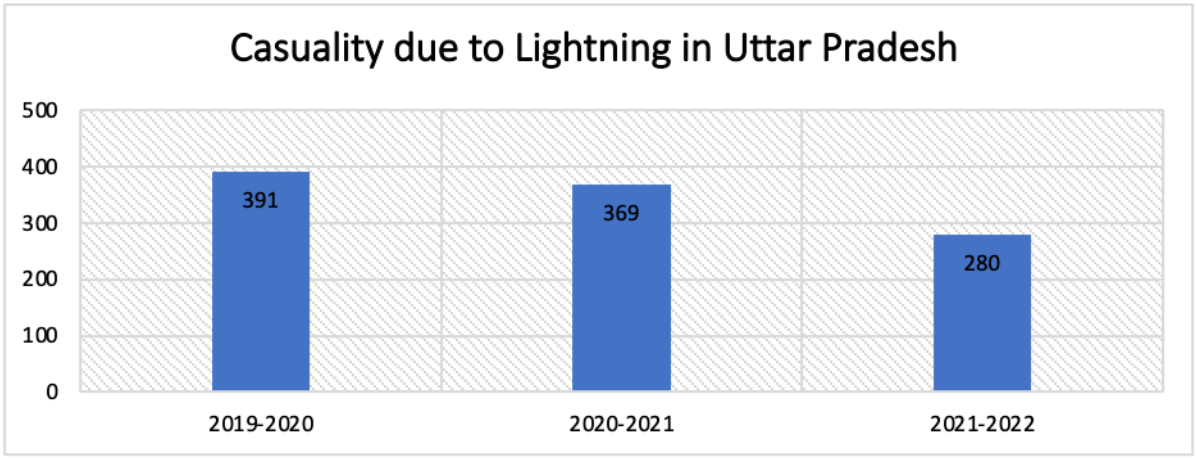
A thunderstorm is usually accompanied by lightning and squall, and causes heavy to very heavy disruption. Electrocution, wall/roof collapse, flying heavy objects due to high-speed wind and tree felling, etc. during a thunderstorm and lightning event are the main causes for human and animal life loss and property damage.

In the Annual Lightning Report 2021-22[30], the Climate Resilient Observing Systems Promotion Council counted over 3 lakh cloud-to-ground lightning strikes in Uttar Pradesh. In Uttar Pradesh lightning strikes are fewer as compared to other States, but mortality figures remain high among the affected States.

- Lightning Vulnerability in Uttar Pradesh

Though the data on zoning of lightning strikes is available at the State level, no micro-zonation data on lightning strikes is available at the District level. Therefore, vulnerability is defined using the lightning strike and number of causalities.

The graph given below shows a decline over the years in causalities reported. This in turn points towards better preparedness in the State for lightning hazard.



[30] CROPC. (2022). *Annual Lightning Report 2021-22 (Executive Summary)* [Ebook]. New Delhi. Retrieved from http://www.cropc.org/LR/Ex%20Summary,%20Annual%20Lightning%20Report%202021-2022%20(5).pdf

Source: **Data compiled from Relief Commissioner's Office, Government of Uttar Pradesh, 2022**

- Western Uttar Pradesh

The number of deaths in Western Uttar Pradesh is less than 10 per cent of the total deaths reported in the State (see Table 1.10). In 2019–2020, only 30 of 391 reported mortalities were in Western Uttar Pradesh. Similarly, in 2020–2021, 33 of 369 and in 2021–2022, 19 of 280 deaths were reported in this region. A majority of those deaths were reported from the Agra, Aligarh and Bareilly Divisions of the State.

Table 1.10: Deaths due to Lightning in Western Uttar Pradesh

S. No.	Division	District	Lightning (2019–2020)	Lightning (2020–2021)	Lightning (2021–2022)
1	Agra	Agra	2	4	0
2		Firozabad	3	3	7
3		Mainpuri	2	3	2
4		Mathura	3	2	1
5	Aligarh	Aligarh	0	4	1
6		Etah	0	0	2
7		Hathras	2	0	0
8		Kasganj	0	4	0
9	Bareilly	Bareilly	1	3	0
10		Badaun	3	1	0
11		Pilibhit	1	0	2
12		Shahjahanpur	7	1	2
13	Meerut	Meerut	2	0	0
14		Bulandshahr	0	2	0
15		G.B. Nagar	0	0	1
16		Ghaziabad	0	0	0
17		Hapur	0	0	0
18		Bagpat	0	0	0
19	Moradabad	Moradabad	0	0	0
20		Amroha	1	0	0
21		Bijnor	2	3	0
22		Sambhal	0	1	0
23		Rampur	0	0	0
24	Saharanpur	Saharanpur	0	0	0
25		Muzaffarnagar	1	1	0

26		Shamli	0	1	1
	Total		30	33	19

Source: **Data compiled from Relief Commissioner's Office, Government of Uttar Pradesh, 2022**

- Central Uttar Pradesh

The number of deaths in Central Uttar Pradesh is less than 20 per cent of the total deaths reported annually in the State. In 2019–2020, 79 of 391 reported mortalities were in Central Uttar Pradesh. Similarly, in 2020–2021, 57 of 369 and in 2021–2022, 39 of 280 were reported in this region. A majority of these deaths were reported in the Kanpur Nagar, Kanpur Dehat, Lucknow, Hardoi, and Lakhimpur Kheri of the Kanpur and Lucknow Divisions of Uttar Pradesh.

Table 1.11: Deaths due to Lightning in Central Uttar Pradesh

S.no.	Division	District	Lightning (2019–2020)	Lightning (2020–2021)	Lightning (2021–2022)
1	Kanpur	Kanpur Nagar	11	0	0
2		Etawah	2	2	0
3		Farrukhabad	3	0	5
4		Kanpur Dehat	6	8	7
5		Auraiya	1	0	3
6		Kannauj	2	2	1
7	Lucknow	Lucknow	1	1	0
8		Hardoi	9	3	1
9		Lakhimpur Kheri	7	3	0
10		Raebareli	7	8	6
11		Sitapur	9	1	3
12		Unnao	2	9	4
13	Ayodhya	Ayodhya	1	1	1
14		Barabanki	4	2	1
15		Ambedkar Nagar	4	9	1
16		Sultanpur	7	6	2
17		Amethi	3	2	1
	Total		79	57	36

Source: **Data compiled from Relief Commissioner's Office, Government of Uttar Pradesh, 2022**

- North-Eastern Uttar Pradesh

The number of deaths in North-Eastern Uttar Pradesh is around 19 per cent of the total deaths reported in the State. In 2019–2020, 55 of 391 reported mortalities were in this region. Similarly, in 2020-21, 89 of 369 reported mortalities and in year 2021-22, 51 of 280 reported

mortalities were in North-Eastern Uttar Pradesh. A majority of these deaths were reported in the Azamgarh and Gorakhpur Divisions of Uttar Pradesh.

