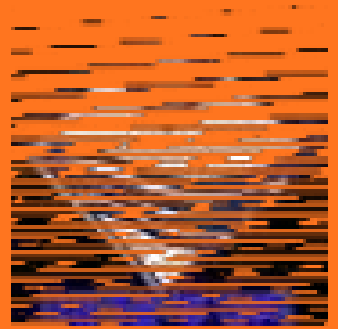




UTTARAKHAND STATE DISASTER MANAGEMENT AUTHORITY (USDMA)



Uttarakhand State Disaster Management Plan (SDMP) 2026-27



STATE DISASTER MANAGEMENT PLAN



UTTARAKHAND STATE DISASTER MANAGEMENT AUTHORITY

**Government of Uttarakhand
USDMA Bhawan, 36 IT Park, Sahastradhara Road
Dehradun 248 013**

Prepared for a Safer Uttarakhand

Planning Today, Securing Tomorrow

State Disaster Management Plan – 2020
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MESSAGE

It gives me immense pride and satisfaction to see the formal publication of the Uttarakhand State Disaster Management Plan (SDMP). This vital document is not only a strategic roadmap for our state's disaster preparedness and response but also a reflection of our unwavering commitment to the safety, resilience, and well-being of the people of Uttarakhand.

Over the years, we have faced several challenging disasters that tested our administrative capacity and community resilience. In each instance, we have drawn strength from our unity and resolve. Yet, we must also learn, adapt, and innovate to stay ahead of future challenges.

The SDMP 2026-27 is a step in that direction. This document is not just a plan, it is a vision. More importantly, it is tailored to the unique risk profile of Uttarakhand, and integrates risk reduction with sustainable development, environmental preservation, and climate resilience.

This Plan recognizes that disaster risk reduction cannot be an isolated function; it must be deeply embedded in every department, every developmental plan, and every budget. The mainstreaming of DRR into governance-across health, infrastructure, education, agriculture, environment, tourism, and urban planning-is central to this vision.

I am especially pleased to see the strong focus on community-based disaster risk management, inclusion of vulnerable sections, and the emphasis on strengthening early warning systems, emergency communication, and post-disaster recovery under the Build Back Better principle. Our pilgrims, tourists, and residents alike deserve a safety net that is proactive, not reactive.

Disaster management is a collective responsibility. This Plan lays out clear institutional mechanisms—from the State Disaster Management Authority to the District and local levels. It establishes a transparent system of accountability and coordination.

I would like to commend the Department of Disaster Management and the Uttarakhand State Disaster Management Authority (USDMA) for their comprehensive, evidence-based, and inclusive approach in preparing this document. I also thank our National and International Partners who have provided technical support in this endeavour as all reaffirm our resolve to transform Uttarakhand into a resilient, adaptive and prepared state. I urge every official, institution, and citizen to read this document, understand its spirit, and contribute to its implementation. Together, we can ensure that the beautiful Devbhoomi of Uttarakhand is not only preserved for future generations but also made safer, stronger, and more resilient in the face of any adversity.

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MESSAGE

Uttarakhand's unique Himalayan geography, rich ecological heritage and rapidly evolving climate risks demand a disaster management system that is proactive, technology-driven, and people-centric. Frequent occurrences of floods, landslides, cloudbursts, forest fires, earthquakes and other hazards remind us that disaster preparedness is not merely a governmental responsibility—it is a collective commitment towards safeguarding lives, livelihoods, and sustainable development.

It is a matter of great satisfaction that the Uttarakhand State Disaster Management Plan (SDMP) 2026–27 has been prepared by Uttarakhand State Disaster Management Authority as a comprehensive framework to strengthen disaster risk reduction, preparedness, response, recovery and resilience across the State. More than a statutory document, this Plan represents our commitment to building a safer and more resilient Uttarakhand through coordinated action, scientific planning, and community participation.

The Government of Uttarakhand has consistently focused on strengthening institutional capacity, enhancing early warning dissemination, modernizing emergency response systems, and promoting community-based disaster risk management. Significant efforts have been made to improve the capabilities of the State and District Emergency Operations Centres, strengthen search and rescue mechanisms, expand capacity-building initiatives, and integrate modern technologies into disaster management.

The SDMP clearly defines institutional responsibilities, coordination mechanisms, preparedness protocols and response strategies for various hazards faced by the State. It also emphasizes continuous training, regular mock exercises, inter-departmental coordination and the integration of disaster risk reduction into developmental planning, ensuring that preparedness remains an ongoing process rather than a one-time effort.

I appreciate the dedicated efforts of the Uttarakhand State Disaster Management Authority, the Department of Disaster Management, district administrations, scientific institutions, technical experts and all stakeholders who have contributed to the preparation of this important document. Their collaborative approach has resulted in a practical, inclusive and forward-looking Plan.

I am confident that this State Disaster Management Plan will serve as a valuable guide for all departments, institutions, local bodies, and communities. I urge every stakeholder to actively implement its recommendations and work together to build a disaster-resilient Uttarakhand that is better prepared to face future challenges.

Madan Kaushik



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Anand Bardhan (IAS)
Chief Secretary

MESSAGE

It is with great sense of responsibility and commitment that I present the Uttarakhand State Disaster Management Plan (SDMP)—a critical policy document that outlines our state's strategic approach to building resilience, enhancing preparedness, and improving institutional mechanisms for disaster risk reduction. Uttarakhand's vulnerability to a wide spectrum of disasters is well documented. Our topography, climate variability, fragile geology contributes to frequent hazards such as landslides, earthquakes, cloudbursts, forest fires, floods, and glacial lake outbursts. The SDMP emerges as an imperative response to these complex risks, offering a well-structured, scientifically informed, and stakeholder-driven framework to anticipate, mitigate, and respond to disasters effectively. One of the core strengths of this Plan is its comprehensive scope. It delineates clear strategies for resource availability, community-based disaster risk management, and training and awareness campaigns at all levels. It emphasizes capacity building, school safety, medical preparedness, and shelter management, while prioritizing emergency communication, data security, and the strengthening of Emergency Operations Centres (EOCs). Importantly, the Plan recognizes the unique needs of children, women, the elderly, and livestock during emergencies and incorporates inclusive planning for their protection and welfare.

The Plan also establishes a strong disaster response mechanism, including an Incident Response System (IRS), real-time coordination through the State Emergency Operations Centre (SEOC), and enhanced early warning dissemination protocols. It addresses search and rescue operations, coordination with the Armed Forces, critical infrastructure restoration, food & nutrition security and public health emergencies. Disaster-specific response plans ensure tailored strategies for diverse hazards.

Moving beyond immediate response, the SDMP sets a roadmap for recovery and building back better (BBB). It outlines a phased recovery process—early, mid, and long-term—guided by principles of sustainability, resilience, and equity. From reconstruction planning to livelihood restoration and psycho-social rehabilitation, the Plan commits to inclusive recovery. Strengthening disaster preparedness is not a singular event but a continuous process of training, learning, coordination, and innovation. The state's emergency operations centres, early warning systems, resource mapping, and digital platforms are being continually upgraded to improve response capabilities.

As Chief Secretary, I reaffirm the Government of Uttarakhand's commitment to operationalization the SDMP in letter and spirit. Let this Plan become a living document—actively guiding our actions, collaborations, and aspirations towards a safer and more resilient Uttarakhand

Anand Bardhan



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Vinay Ruhela
Vice Chairman

State Disaster Management Advisory Committee
Former Vice Chairman
State Planning Commission
(Cabinet Minister Rank)

MESSAGE

It is a privilege to present the revised Uttarakhand State Disaster Management Plan (SDMP) 2026–27, a comprehensive and forward-looking framework that reinforces our collective commitment to building a safer, more resilient and disaster-ready Uttarakhand.

Nestled in the fragile Himalayan ecosystem, Uttarakhand is exposed to a diverse range of natural hazards, including earthquakes, landslides, floods, cloudbursts, forest fires, avalanches, Glacial Lake Outburst Floods (GLOFs) & other Hazards. The growing impacts of climate change, rapid urbanization, expanding infrastructure and increasing human exposure have further intensified disaster risks. These evolving challenges demand a shift from a reactive approach towards a comprehensive disaster risk management framework that emphasizes prevention, preparedness, mitigation and resilience.

The revised SDMP has been developed as a dynamic and implementation-oriented document that provides a strategic framework for strengthening disaster governance across the State. It integrates disaster risk reduction into development planning, promotes evidence-based decision-making, encourages the adoption of emerging technologies and reinforces institutional coordination at every level. The Plan is aligned with the Disaster Management Act, 2005, national guidelines and internationally accepted frameworks for disaster risk reduction, while remaining firmly rooted in Uttarakhand's unique geographical, environmental and socio-economic context.