Table 1.12: Deaths due to Lightning in North-Eastern Uttar Pradesh

S. No.	Division	District	Lightning (2019–2020)	Lightning (2020–2021)	Lightning (2021–2022)
1	Azamgarh	Azamgarh	9	7	9
2		Ballia	7	22	6
3		Mau	6	2	2
4	Basti	Basti	0	6	10
5		Sant Kabir Nagar	2	3	5
6		Siddharthnagar	3	3	3
7	Gorakhpur	Gorakhpur	6	11	4
8		Deoria	11	16	4
9		Kushinagar	5	8	3
10		Maharajganj	1	1	0
11	Devipatan	Bahraich	2	1	2
12		Balrampur	3	5	2
13		Gonda	0	4	1
14		Shravasti	0	0	0
	Total		55	89	51

Source: **Data compiled from Relief Commissioner's Office, Government of Uttar Pradesh, 2022**

- South-Eastern Uttar Pradesh

South-Eastern Uttar Pradesh is the hotspot of lightning hits in the State. The highest number of deaths were reported in 5 of 18 Divisions of Uttar Pradesh. The number of deaths in South-Eastern Uttar Pradesh is around 55 per cent of the total deaths reported in the State. In 2019–2022, 227 of 391 reported mortalities were in this region. Similarly, in 2020–2021, 148 of 369 reported mortalities and in 2021–2022, 174 of 280 reported mortalities were in this region. A majority of these deaths were reported in the Mirzapur, Chitrakoot and Prayagraj Divisions. Mirzapur Division itself accounts for around 20 per cent of the total deaths reported between 2019 and 2022.

Table 1.13: Deaths due to Lightning in South-Eastern Uttar Pradesh

S.no.	Division	District	Lightning (2019–2020)	Lightning (2020–2021)	Lightning (2021–2022)
1	Prayagraj	Prayagraj	15	29	31
2		Fatehpur	17	14	7
3		Kaushambi	9	9	5
4		Pratapgarh	8	5	4
5	Mirzapur	Mirzapur	28	27	22

S.no.	Division	District	Lightning (2019–2020)	Lightning (2020–2021)	Lightning (2021–2022)
6		Sant Ravidas Nagar (Bhadohi)	3	6	2
7		Sonbhadra	37	35	37
8	Varanasi	Varanasi	4	2	1
9		Gazipur	7	16	11
10		Jaunpur	9	13	2
11		Chandauli	12	12	3
12	Chitrakoot	Chitrakoot	11	6	5
13		Banda	12	2	2
14		Hamirpur	13	1	7
15		Mahoba	6	3	8
16	Jhansi	Jhansi	7	1	11
17		Jalaun	10	2	0
18		Lalitpur	19	7	16
	Total		227	190	174

Source: **Data compiled from Relief Commissioner's Office, Government of Uttar Pradesh, 2022**

- Lightning Hazard, Risk, Vulnerability and Capacity Analysis

Hazard/Location	Although all Districts of Uttar Pradesh are prone to lightning strikes, but in the last few years the districts – Prayagraj, Mirzapur, Sonbhadra, Ghazipur and Lalitpur, have reported high number of lightning-related deaths.
Vulnerabilities	• Thatched/tin shed huts/houses. • Lack of impact based early warning system. • Open field where people take shelter under trees when it is raining. • Houses without lightning arresters surrounded by a number of trees • Houses surrounded by trees • Lack of awareness/knowledge, dos and don'ts, etc. in the context of lightning • Non-availability of covered structures/lightning shelters in the open fields • Farming activities during monsoons
Risks	• Mud houses with tin shed fire. • Shelters with galvanized roofs. • Farmers in fields. • Women working in open, children in open fields. • Critical facilities such as schools, Primary Health Centres (PHCs), Community Health Centres (CHCs), AWCs without lightning arrestors. • Fire as the secondary effect of lightning. • Animal grazing in open fields or taking shelter under tin sheds without lightning arrestor. • Disruption of electric power, water supply system, etc.

	• Structures such as glass and plastic which could be damaged. • Vehicles parked outside. • Fishing activity during rains. • Bathing and other domestic activities near ponds/water bodies during rains/rainy clouds/thunderstorms.
Existing Capacity Gaps	• Lack of lightning arrestors in houses especially in rural areas. • Lack of lightning arrestors in public/sensitive buildings. • Lack of common alert protocols for lightning warnings in the District/State. • Lack of knowledge among the population on do's and don'ts • Lack of knowledge/awareness about lightning arrestors among the common masses. • Lack of mechanism for real-time alerts to the last man. • Lack of lightning shelters in the State (particularly in and around agricultural fields)

5.3.6 Hailstorm

Hailstorms cause substantial damage to standing crops as well as to horticultural crops within a very short period of time. Uttar Pradesh experiences unseasonal rains and hailstorms mostly from February to April. However, in the contemporary period hailstorms have occurred as early as in January and even in late period of May.[31]

In March 2015, heavy rains accompanied by a hailstorm damaged wheat, sugarcane and oilseed crops across thousands of hectares in the State. Hence, there is now a pressing need for hailstorm prediction followed by mitigation, recovery and risk reduction measures after a hailstorm strike.

- History of Hailstorms in Uttar Pradesh

Year	No. of Affected Districts	Names of Affected Districts
2014	15	Agra, Allahabad, Banda, Chitrakoot, Firozabad, Hamirpur, Jalaun, Jhansi, Kanpur Dehat, Kasganj, Kaushambi, Lalitpur, Mahoba, Mathura, Pratapgarh
2015	73	Agra, Aligarh, Allahabad, Ambedkar Nagar, Auraiya, Azamgarh, Badaun, Baghpat, Bahraich, Ballia, Banda, Barabanki, Bareilly, Sambhal, Bulandshahr, Chandauli, Amethi, Chitrakoot, Deoria, Etah, Etawah, Faizabad, Farrukhabad, Fatehpur, Firozabad, Gautam Buddha Nagar, Ghaziabad, Ghazipur, Gorakhpur, Hamirpur, Hardoi, Hathras, Jalaun, Jaunpur, Jhansi, Amroha, Kannauj, Kanpur Nagar, Kasganj, Kaushambi, Kushinagar, Lakhimpur Kheri, Lalitpur, Lucknow, Mahoba, Mainpuri, Mathura, Mau, Meerut, Mirzapur, Moradabad, Muzaffarnagar, Hapur, Pilibhit, Shamli, Pratapgarh, Raebareli, Kanpur Dehat, Rampur, Saharanpur, Bhadohi, Shahjahanpur, Sitapur, Sonbhadra, Sultanpur, Unnao, Varanasi, Basti, Mahrajganj,

[31] CHATTOPADHYAY, N., DEVI, S., JOHN, G., & CHOUDHARI, V. (2017). Occurrence of hail storms and strategies to minimize its effect on crops. *MAUSAM*, *68*(1), 75-92. doi: 10.54302/mausam.v68i1.435

Year	No. of Affected Districts	Names of Affected Districts
		Gonda, Siddharthnagar, Shravasti, Sant Kabir Nagar
2018	36	Agra, Azamgarh, Aligarh, Ballia, Banda, Barabanki, Bijnor, Faizabad, Firozabad, Gonda, Hapur, Hardoi, Jalaun, Jaunpur, Kushinagar, Kasganj, Lakhimpur Khiri, Lalitpur, Mathura, Mirzapur, Raebareli, Shahjahanpur, Sant Kabir Nagar, Sonbhadra, Unnao, Basti, Etawah, Jhansi, Kannauj, Kanpur Nagar, Lucknow, Sambhal, Sitapur, Varanasi, Mahoba, Bulandshahr
2020	60	Agra, Firozabad, Mathura, Aligarh, Etah, Kasganj, Prayagraj, Fatehpur, Kaushambi, Pratapgarh, Azamgarh, Ballia, Mau, Bareilly, Badaun, Pilibhit, Shahjahanpur, Sant Kabir Nagar, Siddharthnagar, Chitrakoot, Bahraich, Balrampur, Gonda, Ayodhya, Barabanki, Ambedkar Nagar, Sultanpur, Amethi, Gorakhpur, Deoria, Jhansi, Jalaun, Kanpur Nagar, Etawah,, Farrukhabad, Kanpur Dehat, Auraiya, Kannauj, Lucknow, Hardoi, Lakhimpur Kheri, Sitapur, Unnao, Meerut, Bulandshahr, Gautam Buddh Nagar, Hapur, Mirzapur, Sant Ravidas Nagar, Sonbhadra, Moradabad, Amroha, Sambhal, Saharanpur, Muzaffar Nagar, Shamli, Varanasi, Ghazipur, Jaunpur, Chandauli