One of the defining strengths of this Plan is its emphasis on collaboration. Effective disaster management requires the active participation of government departments, district administrations, local authorities, scientific and technical institutions, civil society organizations, academic institutions, private sectors and local communities.

I sincerely appreciate the dedicated efforts of the Uttarakhand State Disaster Management Authority, line departments, district administrations, scientific institutions, technical experts and all stakeholders whose valuable contributions have made this Plan comprehensive, practical and future-oriented.

I am confident that the Uttarakhand State Disaster Management Plan 2026–27 will serve as an effective guiding framework for policymakers, administrators, emergency responders and communities alike, enabling coordinated action towards our shared vision of a resilient, adaptive and disaster-prepared Uttarakhand.

Vinay Ruhela



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Lt. Col. Raghuveer Singh Bhandari (Retd.)
Vice Chairman
State Disaster Management Advisory Committee

MESSAGE

It gives me immense pleasure to present the revised Uttarakhand State Disaster Management Plan (SDMP) 2026–27, a comprehensive framework that reflects the State's unwavering commitment to strengthening disaster resilience through strategic planning, institutional preparedness and collaborative action.

Uttarakhand's unique Himalayan landscape presents both immense opportunities and significant challenges. The State remains vulnerable to a wide spectrum of natural hazards, including earthquakes, landslides, floods, cloudbursts, forest fires, avalanches and Glacial Lake Outburst Floods (GLOFs). In an era of increasing climate uncertainty and rapidly evolving risks, disaster management must extend beyond emergency response to embrace anticipation, preparedness, adaptation and resilience as integral components of governance and development.

The revised SDMP embodies this progressive vision by providing a comprehensive framework for disaster risk reduction, preparedness, response, recovery and resilient reconstruction. It promotes risk-informed planning, scientific assessment, technological innovation, institutional convergence and community participation while ensuring that disaster resilience remains central to sustainable development across all sectors.

No disaster management framework can succeed without strong partnerships. Government agencies, scientific and academic institutions, emergency responders, civil society organizations, the private sector and local communities must work together with a shared sense of responsibility. Such collaborative efforts not only strengthen preparedness but also enhance the State's ability to respond swiftly, recover effectively and build back better following disasters.

I am confident that the Uttarakhand State Disaster Management Plan 2026–27 will serve as a practical and strategic guide for policymakers, administrators, emergency responders and communities alike, further strengthening Uttarakhand's journey towards becoming a safer, more resilient and disaster-ready State.

Lt. Col. Raghuveer Singh Bhandari (Retd.)



Vinod Kumar Suman (IAS)
Secretary



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MESSAGE

It is with great commitment and purpose that we bring forth the updated Uttarakhand State Disaster Management Plan (SDMP)—a result of collective expertise, rigorous planning, and a deep resolve to protect the people and environment of our Himalayan state. This document is not just a compliance obligation under the Disaster Management Act, 2005 rather it is a visionary, practical, and inclusive roadmap toward a disaster-resilient Uttarakhand.

Our state's topography, ecology, and climate vulnerability expose us to a wide range of natural and human-induced hazards. The SDMP addresses these risks through a comprehensive, structured approach, reflecting the paradigm shift from reactive emergency response to proactive Disaster Risk Reduction (DRR) and climate adaptation. We have taken care to align the Plan with post-2015 global frameworks including the Sendai Framework, the Sustainable Development Goals (SDGs), and the Paris Agreement, as well as the Hon'ble Prime Minister's Ten-Point Agenda for DRR.

As the nodal department for disaster management in the state, we have ensured that this Plan is practical, implementable, and responsive to the needs of both urban and rural areas, as well as the most vulnerable segments of our society - women, children, elderly, persons with disabilities, and marginalized communities.

The SDMP lays out clear institutional roles and responsibilities from the state to the grassroots. It defines Standard Operating Procedures, coordination frameworks, preparedness protocols, and response mechanisms for every key hazard faced by our state. It also provides a strategic vision for long-term resilience building, including capacity development, community-based disaster risk management, financial planning, and insurance frameworks. What distinguishes this Plan is its participatory and dynamic nature. Inputs have been drawn from across departments, scientific institutions, district administrations, NGOs, and community representatives. Our aim has been to ensure that the SDMP is not a theoretical document but a usable, dynamic framework that can be easily adapted at the district and local levels. I commend the team of Uttarakhand State Disaster Management Authority (USDMA) who worked tirelessly to bring this Plan to fruition. Their ownership and attention to details are visible throughout the document.

Let this SDMP guide all of us-government, communities, academia, civil society, and private sector-towards a unified vision of disaster resilience. I urge every stakeholder to adopt, implement, and periodically revisit the Plan to ensure it evolves with our changing risk landscape. Together, we can transform Uttarakhand into a state that is not only disaster-aware but disaster-prepared.

Vinod Kumar Suman

Preface

Disasters, whether natural or man-made, have significant implications for the safety, economy, and well-being of the people and infrastructure within a region. Effective Disaster Management Plans are critical in reducing the vulnerability of communities, minimizing losses, and ensuring a rapid and organized response during the time of emergency. The purpose of the Uttarakhand State Disaster Management Plan (SDMP) is to provide a comprehensive, coordinated, and proactive framework to guide disaster preparedness, mitigation, response, and recovery in the state of Uttarakhand. The SDMP aims to ensure the safety and resilience of communities across the state of Uttarakhand, promoting a robust disaster management culture and enhancing the capacity to manage risks.

Uttarakhand, often referred to as "Devbhoomi" or "Land of the Gods," is a state nestled in the northern part of India, known for its mountainous terrain, sacred shrines, and natural beauty. However, its geographical setting and unique topography also make it highly susceptible to a range of natural hazards and disasters. The state's vulnerability to disasters is a result of various factors, including its hilly and seismically active terrain, heavy rainfall patterns, landslides, floods, cloud burst, forest fire and extreme weather events such as snowstorms and avalanches. Additionally, the state is increasingly facing challenges related to human-induced hazards like deforestation, urbanization, and the construction of roads and infrastructure in ecologically fragile areas.

In this context, the State Disaster Management Plan (SDMP) for Uttarakhand seeks to address these unique challenges by providing clear guidelines, institutional frameworks, and preparedness strategies. The plan emphasizes proactive measures such as hazard mapping, early warning systems, community awareness, and capacity building. Additionally, it aims to ensure timely and effective responses through coordination among government agencies, local authorities, NGOs, and the public.

Ultimately, the SDMP aims to foster a culture of disaster resilience in Uttarakhand, where communities are equipped to prevent, prepare for, respond to, and recover from disasters, minimizing losses and safeguarding the environment for future generations.



Raj Kumar Negi (DIG)
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Vinod Kumar Suman (IAS)
Secretary,
USDMA

Acknowledgement

The successful completion of the State Disaster Management Plan (SDMP) would not have been possible without the unwavering support and guidance of **Shri Vinod Kumar Suman, Secretary, USDMA**. His commitment to strengthening disaster preparedness and resilience in the state has been a driving force behind the successful completion of this document.

We extend our heartfelt gratitude to **Shri Anand Swaroop, the then Additional Chief Executive Officer (Administration), USDMA** for his insightful guidance and constant support throughout the preparation of the SDMP. His valuable inputs, strategic direction and encouragement were instrumental in shaping a comprehensive and effective plan

We extend our sincere thanks to **Shri Rajkumar Negi, DIG, Additional Chief Executive Officer (Operations), USDMA**, for his leadership as Chairman of the Committee for preparation of the State Disaster Management Plan (SDMP) for Uttarakhand. His directions were instrumental in steering this comprehensive program to fruition during various stages of the preparation of this holistic document. His dedication and strategic vision have significantly contributed to the quality and effectiveness of the SDMP.

We also sincerely appreciate the thoughtful suggestions of **Shri Abhishek Kumar Anand, Finance Controller, USDMA** and **Md. Oabaidullah Ansari, Joint Chief Executive Officer, USDMA** which helped to enhance the overall quality of the document.