Source: **Hailstorm memorandum (2014, 2015, 2018, 2020) Relief Commissioner Office, Government of Uttar Pradesh**

District-wise analysis of the above data shows that the Mathura District is the most hailstorm-affected District, followed by Agra, Ballia, Banda, Barabanki Chitrakoot, Jalaun, Kanpur Dehat, Lalitpur, Mirzapur, Shahjahanpur. With an increase in the number of affected Districts and the changing climatic conditions, there is a high possibility of more Districts getting affected due to hailstorms in the future.

- Hailstorm Hazard, Risk, Vulnerability and Capacity Analysis

Hazard/Location	Most Districts of Uttar Pradesh
Vulnerabilities	Due to high exposure and constrained access to resources, homeless, people living in kutchha houses, low-income population, farmers and farm labour are vulnerable.
Risks	• Damage to critical facilities such as schools, PHCs, CHCs, AWCs. • Warehouses. • Disruption of services such as electricity supply and water supply. • Glass structures. • Pre-fabricated structures. • Fire as the secondary effect of lightning. • Vehicles parked outside. • Agriculture including horticulture, poultry, dairy farms. • Fish ponds.

Gaps in Existing Capacities	• Lack of proper systems for data collection, maintenance, and monitoring of Hailstorm events. • Lack of systematic means for the dissemination of early warnings received from Indian Meteorological Department (IDM) to the public at large. • Lack of awareness among farmers on how to save crops from a Hailstorm. • Lack of awareness among farmers about crop and livestock insurance schemes and programmes. • Lack of training and community awareness campaigns for 'at-risk' communities. • Lack of research studies related to hailstorm models and techniques to improve storm forecasting among communities.

5.3.7 Industrial and Chemical Disasters

Being the second-largest economy in India, Uttar Pradesh has a diverse industrial profile, ranging from mineral processing plants in Vindhyan region, bauxite-based aluminum plants in Bundelkhand region, cottage industries in Varanasi and Lucknow, leather industries in Agra and Kanpur, as well as the largest gold market of Asia in Meerut. Apart from this, the Uttar Pradesh-Delhi NCR and Lucknow-Kanpur corridors have thriving electronics industries. The state also holds distinction in being the largest exporter of sports items and musical instruments.

A total of 2,456 hazardous factories are in 38 Districts of the State. As per the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules (1996), Districts Crisis Groups in all the 38 Districts have been constituted under the chairmanship of the District Magistrate of respective Districts. Of these, 118 are identified as Major Accident Hazard (MAH) units.[32]

[32] List of 118 MAH units in Uttar Pradesh

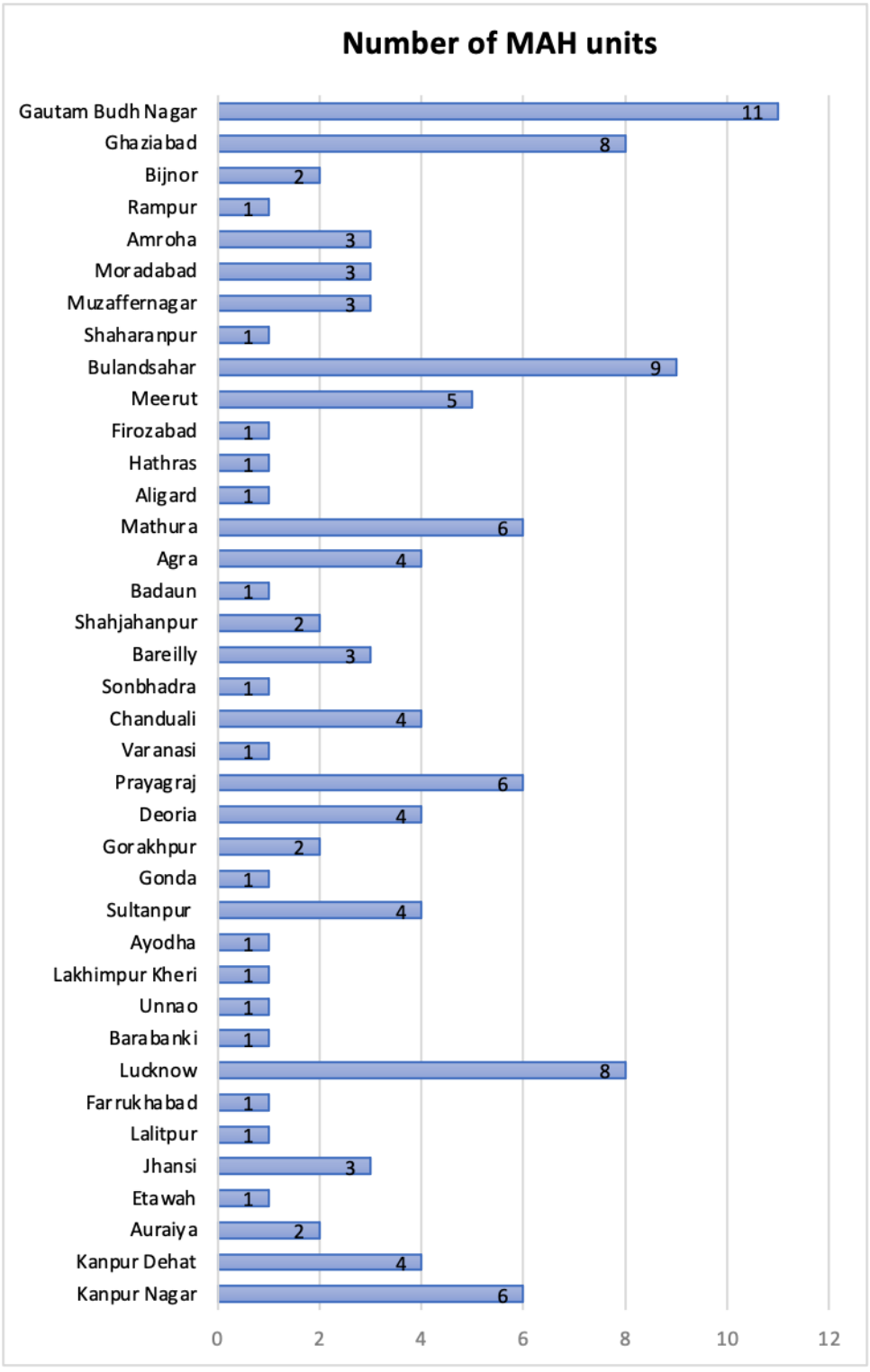


Figure 12: **Number of MAH Units and Manufacturing in Uttar Pradesh**

Source: **http://www.hrdp-idrm.in/live/hrdpmp/hrdpmaster/idrm/content/e5783/e26901/e26917/**

Further, the State also has the largest nuclear power plant, the Narora Atomic Power Station, which can be hazardous if there is a release of radiation in the periphery of the power plant.

- Industrial and Chemical Disasters Hazard, Risk, Vulnerability and Capacity Analysis

Hazard/Location	Kanpur Nagar, Kanpur Dehat, Auraiya, Etawah, Jhansi, Lalitpur, Farrukhabad, Lucknow, Barabanki, Unnao, Lakhimpur Kheri, Ayodhya, Sultanpur, Gonda, Gorakhpur, Deoria, Prayagraj, Varanasi, Chandauli, Sonbhadra, Bareilly, Shahjahanpur, Badaun, Agra, Mathura, Aligarh, Hathras, Firozabad, Meerut, Bulandshahr, Saharanpur, Muzaffarnagar, Moradabad, Amroha, Rampur, Bijnor, Ghaziabad, Gautam Buddh Nagar
Vulnerabilities	• People residing near MAH units. • Those working in MAH units. • Unskilled labour on daily wages in the MAH units.
Risks	• Hazardous Materials (HAZMAT) stored in the MAH units. • Long-term health effects. • Flora and fauna may get affected (contamination of water bodies and fishing ponds). • Loss of life and property in case of a blast. • Fire can be a secondary hazard leading to loss of life and property. • Loss of livelihood for labour in case the plant(s) is closed.
Gaps in Existing Capacities	• Inadequate compliance with mandatory safety certification of industries. • Inadequate regulatory mechanism on land-use plan • Low level of training activities (exercises, simulations) on-site and off-site. • Low level of planning and execution of emergency drills by all the industries. • Lack of awareness on how to safeguard people in case of any gas release. • Inadequate number of community alert systems across various units. • Inadequate number of emergency shelters as compared to the number of people. • Inadequate provision of individual protection equipment to those working inside the plants. • Lack of on-site and off-site safety standards in MAH units. • Lack of proper understanding of HAZCHEM. • Lack of simulation systems for worst-case scenarios in all chemical and industrial units related to the release of various chemicals. • Lack of GIS-based emergency planning and response system for chemical accidents in major industrial clusters. • Lack of mechanisms for warning dissemination to public on do's and don'ts during chemical disasters. • Lack of coordination mechanisms with the line departments on the

	dissemination of warnings to all, down to the last mile. • Lack of private participation/NGOs in enhancing off-site disaster response and risk management • Need for strict enforcements such as audits and inspections.

5.3.8 Stampede

Stampedes have been identified as a major hazard that could occur during mass gathering events.

- History of Stampedes in the State

Table1.12: History of Stampedes in the State (1954–2004)[33]

Year	Location Area Affected	Damage
1954	Kumbh Mela, Allahabad	Reported number of deaths: 800
2004	Chandrashekhar Park, Allahabad	Reported number of deaths: 21 Number of people injured: 21
2007	Mughal Sarai Railway Station	Reported number of deaths: 16 Number injured: 40
2010	Ram Janki Temple of the Kripalu Maharaj Ashram in Kunda, Pratapgarh	Reported number of deaths: 63 Number injured: 100
2011	Radha Rani Temple of Barsana, Mathura, Uttar Pradesh	Reported number of deaths: 02 Number injured: 12
2012	Hanuman Temple in Panki, Kanpur, Uttar Pradesh	Reported number of deaths: 01 Number injured: 12
2013	Kumbh Mela, Allahabad	Reported number of deaths: 36
2014	Chitrakoot	Reported number of deaths: 10
2016	Varanasi	Reported number of deaths: 24 Number injured: 50

- Vulnerabilities in Stampede

Sectors	Vulnerabilities
Social	• Vulnerable groups and individuals viz. women, elderly, children, differently- abled, etc.
Physical	• Congested routes in social/religious gathering places, temples. • Lack of alternative routes in the areas. • Dilapidated religious structures. • Criss-cross pathways. • Crowded railway stations and religious places. • Mass gatherings such as rallies, celebrations, festivals. • Market places/weekend heavy rush markets.

[33] Source: UPSDMP 2018-19

Existing Capacity Gaps	• Lack of systematic risk assessment with understanding of crowd size, flow rate and flow capacity in crowded places. • Inefficient deployment of staff and resources. • Lack of proper planning and management. • Lack of adequate training and mock drills. • Lack of proper crowd management plan, including announcement system. • Lack of inter-agency coordination leading to unclear chain of command and supervision. • Improper communication plan for crowd size, flow capacity understanding, problems arising at the tail end of the crowd. • Lack of proper communication plan and inefficient use of available resources, such as aerial platforms. • No integration of community resources, NGOs and professionals in response effort.

5.3.9 Epidemics

Uttar Pradesh is highly vulnerable to diseases such as Japanese Encephalitis (JE), Acute Encephalitis Syndrome (AES), dengue, swine flu (H1N1), malaria, measles, etc. Since 2020, the State has been experiencing waves of the COVID-19 pandemic. From March 2020 till January 2022, a total of 19.7 lakhs COVID cases have been reported. About 23,088 deaths were reported during this period.[34]

- History of Epidemics in Uttar Pradesh (2004 to 2017)

Table 1.13: History of Epidemics in the State (2004–2017)[35]

Year	Disaster	No. of Districts Affected	Damage
2004	Dengue	Across Uttar Pradesh	Reported number of cases: 7
	Malaria	Various Districts of Uttar Pradesh	85,868 cases
	JE	21 Districts in Eastern Uttar Pradesh	6,611 cases, 1821 deaths
	Dengue	Across Uttar Pradesh	Reported number of

[34] Source: https://www.mygov.in/corona-data/covid19-statewise-status/
[35] Source: National Centre for Disease Control, Disease Surveillance Program

Year	Disaster	No. of Districts Affected	Damage
			deaths: 4 Number of cases: 121
	Malaria	Various Districts of Uttar Pradesh	1,05,302 cases
2006	JE	22 Districts in Eastern Uttar Pradesh	Reported number of deaths: 476 Number of cases: 2,075
	Dengue	Across Uttar Pradesh	Reported number of deaths: 14 Number of cases: 617
	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of deaths: 67
	Malaria	Various Districts of Uttar Pradesh	91,566 cases
	Gastro-enteritis	Various Districts of Uttar Pradesh	612 cases, 6 deaths
2007	JE	17 Districts in Eastern Uttar Pradesh	Reported number of deaths: 577 Number of cases: 2,675
	Dengue	Across Uttar Pradesh	Reported number of deaths: 2 Number of cases: 130
	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of deaths: 197
	Malaria	Various Districts of Uttar Pradesh	81,580 cases
	Gastro-enteritis	Various Districts of Uttar Pradesh	1,264 cases, 15 deaths
2008	Dengue	Across Uttar Pradesh	Reported number of deaths: 2 Number of cases: 51

Year	Disaster	No. of Districts Affected	Damage
	Acute Respiratory Infection	Across Uttar Pradesh	Reported number of deaths: 137
	JE	16 Districts in Eastern Uttar Pradesh	Reported number of deaths: 483 Number of cases: 2,730
	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of deaths: 326
2009	Acute Respiratory Infection	Across Uttar Pradesh	Reported number of deaths: 180
	JE	13 Districts in Eastern Uttar Pradesh	Reported number of deaths: 50 Number of cases: 362
	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of deaths: 159
	Malaria	21 Districts in Eastern Uttar Pradesh and Bundelkhand	6,446 cases
2010	Dengue	Across Uttar Pradesh	Reported number of deaths: 8 Number of cases: 960
	Acute Respiratory Infection	Across Uttar Pradesh	Reported number of deaths: 166
	AES	Across Uttar Pradesh	Reported number of deaths: 494 Number of cases: 3,540
	JE	16 Districts in Eastern Uttar Pradesh	Reported number of deaths: 59 Number of cases: 325
	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of