We gratefully acknowledge the valuable chapter-wise contributions that have enriched this dynamic plan. **Dr Vedika Pant, IRS Expert, USDMA**, authored Chapters 1, 5, and 7 to 11, bringing depth to key areas such as state-specific disaster risks, mainstreaming disaster risk reduction and recovery approaches. **Shri P. D. Mathur, Disaster Risk Management Specialist, PIU USDMA, U-Prepare**, contributed to Chapter 1 (Sections 1.7 and 1.8) and Chapters 3 and 4, strengthening the document through the integration of global frameworks such as disaster risk reduction (DRR), the Sustainable Development Goals (SDGs), climate change adaptation, and social inclusion.

Dr Ruchika Tandon, Geologist, ULMMC, provided important technical inputs to Chapter 2 on hazard risks and challenges in Uttarakhand. **Dr Neha Chauhan, Project Manager, USDMA**, and **Ms. Monika Purohit, Civil and Infrastructure Expert, USDMA**, contributed splendidly to Chapter 6, focusing on technology and evidence-based approaches. **Ms. Puja Kasariya, Project Appraisal Expert, PMU, U-Prepare**, played a key role in compiling and consolidating Chapters 12 to 15, covering financial arrangements, governance, international cooperation, and monitoring mechanisms.

We also extend our sincere thanks to **Md. Shahnawaz, GIS Expert, ULMMC**; **Shri Manish Kumar Bhagat, IEC Expert, USDMA**, **Shri Dharmendra Kushwaha, Earthquake Expert, USDMA** and **Ms. Vimla Makhloga, Documentation Expert, ULMMC**, for their valuable support across various aspects of the plan and documentation process.

Finally, we extend our heartfelt gratitude to everyone who contributed their time, expertise, and dedication. Their collective efforts have made the SDMP a comprehensive and meaningful resource for disaster management in Uttarakhand.

(UTTARAKHAND STATE DISASTER MANAGEMENT AUTHORITY)

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Chapter 1

"There are no "natural disasters" only natural hazards. "Disaster" depends on how system prepare for and response to their hazards.

“Carl Lorenz Cervantes”

1. Foundational Aspects

1.1. Background and Rationale

This is the revised and updated Uttarakhand State Disaster Management Plan (USDMP) prepared by Uttarakhand State Disaster Management Authority (USDMA) in 2020. The Uttarakhand State Disaster Management Plan (SDMP) is a strategic document designed to address the State's unique vulnerabilities to natural and human-induced disasters. The State's location in the Himalayan region is prone to various natural disasters such as Earthquakes, Landslides, Floods, Cloudbursts, Lightning, Avalanche, Urban floods etc. Additionally, the State's ecological fragility, combined with factors like deforestation and industrial activities, exacerbates these risks, increasing the potential for severe impacts on lives, livelihoods, and infrastructure. The SDMP aims to provide a structured and comprehensive framework for disaster risk reduction (DRR), Preparedness, Response, Recovery, and Resilience-building across the State, focusing on ensuring sustainable development and safeguarding the population.

The SDMP is aligned with national and global disaster management policies, incorporating the provisions of the National Disaster Management Plan (NDMP) 2019 and the Disaster Management (DM) Act 2005 to ensure that Uttarakhand disaster management strategies reflect best practices. It recognizes that disaster management is a continuous and dynamic process that requires periodic updates to incorporate new knowledge, technologies, and methodologies. This dynamic nature allows the plan to remain relevant and responsive to emerging disaster risks and global standards in disaster risk management (DRM).

The SDMP emphasizes the disaster management cycle, broken down into distinct phases: pre-disaster (mitigation, prevention, and risk reduction), During Disaster (Rescue and Response,) and Post-disaster (Preparedness, rehabilitation, Reconstruction, and Recovery). Each phase involves specific activities and strategies to address the State's diverse hazards. Mitigation focuses on reducing the risk and impact of disasters, while preparedness ensures that government and local communities are ready to respond effectively when a disaster occurs. The response phase involves the immediate actions taken to address the effects of a disaster, and the recovery phase focuses on restoring the affected area, building back better, and ensuring long-term resilience.

A vital feature of the SDMP is its integrated and multi-stakeholder approach to disaster management. While the primary responsibility for disaster management lies with the state government, the plan recognizes the necessity of a coordinated effort among various stakeholders, including the central government, local authorities, the private sector, non-governmental organizations, and communities. The Uttarakhand State Disaster Management Authority (USDMA), which serves as the State's nodal agency for disaster management, is central to coordinating these efforts. USDMA is tasked with laying down policies, approving disaster management plans, coordinating their implementation, and overseeing state mitigation, capacity-building, and preparedness activities.

Furthermore, the SDMP outlines a clear responsibility framework to avoid ambiguity in executing disaster management activities. The roles of different agencies are defined at each stage of the disaster management cycle, ensuring clarity and accountability. In cases where the State's resources are insufficient to handle a disaster, the SDMP provides for the mobilization of

additional support from the central government or other external sources. This collaborative approach ensures that the State's response capability is reinforced by national-level support when needed and that local communities actively engage in disaster preparedness and recovery efforts.

The plan also emphasizes the need for continuous capacity building at all levels government agencies, local authorities, and communities—through training, awareness campaigns, and simulation exercises. This ensures that all stakeholders are well-prepared to handle the diverse challenges of disasters. Additionally, the SDMP recognizes the importance of incorporating lessons from past disasters and international best practices into the State's disaster management strategies.

The SDMP is not a static document but is designed to evolve through periodic reviews and updates. This ensures that the plan stays relevant and practical considering new risks, technological advancements, and evolving global standards in disaster management. The SDMP's flexibility and adaptability make it vital to ensure that Uttarakhand is better equipped to manage and mitigate disaster risks, protect its people, and maintain sustainable development despite natural calamities

1.2. Significance of the Plan

The Disaster Management Act 2005, under Section 23(1), mandates the preparation of a State Disaster Management Plan (SDMP) for every State. Beyond this legal requirement, Uttarakhand's unique hazard profile and disaster history underscore the necessity for a comprehensive and structured SDMP to effectively manage and mitigate disasters across the State. Uttarakhand's geographical and environmental vulnerabilities to a range of natural hazards, including Landslides, Floods, Earthquakes, cloudbursts, and forest fires, highlight the critical need for such a plan to protect lives, livelihoods, and infrastructure.

The SDMP is a dynamic and evolving document prepared under the Disaster Management Act 2005 provisions. It establishes a multi-stakeholder framework to enable the active partnership of governmental entities, non-governmental organizations, private sector enterprises, academic institutions, and community groups for Disaster Risk Reduction (DRR) within the State. Section 2(e) of the DM Act defines a disaster as a "continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for —

- Prevention of danger or threat of any disaster.
- Mitigation or reduction of risk of any disaster or its severity or consequences.
- Capacity-building.
- Preparedness to deal with any disaster.
- Prompt response to any threatening disaster situation or disaster.
- Assessing the severity or magnitude of effects of any disaster”.

The Uttarakhand State Disaster Management Plan (SDMP) draws inspiration from global frameworks like the Hyogo Framework for Action (2005–2015), the Sendai Framework (2015–2030), the Paris Agreement, and the Sustainable Development Goals (SDGs). These emphasize integrating disaster risk reduction (DRR) into development and environmental planning for a more sustainable approach. Aligned with these commitments, the SDMP provides a forward-looking strategy with specific actions, timelines, and measurable outcomes. It promotes a decentralized approach, enabling districts to tailor their disaster management plans to local

challenges while supporting state-level objectives. The SDMP is a dynamic "living document" subject to regular updates based on emerging risks and lessons learned. Capacity building is central to the SDMP, focusing on training, community engagement, and awareness campaigns to ensure preparedness across all sectors. It also advocates leveraging technology, innovation, and research to strengthen risk assessment, early warning systems, and disaster response.

As a guiding framework, the SDMP aims to minimize risks, reduce vulnerabilities, and enhance resilience, fostering a culture of preparedness and sustainable development for a safer, more resilient Uttarakhand.

1.3. Methodological Framework and Process

The Uttarakhand State Disaster Management Plan (SDMP) is grounded in globally recognized frameworks, including the Hyogo Framework for Action (2005–2015), the Sendai Framework for Disaster Risk Reduction (2015–2030), the Paris Agreement, and the Sustainable Development Goals (SDGs). These frameworks advocate for integrating disaster risk reduction (DRR) into broader development and environmental strategies to achieve a sustainable and holistic approach to disaster management. In alignment with these global priorities, the SDMP outlines a comprehensive strategy featuring defined timelines, measurable outcomes, and actionable steps for effective DRR implementation. It emphasizes a decentralized approach, empowering districts to develop tailored disaster management plans that address specific local challenges while aligning with state-level objectives. Recognizing the dynamic nature of disaster risks, the SDMP is designed as a "living document" to be regularly reviewed and updated based on evolving risks, priorities, and lessons from past experiences.