Year	Disaster	No. of Districts Affected	Damage
			deaths: 164
2011	JE	16 Districts in Eastern Uttar Pradesh	Reported number of deaths: 27 Number of cases: 224
	Dengue	Across Uttar Pradesh	Reported number of deaths: 5 Number of cases: 155
	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of deaths: 26
	Acute Respiratory Infection	Across Uttar Pradesh	Reported number of deaths: 196
	AES	Across Uttar Pradesh	Reported number of deaths: 579 Number of cases: 3,492
2012	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of deaths: 254
	JE	16 Districts in Eastern Uttar Pradesh	Reported number of deaths: 23 Number of cases: 139
	Dengue	Across Uttar Pradesh	Reported number of deaths: 4 Number of cases: 342
	Acute Respiratory Infection	Across Uttar Pradesh	Reported number of deaths: 226
	AES	Across Uttar Pradesh	Reported number of deaths: 557 Number of cases: 3,484

Year	Disaster	No. of Districts Affected	Damage
2013	Diarrhoeal Diseases	Across Uttar Pradesh	Reported number of deaths: 272
	JE	21 Districts in Eastern Uttar Pradesh	Reported number of deaths: 81 Number of cases: 472
	Dengue	Across Uttar Pradesh	Reported number of deaths: 5 Number of cases: 1,614
	Acute Respiratory Infection	Across Uttar Pradesh	Reported number of deaths: 377
	AES	Across Uttar Pradesh	Reported number of deaths: 1,236 Number of cases: 6,425
	H1N1	Western Uttar Pradesh	Reported number of deaths: 8 Number of cases: 98
2015	JE	16 Districts in Eastern Uttar Pradesh	Reported number of deaths: 42 Number of cases: 351
	Dengue	Across Uttar Pradesh	Reported number of deaths: 9 Number of cases: 2,892
	AES	Across Uttar Pradesh	Reported number of deaths: 479 Number of cases: 2,894
	Influenza (H1N1)	Various Districts of Uttar Pradesh	Reported number of

Year	Disaster	No. of Districts Affected	Damage
			deaths: 50 Number of cases: 1,578
2016	JE	16 Districts in Eastern Uttar Pradesh	Reported number of deaths: 73 Number of cases: 410
	Dengue	Across Uttar Pradesh	Reported number of deaths: 42 Number of cases: 15,033
	AES	Across Uttar Pradesh	Reported number of deaths: 621 Number of cases: 3,919
	Stampede	Varanasi	Reported number of deaths: 24 Number injured: 50
	H1N1	Various Districts of Uttar Pradesh	Reported number of deaths: 16 Number of cases: 122
2017	Dengue	Across Uttar Pradesh	Reported number of deaths: 28 Number of cases: 3,032
	AES	Across Uttar Pradesh	Reported number of deaths: 590 Number of cases: 4,693
	JE	16 Districts in Eastern Uttar Pradesh	Reported number of deaths: 80

Year	Disaster	No. of Districts Affected	Damage
			Number of cases: 675
	H1N1	Various Districts of Uttar Pradesh	Reported number of deaths: 132 Number of cases: 3,858
2020 – till date[36]	COVID-19	All Districts of Uttar Pradesh	Reported number of deaths: 23,576 Number of cases: 21,08,686

[36] As on 09 August 2022 www.mygov.in/covid-19/

- Epidemics Hazard, Risk, Vulnerability and Capacity Analysis

Hazard/Location	• Districts of Eastern Uttar Pradesh are highly affected by JE, AES, malaria and other vector-borne and water-borne diseases. • 16 Districts of Eastern Uttar Pradesh (Gorakhpur, Kushinagar, Maharajganj, Siddharthnagar, Sant Kabir Nagar, Deoria, Azamgarh, Ghazipur, Bahraich, Ballia, Lakhimpur Kheri, Pilibhit, Balrampur, Gonda, Ayodhya, Mau) are most affected by JE/AES. • Dengue, malaria and chikungunya frequently affect NCR Districts and other Districts of Western Uttar Pradesh. • COVID-19 affects both the urban and rural population of Uttar Pradesh. The entire State is susceptible to COVID-19.
Vulnerabilities	• Many communicable diseases occurring in Uttar Pradesh are capable of causing large-scale outbreaks and fall under the epidemic category. • High population density across the State. • Economically weaker section of population living in unhygienic conditions.
Risks	**Health:** • Probability of increase in neonatal and child morbidity and mortality. • Probability of poor immunity levels among children, women and the elderly, especially of the most vulnerable communities. **Nutrition:** • Probability of increase in the number of malnourished and severely malnourished children. • Probability of increase in anaemia among adolescent girls and women. **Education:** • Loss of school days due to closure of schools and absenteeism in case illness. • Possibility of children losing interest in studies due to periodic closure of schools during a pandemic. • Possibility of low attendance even when schools reopen during a pandemic. **WASH:** • Possibility of lack of availability of safe drinking water. • Possibility of poor sanitation conditions in the communities.
Gaps in Existing Capacities	• Inadequate level of awareness among communities on prevention and care in the context of various diseases. • Inadequate level of awareness among communities on social protection schemes including health insurance. • Increased burden on the health system resulting in disruption of some routine health services. • Inadequate level of awareness among community members on preventive practices related to health and hygiene. • Possibility of lack of skilled human resources during an epidemic.

- COVID-19

For the first time in recent years, a pandemic has been considered as a disaster. The DM Act 2005 and Epidemic Disease Act 1897 were invoked.

As part of the COVID-19 response, the Relief Commissioner's Office (RCO) coordinated with various Government Departments, NGOs and the private sector to promptly manage the COVID-19 crisis. The RCO focused on managing the large influx of returning migrant workers. Shelters and transit camps manned by Home Guards in all 75 Districts ensured safe points of arrival and health check-ups. Many 15-day dry ration kits were given to returning migrants. Community kitchens across the State worked tirelessly to provide food packets and dry ration kits to the homeless and to those suffering a loss of livelihood.

The Government also provided direct benefit transfer of INR 1,000 each into the bank accounts of over 1.2 million daily wage earners and 1 million returning migrants. Incoming trains to major transit points and bus transfers to the Districts ensured that the migrants reached home safely. About INR 50,000/- was given to each child who had lost both their parents during COVID-19. The UPSDMA issued critical advisories and created awareness among communities on COVID-appropriate behaviour.

There was no prior framework for managing a pandemic of such a scale. The Government of Uttar Pradesh adopted innovative measures for responding effectively to the pandemic.

As a consequence of Covid-19, the various departments have institutionalised mechanism for such eventualities in future such as, migration management, availability of oxygen cylinders/drugs/medicines etc. Hospitals need to gear up for surge in their capabilities, more essentially the isolation/quarantine wards. The plans for such eventuality require constant upgradation by the respective departments. SEOC/DEOCs will have to ensure adequate functional flexibility to adapt the concept of Integrated Covid Command Centre.