The plan underscores the importance of capacity building at all levels of governance, advocating for regular training, stakeholder collaboration, and community awareness initiatives to strengthen preparedness and response capabilities. Additionally, it emphasizes the application of technology, innovation, and scientific research to enhance risk assessment, early warning systems, and disaster response mechanisms.

As a strategic framework, the SDMP seeks to mitigate risks, reduce vulnerabilities, and build the resilience of communities and ecosystems, thereby promoting a culture of preparedness and sustainable development for a safer and more resilient Uttarakhand.

1.4. Paradigm Shift in Disaster Management

The enactment of the Disaster Management (DM) Act, 2005, and the National Policy on Disaster Management (NPDM), 2009, marked a transformative shift in India's disaster management approach. Moving from a reactive, relief-focused model to a proactive framework, these policies prioritize prevention, mitigation, and preparedness. The NPDM underscores that while natural hazards cannot be avoided entirely, effective disaster risk reduction (DRR) and mitigation strategies can prevent such hazards from escalating into disasters.

Disaster risk emerges from the interaction between hazards and vulnerabilities across physical, social, economic, and environmental dimensions. To address this, the NPDM advocates a multi-pronged approach to DRR, which includes embedding risk reduction measures into development projects, prioritizing mitigation initiatives through Central and State Government collaboration, and supporting state-led mitigation efforts. The policy also highlights the importance of leveraging indigenous knowledge for disaster resilience and protecting heritage structures.

Aligned with UNISDR terminology, DRR entails systematically addressing the root causes of disasters by reducing exposure to hazards, minimizing vulnerabilities, ensuring sustainable land and environmental management, and enhancing preparedness. While "Disaster Reduction" and "Disaster Risk Reduction" are often used interchangeably, the latter better conveys the continuous nature of risk reduction efforts. Mitigation, a critical component, involves a range of actions to minimize the adverse effects of hazards.

Historically, India's disaster management approach focused on post-disaster relief and rehabilitation. However, this has evolved into a proactive, risk-focused strategy emphasizing resilience and preparedness. In Uttarakhand, this paradigm shift is evident in initiatives such as risk-sensitive urban planning, establishing early warning systems, and promoting community-based disaster management practices. The State Disaster Management Plan (SDMP) reflects these priorities, aligning national and international frameworks to promote a science-based, inclusive, and sustainable approach to disaster management.

1.5. Main Pillars of the State Disaster Management Plan (SDMP)

The Uttarakhand State Disaster Management Plan (SDMP) is built on five main pillars that guide its structure and implementation:

Conforming to National Legal Mandates: The SDMP aligns with key national legal frameworks, including the Disaster Management (DM) Act 2005, National Policy on Disaster Management (NPDM) 2009, and the National Disaster Management Plan (NDMP) 2019.

Proactive Participation in Global Goals: The SDMP ensures active engagement with international agreements India is a signatory to, including the Sendai Framework for Disaster Risk Reduction (SFDRR), Sustainable Development Goals (SDGs), and the Paris Agreement on Climate Change. These global frameworks guide the SDMP, promoting mutual reinforcement and coherence in disaster risk reduction (DRR) and climate resilience.

Prime Minister's Ten-Point Agenda for DRR: This pillar focuses on aligning the SDMP with contemporary national priorities for disaster risk reduction as articulated by the Prime Minister's Ten-Point Agenda, which provides a clear vision for India's disaster management strategy.

Social Inclusion: Social inclusion is a central cross-cutting principle throughout the SDMP, ensuring that disaster risk reduction efforts are accessible and equitable, particularly for vulnerable and marginalized groups.

Mainstreaming DRR: Disaster risk reduction (DRR) is integrated as a core component of all development processes, ensuring that risk management is a part of the day-to-day functioning of government policies, programs, and development projects.

1.6. Legal and Regulatory Framework

Section 23(1) of the Disaster Management (DM) Act, 2005, mandates that every State must develop a State Disaster Management Plan (SDMP). The SDMP aligns with the National Policy on Disaster Management (NPDM), 2009, and adheres to the DM Act's provisions, which require central ministries and departments to prepare their disaster management plans. While the SDMP is applicable across the entire State, Section 38(2)(g) of the DM Act specifies that each ministry and department of the State Government must formulate disaster management plans following the guidelines issued by the National and State Authorities. These plans are essential to define how each ministry and department will contribute to the State's disaster management efforts,

encompassing prevention, preparedness, response, and Recovery.

Further, Section 39 of the DM Act, 2005, underscores that all State Government departments must integrate disaster prevention and mitigation measures into their development plans and projects. The SDMP assigns specific and general responsibilities to all stakeholders and departments involved in disaster management, as mandated by the DM Act. Ministries and departments must accept and implement these responsibilities, even if they extend beyond their conventional roles. Disaster management often demands extraordinary measures beyond routine functions, necessitating proactive participation from all stakeholders. To enhance the effectiveness of the SDMP, it is supported by contingency plans, Standard Operating Procedures (SOPs), manuals, and guidelines across the State's multi-tiered governance framework.

1.7. Integration Frameworks for DRR, SDGs & Climate Change Adaptation

The adoption of three pivotal global agreements in 2015—the Sendai Framework for Disaster Risk Reduction (UNISDR, 2015), the Sustainable Development Goals (UN, 2015), and the COP21 Paris Agreement on Climate Change (UNFCCC, 2015)—has created a unique opportunity to harmonize efforts across disaster risk reduction (DRR), sustainable development, and climate change response. These agreements underscore the interconnections between these areas and emphasize the need for coordinated action.

The Sustainable Development Goals (SDGs), embodied in the global initiative transforming Our World: The 2030 Agenda for Sustainable Development, offer a transformative blueprint with poverty eradication as its primary objective. Central to the SDGs is integrating economic, social, and environmental dimensions of sustainable development, vital for achieving long-term global prosperity. The Paris Agreement on climate change further highlights the importance of preventing, minimizing, and addressing the loss and damage linked to the adverse effects of climate change, including both extreme weather events and gradual environmental changes. It underscores how sustainable development can play a crucial role in reducing the risks associated with climate change.

A key theme in all three global agreements is disaster risk reduction (DRR) and resilience building. These frameworks share a common goal of fostering sustainable development, with the Sendai Framework marking a significant shift by prioritizing disaster risk management over traditional disaster management. These agreements recognize that the outcomes in DRR are shaped by complex, interconnected social and economic processes, which often overlap across the three agendas. DRR and resilience are not only intrinsic to sustainable development but are also vital for its realization. In turn, effective disaster risk management is essential for fostering sustainable development.

There is a strong global commitment to achieving ambitious targets and accelerating the implementation of these international agreements. Given the complementary nature of these post-2015 frameworks, aligning and reinforcing actions across the domains of DRR, sustainable development, and climate change can lead to better outcomes. Efforts must be made to avoid "policy risks" or contradictory policies that could create more risks rather than reduce them. Promoting coherence and mutual reinforcement across these frameworks requires political commitment, robust monitoring, transparent reporting, and supportive partnerships at all levels.

Acknowledging this global consensus, the SDMP has sought to address the challenges of

aligning national initiatives with the three post-2015 global frameworks, ensuring coherence and mutual reinforcement in DRR, sustainable development, and climate change response

1.8. Prime Minister's Ten-Point Agenda for Disaster Risk Reduction

Apart from the Sendai Framework, the 10-point Agenda announced by the Prime minister is a Vision Document, which is also based on two other important global Frameworks, namely Sustainable Development Goals (SDGs) and Paris Agreement on Climate Change. It is envisioned that the interaction and cooperation amongst different stakeholders, including Government of India (GoI), Governments of States/UTs, and other stakeholders could help in achieving the targets declared by the Prime Minister.

The PM's 10-point Agenda provides concrete ideas for implementing the SFDRR. In the meeting of the National Executive Committee (NEC) held on 6th October 2017 to discuss the PM's 10-Point Agenda on Disaster Risk Reduction decided that the States would devise a Roadmap with quantifiable milestones to achieve the targets set by the PM's 10-point Agenda.

It is, therefore, important for states to devise a Roadmap for the implementation of SFDRR as year after year a lot of damage occurs to the critical infrastructure that offsets the development process besides causing immense loss of human lives and livelihoods.

The states thus need to prioritize the goals and targets to be achieved in the coming years in a planned and systematic manner on the lines of SFDRR so as to realize a Disaster Resilient State.