5.3.10 Snakebite

The Government of Uttar Pradesh declared snakebite as a State disaster in 2018. Incidents of snakebite occur throughout the year, however, during monsoons, a sharp rise in cases has been observed. According to the report from UPSDMA, a total of 1,037 deaths due to snakebite occurred between 2018 and 2021. The details are as follows.

S. No.	Year	No. of Deaths
1	2018–2019	21
2	2019–2020	484
3	2020–2021	532
4	2021-2022	981
	Total Deaths	2,018

Source: **Uttar Pradesh State Disaster Management Authority, 2018–2021**

- District-wise Deaths due to Snakebite

Table 1.15: Year-wise Deaths due to Snakebite

S. No.	Name of District	Number of Deaths

		2018–2019	2019–2020	2020–2021	2021-2022
1	Agra	01			
2	Firozabad		09	06	15
3	Mainpuri			06	16
4	Mathura				01
5	Aligarh		04	01	05
6	Etah		01		04
7	Hathras		02		
8	Kasganj				04
9	Prayagraj		05	01	13
10	**Fatehpur**		**48**	**50**	**62**
11	Kaushambi		13	10	08
12	Pratapgarh		12	09	18
13	Azamgarh		02	20	32
14	Ballia	01	07	03	20
15	Mau		01	02	03
16	Bareilly		05		02
17	Badaun		02	05	03
18	**Pilibhit**		**25**	**14**	**16**
19	Shahjahanpur			04	17
20	Basti		01		21
21	Sant Kabir Nagar		01		03
22	Siddharthnagar			02	10
23	Chitrakoot			04	12
24	Banda		02	15	17
25	Hamirpur	01	06	03	18
26	**Mahoba**	**01**	**12**	**15**	**19**
27	Bahraich		05	08	
28	Balrampur	01		01	06
29	Gonda	05	04	11	28
30	Shravasti		01	02	02
31	Ayodhya	05	08	02	36
32	**Barabanki**		**18**	**34**	**59**
33	**Ambedkar Nagar**		**29**	**10**	**03**
34	Sultanpur		01	04	05
35	Amethi		02	20	08
36	Gorakhpur		14	05	09
37	Deoria				04
38	Kushinagar		11	07	06
39	Mahrajganj			01	
40	Jhansi		01		06
41	Jalaun		02		02
42	Lalitpur		10	04	41
43	Kanpur Nagar		06		
44	Etawah		03	03	14
45	Farrukhabad		11	03	11
46	Kanpur Dehat				33
47	Auraiya		01		04
48	Kannauj		08	04	05

S. No.	Name of District	Number of Deaths			
		2018–2019	2019–2020	2020–2021	2021-2022
49	Lucknow				06
50	**Hardoi**		**53**	**25**	**13**
51	**Lakhimpur Kheri**		**14**	**23**	**13**
52	**Raebareli**		**11**	**17**	**23**
53	Sitapur	05	06	10	51
54	**Unnao**		**31**	**48**	**38**
55	Meerut		01		
56	Bulandshahr		02		01
57	Gautam Buddh Nagar				
58	Ghaziabad				
59	Hapur		02		
60	Baghpat				
61	**Mirzapur**		**07**	**29**	**45**
62	Sant Ravidas Nagar		01		
63	**Sonbhadra**		**29**	**47**	**100**
64	Moradabad		04		04
65	Amroha		01		
66	Bijnor			03	03
67	Sambhal		01		
68	Rampur				
69	Saharanpur		02	02	02
70	Muzaffarnagar				03
71	Shamli				
72	Varanasi		01		01
73	**Ghazipur**	**01**	**14**	**14**	**49**
74	**Jaunpur**		**09**	**19**	**08**
75	Chandauli		02	06	
	Total Deaths	21	484	532	981

Source: **Uttar Pradesh State Disaster Management Authority, 2018–2021**

From *Table 1.15*, the hotspots for snakebite can be defined as:

1. Deaths between 51 and 100;
2. Deaths between 21 and 50; and
3. Deaths between 10 and 20.

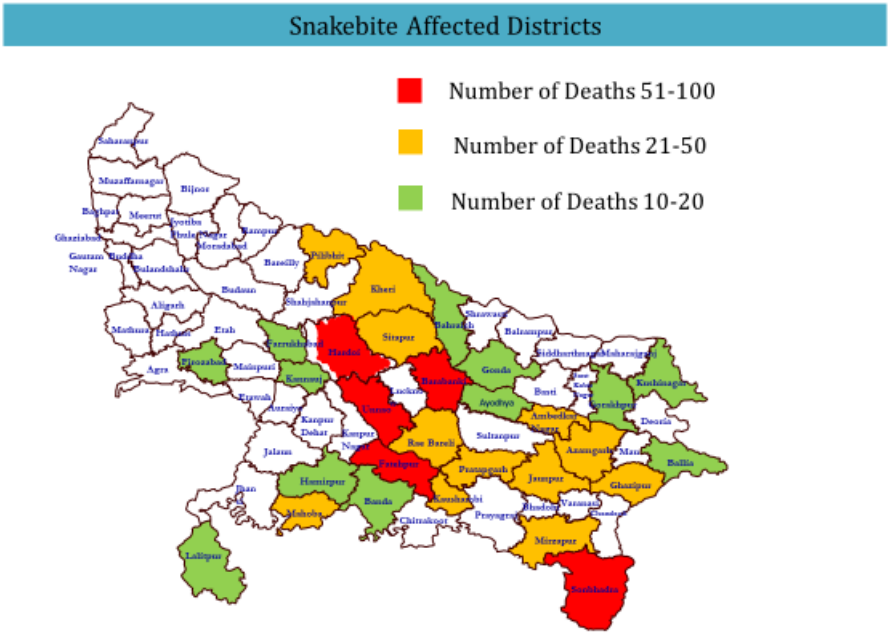


Figure 13: Snakebite-affected Districts during the period 2018–2021

The Districts with deaths in the topmost category, i.e., 51–100, are Fatehpur (98), Unnao (79), Hardoi (78), Sonbhadra (76), Barabanki (52).

- Snakebite Hazard, Vulnerability and Capacity Assessment

Hazard/Location	• **Fatehpur, Unnao, Hardoi, Sonbhadra and Barabanki are hotspots**
Vulnerabilities	• Farmland, poultry farms, fishponds, animal sheds, etc. • Thatched houses, mud houses, farmhouses. • Abandoned buildings/spaces. • Forest areas.
Gaps in Existing Capacities	• Lack of adequate resources for the worst-affected regions to improve community education, access to timely health care, training of medical staff, and provision of appropriate anti-venom. • Inadequate availability of skilled human resources at the first point of care such as PHCs or CHCs. Snakebite is a medical emergency, requiring prompt and skilled clinical intervention to save the life of the victims. • Lack of adequate supply of anti-venom at PHCs/CHCs in rural areas. • Unavailability of adequate number of ambulances in remote

	rural areas for quick movement of victims to health centres. • Lack of awareness among community members on seeking urgent hospital care. • Lack of trainings on first aid and proper treatment for snakebite at the community level. • People resorting to local beliefs and superstitions for treating snakebite cases.

5.4 Social Vulnerability

The State of Uttar Pradesh has people from various socio-economic strata, cultural and geographical areas. Social vulnerability creates multiple stressors and shocks, including abuse and social exclusion in various disasters. Social vulnerability refers to the inability of people, organizations, and societies to withstand adverse impacts from multiple stressors to which they are exposed. Variables such as household density, population density, literacy rate, homeless population, elderly population, SC/ST population, workforce participation rate (%), and the Public Health Infrastructure Index, which defines the influences of vulnerability of the various variable are given in *Table 1.16.*

Table 1.16: Social Vulnerability in the State

Index	Variables	Estimates	Influence	Sources
PD	Population Density (person/km^2)	829	The State of Uttar Pradesh ranks 4th in terms of highest population density among all the States. The higher the density of the State, higher will be the vulnerability due to any disasters. The data on flood in 2019 shows 7,45,926 people and 1,296 villages were affected, which resulted in a haphazard lifestyle recovery of the affected families.	Census of India 2011
LITR	Literacy Rate	69.72	The State of Uttar Pradesh has a low literacy rate and falls in the bottom five among States with low literacy. The literacy gap creates a low level of involvement/engagement in training and capacity building programmes, particularly for those involved in agriculture. This makes farmers more inefficient towards the adaptability of crops to droughts or seasonal pest attack, which makes them more vulnerable.	Census of India 2011
HLP	Houseless Population (person per thousand)	329125	The State accounts 37.17 per cent of the total houseless population of India. These families do not have roof above their heads, disasters like flood and drought create vulnerabilities for the household population as the families do not have proper documentation available for money transfer from various schemes and grants in case of any disaster.	Census of India 2011
EP	Elderly Population (%)	7.7%	The State accounts 7.7 per cent of the total elderly to the total State population, of which 80 per cent of the elderly persons stay back in the rural areas and support their families in agricultural practices. Flood and droughts exacerbate the condition of the elderly livelihood, etc.	MOSPI

Index	Variables	Estimates	Influence	Sources
SC/ST	SC and ST Population (%)	21.10% and 0.57%	A large section of the population of Uttar Pradesh accounts for SC population, most of them living below the poverty line. When a disaster strikes, the resilience to 'Build Back Better' would be very low in the SC population. Hence, a large chunk of population is directly or indirectly vulnerable to disasters.	Census of India 2011

5.5 Vulnerability Analysis Using SDGs Indicators from 2020 NITI India Index

The NITI Aayog SDG India Index helps in understanding vulnerabilities in a comprehensive manner. State-level progress and gaps across various sectors are identified to reduce the vulnerabilities. Aligned to the NITI India Index, the vulnerability analysis for Uttar Pradesh is given below.

Vulnerability Analysis for the State of Uttar Pradesh

S. No.	NITI India Index	National Value	State Value	Analysis
1.1	Proportion of population living below the national poverty line	21.92	29.43	Poverty is a major driver of people's vulnerability towards disasters. The State's poverty index value is higher than the national value, which indicates that a large chunk of the State's population lives below the poverty line and is more likely to get affected by a disaster. Since the State is exposed to disasters throughout the year, a section of the population is highly vulnerable which in turn will increase poverty. Inclusion of such vulnerable sections into financial support and social protection schemes will help in reducing their vulnerability.
1.2	Proportion of the population (out of total eligible population) receiving social protection benefits under Pradhan Mantri Matru Vandana Yojana (PMMVY)	91.38	93.48	Under-nourishment and low birth weight significantly affect the health of the child. Economic and social distress created by disasters aggravates these conditions further.

				Although the State value is higher than the national value, 100 per cent coverage of the marginalized population should be the target to be achieved as soon as possible; special provision should be made for the population living in flood- and drought-prone areas of the State.
1.3	Proportion of beneficiaries covered under the National Food Security Act (NFS) 2013	99.51	99.23	Damage to roads and bridges, failure of communication and disruption of essential services are common during and after a disaster. Since the coverage in the State is not 100 per cent in normal times, after a disaster strikes more people will be left out of the food security ambit due to the lack of access to fair price shops, non-supply of ration, malpractices of shopkeepers, etc. Apart from increasing the coverage of the vulnerable and marginal populations under the NFS, a well-developed disruption-safe transportation and distribution system of food/ration which involves the vulnerable community will help in reducing the vulnerability.
1.4	Percentage of children aged 0–4 years who are stunted	34.7	38.8	Pregnant and breastfeeding women, young girls and children are considered to be more vulnerable during disaster as their bodies need nutrients and are susceptible to harmful consequences of deficiencies such as anaemia, stillbirth, stunting, underweight birth, weak immunity, impairment, among other issues. Poshan Abhiyaan, Anemia Mukt
1.5	Percentage of pregnant women age 15–49 years who are anaemic	50.3	51	

1.6	Percentage of children aged under 0–4 years who are underweight	33.4	36.8	Bharat, and PMMVY are schemes launched by the Central Government to address the health issue of women and children. However, the values at the national and State levels show that a large chunk of the targeted population is still not covered under these programmes. These numbers are of great concern for a State like Uttar Pradesh where the Neonatal Mortality Rate and Maternal Mortality Rate stand at 35 and 285 per lakh live births respectively.
1.7	Percentage of adolescents aged 10–19 years having anaemia (any)	28.4	31.6	
1.8	Percentage of fully immunized children in the age group 0–5 years	91	95	Immunization helps in preventing morbidity and mortality due to disease among children. Although the State value is better than the national value, it still lags in achieving the target of full immunization. Studies have shown that coverage of vaccination varies significantly across geographical, regional, rural-urban, poor-rich, and gender-related factors. Due to gender inequality and gender discrimination, girls receive fewer immunizations than boys, and lower vaccination coverage was also seen among higher birth order infants.[37] So, for a State such as Uttar Pradesh, which has 40 Districts that are highly prone to floods, low immunization rate among children in these areas will increase their vulnerability towards water-borne diseases and infections.

[37] http://www.ijmsph.com/fulltext/67-1524649385.pdf?1629043958

1.9	Percentage of families covered under Pradhan Mantri Jan Arogya Yojana (PMJAY)	58.46	38.97	In a developing country such as India, millions are trapped into poverty due to high out-of-pocket expenditure. Low coverage of the low-income population under PMJAY makes them more vulnerable to disasters.

The indicators (described in the table below) act as tools to understand which population groups and which locations in the State are more likely to face the negative impacts of a disaster and factors causing it. By addressing these social vulnerability indicators, the risk of damage to the community can be reduced and resilience can be improved. The actions linked to the above-mentioned indicators are outlined under prevention, mitigation, preparedness and response measures in Volume II and III of the SDMP.

- NITI Aayog's Indicators for Analysing Structural Vulnerability

S. No.	NITI India Index	National Value	State Value	Analysis
1.1	Percentage of population getting safe and adequate drinking water within premises through Piped Water Supply (PWS)	51.36	20.35	PWS helps in providing sustainable and adequate water supply which is crucial during disasters. Low State and National values of PWS show that a large part of the population may face safe drinking water crisis during a disaster.
1.2	Percentage of urban households having drainage facility	87.6	92.1	Improper and unplanned drainage makes the city population vulnerable to public health issues such as malaria, dengue and epidemics during normal times. During the rainy season, it increases the overall risk of the population to these diseases.
1.3	Percentage of households living in kutcha houses (rural + urban)	4.2	6.4	Flood and excess rainfall are the major disasters that occur every year in the State, and many people lose their houses during those disasters. With a high percentage of people living in *kutcha* houses in the State, the chances of them falling into poverty is very high. However, increasing the outreach of Pradhan Mantri Awas Yojana (PMAY), Pradhan Mantri Awas Yojana (Gramin), Rajeev Awas Yojana, and State-run housing schemes with disaster-resilient designs will not only provide sustainable housing, but

S. No.	NITI India Index	National Value	State Value	Analysis
				also help in reducing vulnerability.

The actions linked to the above-mentioned indicators are outlined under prevention, mitigation, preparedness and response measures in Parts II and III of the SDMP.