Table 1: The Agenda Points & State Level Priorities

S. No.	agenda point	SFDRR priority area	state level DRR priorities
1	Mainstreaming Disaster Risk Reduction in Public Expenditure, particularly in infrastructure development	Priority Area 3	1. Identifying concrete DRR measures in key sectors with highest concentration of risk 2. Mainstreaming DRR in flagship schemes of the State 3. Establishing a mechanism to ensure that standards for disaster resilience are periodically upgraded and disseminated
2	Risk Coverage for All, particularly for the poorest	Priority Area 2	1. Development of disaster insurance mechanisms for house-owners in disaster prone areas 2. Development of parametric insurance for weather and climate related disasters 3. Develop insurance products to cover major infrastructure projects
3	Greater Involvement and Leadership of Women in Disaster Risk Management	Priority Area 2	1. Includes women among the new units of SDRF under expansion 2. Sizeable representation of women in development of volunteer schemes such as 'Aapda-Mitra', Yuva Aapda Mitra & Aapda Sakhi Schemes. 3. Prioritize training and sensitization of Elected Women Representatives at the local level

S. No.	agenda point	SFDRR priority area	state level DRR priorities
4	Invest in Mapping Disaster Risk by covering all hazards	Priority Area 1	1. Undertake state level multi-hazard risk assessments. 2. Develop maps for all major hazards in a standardized format to facilitate disaster risk reduction 3. Develop standards/ guidelines for different types of risk assessment
5	Leverage Technology to enhance the efficiency of disaster risk management efforts	Priority Area 3	1. Assess the efficacy of India Disaster Resources Network (IDRN) and revive it with modifications (National level) 2. Develop an e-platform to map expertise and resources on highly specialized aspects of disaster response 3. Increase the efficacy of early warning systems for all major hazards through the application of technology
6	Develop a network Of Universities in UK, to work on disaster-related issues	Priority Area 3	Thematically focused network of Universities in Uttarakhand and technical institutions (e.g., on earthquake risk management, landslide risk management, GLOF etc.)
7	Making use of social media and Mobile Technologies	Priority Area 2	1. Develop a social media strategy for Disaster Risk Management in Uttarakhand 2. Capacity Development of State level Officials in DRM 3. Develop partnership with the CSR wing of key social media platforms
8	Invest in local capacity, not only for response but also for disaster risk reduction	Priority Area 3	Take stock of on-going community-based programs led by CSOs and explore opportunities for up-scale good practices
9	Systematize Post-Disaster Recovery based on lessons learned from past experiences	Priority Area 4	1. Develop national and state level guidelines for Post-Disaster Recovery and 'Build Back Better' 2. Systematically document post-disaster recovery work and lessons learned
10	Bring about greater cohesion in International Response to disasters	Priority Area 4	Engage with International Mechanisms like South-South Cooperation mechanisms to support post-disaster recovery

1.9. Implementation of Ten Point Agenda in Uttarakhand

1.9.1. Mainstreaming DRR into Developmental Projects & Disaster resilient Infrastructure

- Uttarakhand has adopted and mandated National Building Code norms in its Common Building Rules applicable across the State.
- Fire No Objection Certificate (NOC) is made Mandatory to all high-rise buildings/Apartments/Commercial Complexes.
- Under the World Bank assisted Uttarakhand Disaster Recovery Project (UDRP), UDRP AF & U-Prepare, disaster resilient infrastructure like bridges, government buildings, roads are being constructed in various part of the state.
- Prepared the Departmental DM Plans for 10 key Departments as per Sendai Framework for imbibing DRR Principles in their planning and actions.

- Prepared State DM plan, DM Plans for all 13 Districts, Hotspot Mitigation Plans of 14 Hotspots (5 Urban, 5 Rural, 4 Tourist destinations) in the State, with Risk mitigation strategies and DRR activities
- Activated the District, City, School and village level mock exercises

1.9.2. Risk Coverage to all, particularly for the poorest

- Uttarakhand is implementing Fasal Bima Yojana in the State
- The State is contemplating a Comprehensive Risk Coverage Insurance Scheme to cover risks of human loss, property loss, crop Loss and loss of livelihoods

1.9.3. Greater Involvement & Leadership of Women in DRM

- Over a time, UK has developed a strong women Self-Help Group (SHG) network.
- Regular Training programs to SHG members
- Training programs on the First Aid and Search & Rescue, Early Warning are being imparted to Mahila Mangal Dals (MMD) across the state.
- Out of 1700 trained Aapda Mitra Volunteers, more than 20% are women volunteers.
- Greater participation by women in on going Yuva Aapda Mitra Scheme.

1.9.4. Invest in mapping Disaster Risk by covering all hazards

- A detailed Disaster Risk Assessment of Uttarakhand State covering five hazards viz; earthquake, landslides, floods, flash floods & industrial hazards have been carried out under UDRP. A Risk Atlas of State and Risk Assessment maps up to Block level have also been prepared.
- Carried out Seismic Risk/ Vulnerability assessment of more than 7,374 houses of Mussoorie, Nainital & Bageshwar towns using RVS technique.
- Seismic Risk/ Vulnerability assessed of 11,239 lifeline buildings across the state using RVS technique.

1.9.5. Leveraging Technology to enhance the efficiency of DRM efforts

- Uttarakhand has entered an MOUs with IIT Roorkee, IMD and SAC-ISRO for exchange of risk sensitive information and early warning.
- Uttarakhand SDMA has developed a Web Portal that also incorporates E-Platform for sharing information, expertise and feedback
- Uttarakhand SDMA has also established state-of-the-art EOC at State level.
- Uttarakhand State has established a Flood Early Warning System with support of THDC Ltd in downstream of Tehri Dam.

1.9.6. Develop a network of Universities to work on disaster related issues

- Uttarakhand SDMA contemplating a MOU with 3 Universities namely Doon University, Graphic Era University and University of Petroleum and Energy Studies for taking DRR related research and Studies.

- Indian Institute of Technology, Roorkee has created a Centre on Disaster Management, which is also engaged in DRR and CCA studies and helping in the Planning and Capacity Building features of various stakeholders.

1.9.7. Make use of social media and mobile technologies

- Uttarakhand is the front runner in using social media for creating awareness and information dissemination among all the stakeholders.
- Mass Messaging is widely used in Early warning in Disaster Situations.
- Uttarakhand SDMA has developed a mobile app “Bhudev App” in collaboration with Department of Earthquake Engineering, IIT Roorkee for earthquake early warning.

1.9.8. Invest in local capacity not only for response but also for DRR

- Uttarakhand SDMA carried out training on search & rescue/ first aid of the duration of 5 days for Yuvak Mangal Dals & Mahila Mangal Dals with the help of various NGOs. More than 8000 Mangal Dals members trained.
- 15,300 community volunteers trained at Nyaya Panchayat level in 622 training programs of the duration of 10 days across the state.
- 1998 community volunteers trained as Aapda Mitra across the state in search & rescue/ first aid.
- 172 teachers trained in 6 training programs of the duration of 5 days on school safety.

1.9.9. Systematize post disaster recovery using lessons learned from past experiences

- Documentary films were prepared on Rescue and Relief operations during June-2013 Uttarakhand Floods.
- Several reports were generated/ documents prepared after June 2013 floods and later on disasters.

1.9.10. Bring about greater cohesion in international response to disasters

- Incident Response System has been adopted and notified in the State.
- A GO-NGO Coordination Cell is established for better response and relief operation.
- An Inter-Agency Group (IAG) of leading CBOs & NGOs has also been established in the State for better coordination.

1.10. Social Inclusion and Equity in Disaster Management

Disasters affect everyone, but their impacts are not uniform due to pre-existing socio-economic disparities. Vulnerable groups, such as women, Scheduled Castes, Scheduled Tribes, minorities, and economically marginalized populations, often face heightened challenges during and after disasters. These groups experience disproportionate impacts, exacerbated by systemic inequalities. The preamble of the National Policy on Disaster Management (NPDM), 2009 recognizes this reality, highlighting the unequal burden such community's bear. Furthermore, the Disaster Management Act (DM Act), 2005 underscores the principles of equality and non-discrimination, explicitly prohibiting bias based on gender, caste, religion, community, descent, or any other social characteristic in disaster management initiatives.

Social inclusion in disaster management entails ensuring equitable rights, access, and opportunities for all individuals while safeguarding their dignity and embracing diversity. It prioritizes leaving no one behind in disaster preparedness, response, Recovery, and resilience-building efforts. This inclusive approach recognizes and addresses every community member's unique needs and capacities, fostering resilience and reducing vulnerabilities across all sections of society.