5.6 Environment Vulnerability

Environmental hazard has the potential to threaten the surrounding natural environment and adversely affect people's health. Due to rapid urbanization, air, water and soil are badly affected. In urban locations due to rapid growth of the population and urbanization, environmental degradation is rapid. Air pollution is a growing concern in the State of Uttar Pradesh. In November 2017, air quality in many cities of the State was reported to be worse than that of Delhi. The cities Kanpur, Varanasi, Ghaziabad and Muzaffarnagar reported a very poor Air Quality Index (AQI). Moradabad reported an AQI of 500, which is the highest level on the scale. Experts have reported finding traces of carbonic elements in the air in Moradabad. This was attributed to burning of electronic waste and operation of brass factories in the city.

Table 1.17: Environmental Vulnerability in the State

Index	Variables	Concentration/ Estimates	Influence	Source
NO_2 PM2.5	NO_2	30 in µg/m^3	Increases the risk of respiratory problems, coughing, and serious health problems	Central Pollution Control Board
PM10	PM2.5 PM10	88.22 in µg/m^3 194.75 in µg/m^3	PM2.5, affects visibility by altering the way light is absorbed and scattered in the atmosphere, leading to increased accidents	
SO2	SO2	13 in µg/m^3	High concentrations of SO_2 leads to inflammation in the eyes, nose and lungs. The higher concentration may leads to acidic rainfall and can harm trees and plant by damaging foliage and decreasing growth	

As per the National Forest Policy, the national target for forest cover is 33 per cent. The Government of Uttar Pradesh is committed to increasing its forest cover to 11 per cent of the State's total area by 2030. In recent years, massive plantation programmes have been taken up in the State to increase the forest and tree cover[38] with the aim of combating climate change.

[38] https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-uttar-pradesh.pdf

5.7 Capacity Analysis

Capacity includes physical, institutional, social, or economic means as well as skilled personal or collective attributes such as leadership and management. The State of Uttar Pradesh has a well-established institutional network to support DM activities.

5.7.1 Incident Management: State Emergency Operation Centre (SEOC)

The State Emergency Operation Centre aims to support individuals in crises and link them with the concerned emergency support department and Districts in case of a disaster. The SEOC is supported by the STD-enabled toll-free number, 1070, where anyone can call in during a crisis and request assistance on relief/relief queries from the SEOC.

Figure 24: State Emergency Operations Centre in Uttar Pradesh

5.7.2 Disaster Response: 112 UP, 102 UP Fire, UP SDRF, UP PAC

The Government of Uttar Pradesh, in accordance with the National Emergency Response System (NERS), has integrated 112 as its emergency response number with additional services such as fire, ambulance and women helpline.

The state-of-the-art 112 helpline is integrated with the location-based tracking system, emergency location service provided by Google Android phones, Radio Over Internet Protocol (ROIP), Computer-Aided Design (CAD) System, and Primary Rate Interface (PRI) with BSNL for multiple calls, which are received on Avaya Systems for monitoring of incidents.

- The disaster distress call is transferred to the nearest police response vehicle of 112 Uttar Pradesh to support the individual stuck in a disaster; at the same time, the response vehicles – 108 ambulances and 102 fire services – are called for support to the disaster site.
- The number of SDRF has been raised from the State Reserve Police Force to support disaster response in the State of Uttar Pradesh.

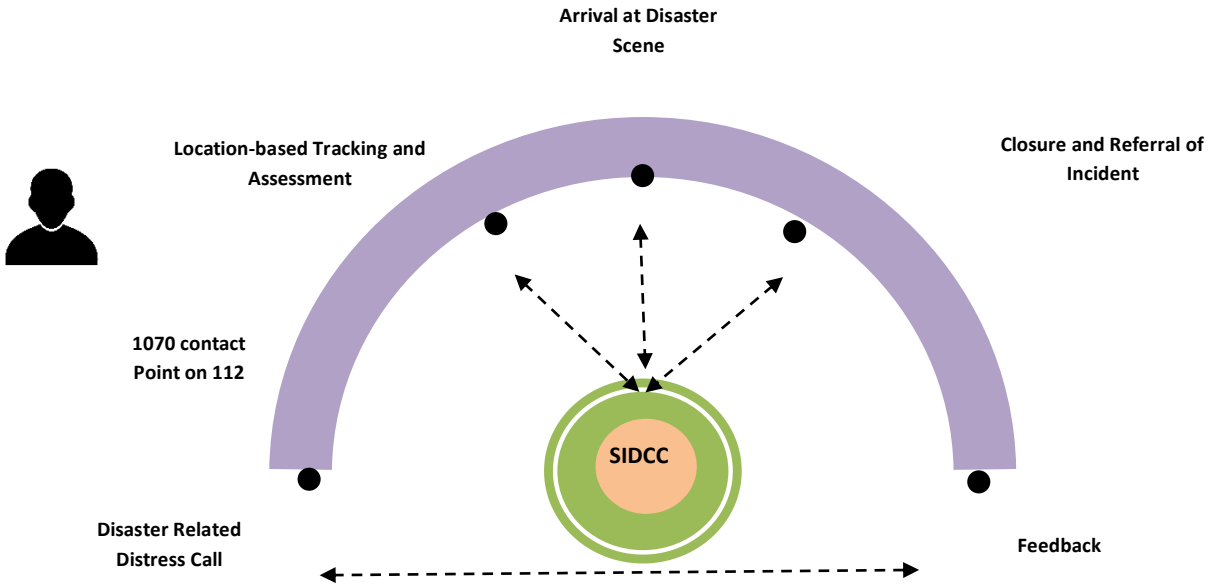


Figure 15: Functionality of State Integrate Disaster Control Centre in Uttar Pradesh

5.7.3 Information Management and Data Analysis – Remote Sensing Application Centres

The RCO and UPSDMA are supported by the RSAC in the State to provide information and data analysis of hazard and vulnerability assessment of various disasters, river course changes and migration for the Geographic Information System (GIS)-based decision support system. The State Government has a robust system for reporting disaster-related events.

5.7.4 Early Warning and Dissemination – FMISC, Indian Meteorological Department (IMD) Lucknow, CWC

Early warning of floods is provided by the Indian Meteorological Department (IMD) rainfall advisories followed by real time actual rainfall at the various monitoring sites. The reservoirs and river danger levels are monitored by the Central Water Commission (CWC). The Flood Management Information System Centre (FMISC) warns the Districts on the flow and discharge levels from various reservoirs in case of floods.

Early warning of lightning is provided by the Damini app integrated with the National Informatics Centre's (NIC's) mass messaging system, which forecasts the probable lightning-specific flash points in an area; a mass message is shared on the mobile numbers of the population as an advisory on lightning.

5.7.5 Equipment Inventory: Fire, DDMA, Tehsil,

The details of the all the resources available in the fire station, DDMA, and tehsil-level inventories have been updated on the India Disaster Resources Network (IDRN) to strengthen the mutual sharing of resources during a disaster among the Districts.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