1.11. Integration of Disaster Risk Reduction (DRR) into Development Planning

Disasters can significantly hinder the development of affected regions, sometimes reversing decades of progress. Development that disregards disaster risks or failures to incorporate adequate risk reduction measures exacerbate existing vulnerabilities and may introduce new risks, amplifying the adverse impacts of future disasters.

Mainstreaming Disaster Risk Reduction (DRR) entails systematically integrating disaster risk management into all development initiatives. This approach aims to enhance resilience, minimize losses, and accelerate progress toward sustainable development goals. It involves embedding disaster risk reduction considerations into every policy formulation, planning, and implementation stage to ensure that development objectives and disaster management strategies are mutually reinforced. Given the escalating challenges posed by climate change, which acts as a risk multiplier and intensifies the uncertainties associated with hydro-meteorological hazards, DRR mainstreaming must also address the evolving risk scenarios influenced by climate change impacts. Despite its critical importance, DRR mainstreaming is often misunderstood or vaguely interpreted by policymakers and practitioners, creating a significant gap that needs urgent attention.

As a cornerstone of the National Disaster Management Plan (NDMP), DRR mainstreaming is becoming increasingly central to development and disaster management strategies. It aligns closely with the actions required to achieve Sustainable Development Goals (SDGs) and respond to climate change. Disaster resilience emerges as a shared priority across these interconnected efforts. DRR mainstreaming emphasizes integrating disaster resilience not as an ancillary component but as an essential principle guiding all developmental planning and implementation.

1.12. Vision

The vision of the State Disaster Management Plan (SDMP) aligns with national policies, laws, the Prime Minister's Ten-Point Agenda for Disaster Risk Reduction (DRR), and international frameworks and best practices.

Uttarakhand is particularly susceptible to hazards such as earthquakes, landslides, floods, flash floods, droughts, and avalanches, which have historically caused extensive loss of life, infrastructure, and resources. Although natural hazards cannot always be prevented, their impact can be mitigated through proactive planning and preparedness. The SDMP is designed to guide the State toward achieving disaster resilience by providing a flexible, scalable framework applicable across all phases of the disaster management cycle—prevention, mitigation, preparedness, response, and Recovery. It integrates the "build back better" principle to ensure recovery efforts contribute to safer, more resilient communities and systems.

1.13. Scope and Applicability of the Plan

As per the Disaster Management (DM) Act, 2005, the State Disaster Management Plan (SDMP) encompasses the following key components:

Vulnerability Assessment: Identifying the susceptibility of various regions of the State to different types of disasters.

Prevention and Mitigation Measures: Outlining strategies and actions for disaster prevention and mitigation.

Integration with Development Plans: Defining how disaster risk reduction measures will be integrated into the State's development plans and projects.

Capacity-Building and Preparedness: Detailing measures to enhance capacity-building and preparedness at all levels.

Roles and Responsibilities: Clearly define the responsibilities of state government departments concerning disaster management measures.

The SDMP provides a comprehensive framework for disaster management across the State and is subject to periodic reviews and updates. The State Government ensures adequate financial allocations for its implementation.

The SDMP outlines mechanisms for mobilizing and coordinating various departments and agencies while delineating the State Government's responsibilities across all disaster management phases. During disaster response operations, the deployment of armed forces and central agencies within the State will adhere to established protocols between the Central and State Governments. The State may also seek assistance from the Central Government or neighboring states when required. Incident-specific response responsibilities are assigned to designated agencies.

The SDMP is based on hazard-specific guidelines prepared by the National Disaster Management Authority (NDMA), which serve as the primary reference unless otherwise specified. The Government of Uttarakhand has implemented the State, district, and tehsil levels to ensure coordinated and effective post-disaster responses.

Furthermore, each district and department must develop specific disaster management plans detailing addressing and managing disasters within their respective jurisdictions, ensuring comprehensive preparedness and response capabilities.

1.14. Strategic Objectives

Aligned with the mandates of the Disaster Management (DM) Act, 2005, the National Policy on Disaster Management (NPDM), 2009, the Prime Minister's Ten-Point Agenda for Disaster Risk Reduction (DRR), and post-2015 global frameworks, the State Disaster Management Plan (SDMP) 2024 outlines the following objectives:

- **Enhance Understanding of Disaster Risk:** Strengthen the understanding of disaster risks, hazards, and vulnerabilities at all levels.
- **Strengthen Disaster Risk Governance:** Promote robust disaster risk governance to ensure a coordinated and inclusive approach.
- **Invest in DRR for Resilience:** Advance structural, non-structural, and financial measures to enhance resilience and build capacities.

- **Promote Preparedness and Response:** Enhance disaster preparedness to ensure adequate response and pre-planned actions.
- **Foster "Build Back Better":** Integrate "Build Back Better" principles into Recovery, rehabilitation, and reconstruction for resilient outcomes.
- **Prevent Disasters and Reduce Risks:** Minimize loss of life, livelihoods, and assets while addressing vulnerabilities across sectors.
- **Increase Resilience and Manage Risks:** Build resilience by effectively reducing existing risks, preventing new ones, and managing residual risks.
- **Empower Local Authorities and Communities:** Strengthen local governance and engage communities as active partners in disaster management.
- **Promote Social Inclusion:** Ensure disaster management efforts are inclusive, gender-sensitive, and empowering for all, especially vulnerable groups.
- **Integrate DRR into Development:** Mainstream disaster risk reduction into developmental planning, projects, and policies.
- **Strengthen Scientific and Technical Capabilities:** Leverage science, technology, and traditional knowledge for risk assessment and decision-making.
- **Enhance Early Warning Systems:** Establish and maintain reliable early warning systems and communication networks.
- **Develop Multi-Hazard Risk Assessments:** Conduct comprehensive assessments and create hazard-specific risk maps, considering climate change scenarios.
- **Promote Resilience in Critical Sectors:** Strengthen disaster resilience in critical infrastructure, health systems, water management, and educational institutions.
- **Encourage Traditional and Modern Mitigation Measures:** Blend traditional practices with modern technologies for sustainable risk mitigation.
- **Strengthen Institutional Capacities:** Address capacity gaps and implement institutional strengthening programs at all levels.
- **Facilitate Risk Transfer Mechanisms:** Promote tools such as insurance and financial instruments for effective risk transfer.
- **Implement Ecosystem-Based Approaches:** Adopt ecosystem-based strategies for resource management in vulnerable regions.
- **Integrate Climate Adaptation with DRR:** Incorporate climate adaptation strategies in agriculture, water management, and other critical sectors.
- **Promote Women's Leadership in DRR:** Ensure active participation and leadership of women in disaster management efforts.
- **Focus on Risk Modelling and Monitoring:** Enhance disaster risk modelling, assessment, and monitoring systems for informed action.
- **Foster a Culture of Prevention and Mitigation:** Advocate for a preventive mindset across all societal and governance levels.
- **Ensure Post-Disaster Support Systems:** Develop robust post-disaster Recovery, monitoring, and evaluation mechanism

This comprehensive framework ensures a cohesive, inclusive, and effective disaster management approach for Uttarakhand, integrating principles of resilience and sustainability.

1.15. Time Horizons: Short, Medium, and Long-Term Perspectives

The measures outlined in this plan are categorized into three implementation time frames: Short-term (T1), Medium-term (T2), and Long-term (T3). The terms "Short," "Medium," and "Long" refer strictly to the anticipated completion timeframes and are not indicative of prioritization. These timelines are tentative and subject to revision based on factors such as technological advancements. For instance, some measures initially planned for the long term may be expedited,

while actions set for shorter time frames must adhere to their deadlines. While some actions across all categories are underway or require upgrades, others are yet to be initiated. These timeframes are not necessarily sequential medium and long-term measures may commence alongside short-term actions. Importantly, medium and long-term goals are not of lower priority but require extended time for completion and should, therefore, be initiated at the earliest opportunity.

Implementation progress varies significantly across different stakeholders and departments. Each State Government department is responsible for appropriately categorizing actions within their Disaster Management Plans (DM Plans) based on the relevant timelines during preparation or revision.

Recovery efforts following a disaster are typically categorized into three distinct phases:

- Short Term Recovery: Within 18 months.
- Medium Term Recovery: Within five years.
- Long-Term Recovery: Within five to ten years.

These phases depend on the type and scale of the disaster and apply to specific recovery programs. The SDMP outlines these phases broadly without prescribing fixed timelines, allowing flexibility based on situational demands.

1.16. State-Specific Categories of Disasters

Disasters may arise from natural hazards, human activities, or both. Human-induced factors frequently exacerbate the adverse impacts of natural disasters. On a global scale, the Intergovernmental Panel on Climate Change (IPCC) has reported that human-induced climate change has significantly increased the frequency and intensity of extreme weather events. While natural phenomena such as heavy rainfall and earthquakes occur independently of human activity, anthropogenic influences amplify their effects.

Rapid industrialization and urbanization further heighten the risk of human-induced disasters and increase the potential for damage to life, property, and infrastructure during natural and anthropogenic events. Additionally, society faces specific vulnerabilities related to Chemical, Biological, Radiological, and Nuclear (CBRN) threats, which can escalate into emergencies or full-scale disasters if inadequately managed. These considerations form the basis for the State's classification of disasters, encompassing both natural and human-induced events. The focus remains on understanding and mitigating the compounded risks stemming from human activity and its influence on natural disaster outcomes.

1.16.1. Natural Hazards and Disasters

The Disaster Information Management System (DesInventar) employs a globally recognized classification system for categorizing disasters caused by natural hazards. This system, widely used for monitoring the progress of Sendai Framework targets, organizes natural hazards into five primary categories:

- **Geological:** Hazards originate from geological processes or phenomena, such as earthquakes, landslides, and volcanic eruptions. These events can result in loss of life, injuries, health impacts, and

damage to property, disruption of livelihoods and services, and environmental degradation. Hydro-meteorological factors may also contribute to these events.

- **Hydrological:** Hazards are caused by deviations in the natural water cycle, including floods and the overflow of water bodies due to factors like wind set-up. These events can severely impact infrastructure, property, and ecosystems.
- **Meteorological:** Hazards arise from short-lived or small- to mesoscale atmospheric processes, lasting from minutes to days. Examples include storms, cyclones, and tornadoes, which pose significant risks to human life, infrastructure, and economic stability.
- **Climatological:** Hazards driven by long-term atmospheric processes, including intra-seasonal to multi-decadal climate variability. These include droughts, heat, and cold waves, disrupting ecosystems, agriculture, and communities.
- **Biological:** Hazards are caused by organic processes or biological vectors, including exposure to pathogens, toxins, and bioactive substances. These can result in illness, injury, loss of life, and social, economic, and environmental disruption.

This classification framework provides a comprehensive understanding of natural hazards, their impacts, and the strategies for effective mitigation and response.

1.16.2. Human-Induced Disasters

The National Policy on Disaster Management (NPDM) 2009 emphasizes that factors such as population growth, rapid urbanization, industrialization, development in high-risk zones, environmental degradation, and climate change significantly increase vulnerabilities to human-induced disasters. Insufficient disaster preparedness has further heightened the susceptibility of communities, wildlife, and ecosystems to these hazards.

Human-induced disasters include industrial accidents, transportation incidents (road, air, and rail), river or sea mishaps, building collapses, fires, flooding, urban flooding, and oil spills. Particularly notable are risks arising from Chemical, Biological, Radiological, and Nuclear (CBRN) threats. Terrorist activities and secondary incidents stemming from intentional or unintentional human actions compound these dangers. Addressing these risks requires robust disaster preparedness, meticulous planning, and effective response measures.

1.17. Institutional Mechanism for Disaster Management

1.17.1. State Disaster Management Authority (SDMA)

The State Disaster Management Authority (SDMA) was established under Section 14 of the Disaster Management Act of 2005 and is chaired by the Chief Minister. The SDMA is tasked with:

- Formulating disaster management policies and plans
- Overseeing the implementation of the State Disaster Management Plan (SDMP)
- Recommending the allocation of funds for mitigation and preparedness measures
- Reviewing developmental plans across departments to ensure the integration of disaster prevention, preparedness, and mitigation measures.

In emergencies, the Chairperson of the SDMA is empowered to exercise any or all of the Authority's powers, subject to ex post facto ratification by the Authority. As per Section 18 of the DM Act, 2005, the SDMA's powers and functions include:

- Formulating the state disaster management policy
- Approving the State Plan in line with guidelines from the National Authority,
- Endorsing disaster management plans prepared by various State Government departments,
- Issuing guidelines to integrate disaster prevention and mitigation measures into departmental development plans and projects,
- Coordinating the implementation of the State Plan,
- Recommending funds for mitigation and preparedness measures,
- Reviewing development plans from various State departments to ensure integration of disaster prevention and mitigation measures
- Monitoring and guiding measures related to mitigation, capacity building, and preparedness undertaken by State Government departments.

The USDMA was constituted via Government Order No. 1198/XVIII (2)/07-3(6)/2007, dated October 10, 2007, with its composition outlined in the corresponding government order.

Table 2:USDMA Constitution Committee

S.No.	Portfolio	Status
1.	Chief Minister	Chairperson
2.	Minister, Disaster management	Vice Chairperson
3.	Minister, Health & family welfare	Member
4.	Minister, Irrigation and drinking water	Member
5.	Minister, transport	Member
6.	Minister, Rural development	Member
7.	Chief Secretary Ex-Officio Chairperson of state executive committee	Member & CEO
8.	Principal Secretary, Finance	Member
9.	Principal Secretary, Disaster Management	Member

1.17.2. State Executive Committee (SEC)

As per Section 20 of the Disaster Management Act, 2005, the State Executive Committee (SEC) is established to support the State Disaster Management Authority (SDMA) in carrying out its functions and to coordinate actions in line with the guidelines set forth by the State Authority.

The SEC was constituted through Government Order No. 141/XVIII/08-3(6)/2007, dated January 8, 2008. The composition of the SEC is outlined as follows:

Table 3:SEC Committee

S. No.	Portfolio	Status
1.	Chief Secretary	Chairperson
2.	Additional Chief Secretary	Member
3.	Secretary, Disaster management	Member
4.	Secretary, Finance	Member
5.	Secretary, Health & family welfare	Member

1.17.3. District Disaster Management Authority (DDMA)

In compliance with Section 25 of the Disaster Management Act of 2005, District Disaster Management Authorities (DDMAs) have been established in all 13 districts of the State. These were constituted through Government Order Nos. 1501-13/XVIII (2)/07-3(6)/2007, dated December 4, 2007.

Table 4: Composition of the DDMAs

S. No.	Portfolio	Status
1.	District Magistrate	Chairperson
2.	Chairperson Zila Panchayat	CO- Chairperson
3.	Superintendent of Police	Member
4.	Chief Development Officer	Member
5.	O/C Disaster Management /Additional District Magistrate	Member & CEO
6.	Chief Medical Officer	Member
7.	Executive Engineer, Public Work Department	Member

1.18. Plan Execution and Implementation

The State Disaster Management Plan (SDMP) for Uttarakhand establishes priorities, timeframes, and thematic areas for Disaster Risk Reduction (DRR), which must be implemented, decentralized, and coordinated by both central and State governments. Funding for the SDMP comes from the Union and State budgets, primarily allocated through various ministries and agencies. Centrally provided funds are directed mainly at the State Disaster Response Fund (SDRF) for immediate relief and emergency response. At the same time, DRR is integrated into broader development plans without separate financial allocations. The SDMP outlines actions across short-, medium-, and long-term timeframes. Rather than sequentially, all stakeholders will implement these actions concurrently, including government agencies, the private sector, and non-governmental organizations. While full implementation may take time, significant progress has already been made, and efforts continue to meet the plan's objectives.

At the district level, each district must prepare a District Disaster Management Plan (DDMP) in alignment with the SDMP. District Disaster Management Authorities (DDMAs) regularly review and update these plans, integrate DRR into all development activities, and adopt a multi-stakeholder approach to ensure effective implementation.

Implementation challenges may arise due to the plan's ambitious scope. To address this, departments appoint nodal officers to oversee execution. The SDMP is considered a "living document" and is subject to regular updates, at least annually. Updated versions are circulated to district offices, published on the Departmental portal, and shared with key stakeholders. Annual reviews involve workshops to facilitate feedback and improve implementation.

Chapter 2

"Disasters have a way of making us
wake up."

“James Lee Witt”

2. Hazard Risks and Challenges in Uttarakhand

2.1. Background

Uttarakhand, located in the northern part of India, is a predominantly hilly state in the Indian Himalayas. It was established as the 27th state of the Indian Union on November 9, 2000, following the bifurcation of Uttar Pradesh, with 13 hill districts being carved out to form Uttarakhand. The state is situated between latitudes 28°43' N and 31°27' N, and longitudes 77°34' E and 81°02' E, covering an area of 53,483 km². It spans a maximum distance of 301 km in the east-west direction and 255 km in the north-south direction. The topography of Uttarakhand is characterized by significant variation in elevation, ranging from 210 meters in the southern plains to 7,817 meters at its highest point, Nanda Devi. The state shares international borders with China (Tibet) to the north and Nepal to the east. Additionally, it has inter-state boundaries with Himachal Pradesh to the west and northwest, and Uttar Pradesh to the south. The general profile of Uttarakhand is depicted in (Table No. 2.1).

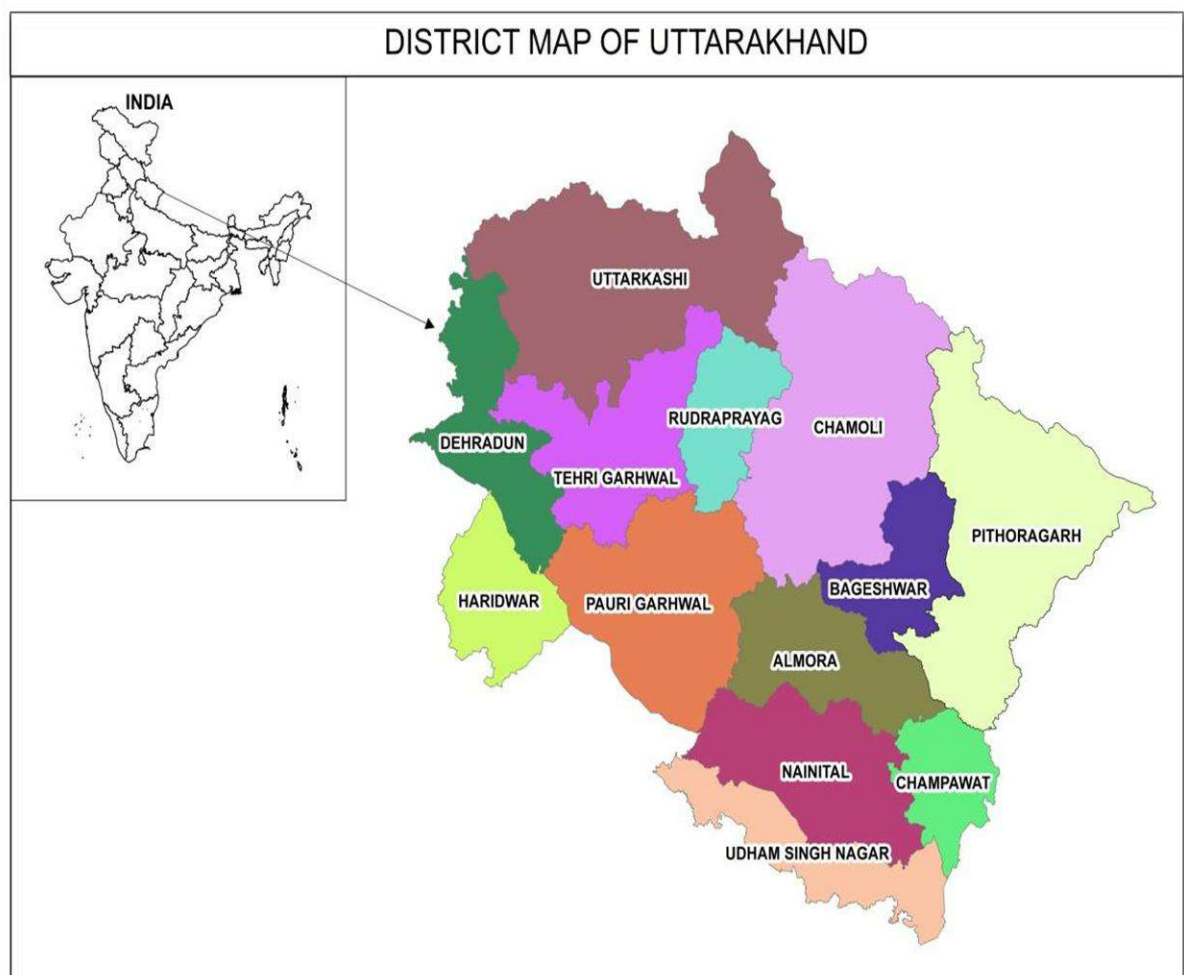


Figure 1: District map of Uttarakhand

Table 5: General Information of Uttarakhand State

State formed on		9 NOVEMBER 2000
Total area		53,483 km ²
Length/ width		320 km/385 km
Highest elevation		Nanda devi (7816 m)
Lowest elevation		Sharda Sagar Reservoir (187 m)
Total forest area		24,305 square km
Urban		30.55% (2011)
Rural		69.45% (2011)
Capital	Temporary	Dehradun
	Summer	Gairsain
Total districts and blocks		13 and 95
High court		Nainital
Main crops		Rice, wheat, maize, sugarcane, mellites & pulses.
Main fruits		Apple, litchi, plum, peach, Malta, Mango, Apricot, Kafal
Main rivers		Bhagirathi, Alaknanda, Mandakini, Pindar, Tons, Yamuna, Kali (Sharda), Bhilangana, Sarayu, Ramganga.
Main tourist and historic places		Nainital, Mussoorie, Pauri, Almora, Ranikhet, Khirsu, Rishikesh, Auli, Chopta, Jim Corbett National Park, Valley of Flowers,
Main religious places		Badrinath, Kedarnath, Gangotri, Yamunotri, Panch Kedar, Panch Badri, Panch Prayag, Haridwar, Rishikesh, Hemkund Sahib
Population density (persons/km)		189
Total population (millions)		10.09 (2011)
Male population (millions)		5.14
Female population (millions)		4.94
Sex ratio (females per 1,000 males)		963
Literacy rate (%)		78.82 (2011)
Economic profile		
GDP total (2024–2025)		3.94 lakh crore (US\$46 billion)
Per capita income		295,751 (US\$3,500) (10th)
Key industries		Automobile and auto-components, Agro & food processing, Paper industry, Pharmaceuticals, FMCG, Tourism, Hydropower, Forest-based industries (resin, plywood, sawmills)
Key industrial areas		Haridwar, Rudrapur & Sitarganj US Nagar, Dehradun (Selaqui) & Nainital

2.2. Hazard, Risks and Vulnerabilities

Uttarakhand is becoming increasingly vulnerable due to a combination of geological factors, resource exploitation, growing population pressures, and other challenges. These vulnerabilities are expected to intensify with the impacts of climate change, which could severely disrupt the Himalayan ecosystem through rising temperatures, altered precipitation patterns, more frequent cloud bursts, and changing biotic conditions. Predictions indicate that, with the expected increase in average temperatures, all aspects of human and natural life in the region will be affected. Locally, communities will face significant challenges in adapting, while the impacts of extreme rainfall events, retreating glaciers, and other changes could also affect millions of people downstream in the river basins.

Over the past few years, there has been a marked increase in extreme weather events, such as flash floods, erratic rainfall, and heatwaves, leading to higher mortality and morbidity associated with climate variability. Climate change will likely affect vulnerable groups, including women, children, and marginalized communities in the hilly terrain of Uttarakhand. Livelihoods in these areas are highly sensitive to climate change, as farming is largely rain-fed and the small-scale, subsistence nature of agriculture results in low productivity and income levels. The risks posed by climate change such as irregular rainfall and extreme weather events lead to a few dangerous disasters in the last decade in the Uttarakhand and thus migration is enhancing in the Uttarakhand state. Furthermore, connectivity and infrastructure, already vulnerable to landslides, floods, and other extreme events, are at further risk from climate change. Extreme weather can damage roads, disrupt basic services like water supply and drainage systems, and impair overall connectivity.

Many of these changes are already observable in the Uttarakhand hilly terrain. While communities are employing autonomous and collective strategies to cope with these challenges, the interaction of various factors-climate change, development, adaptation, and mitigation makes the situation complex. Uttarakhand must act as the focal point for climate change response by preparing reliable data to assess current conditions and predict future scenarios, which will inform planning and enhance resilience to climate impacts and contribute to a better quality of life for communities in the region.

Also, Hydropower is a key resource for the state, with many large and medium-sized hydroelectric projects in various phase (operational/ under constructional stage) are going on. While hydropower remains a vital resource for Uttarakhand's energy needed but climate change, flash floods, landslides, seismic risks, and glacial melt all pose serious challenges to the region's hydropower infrastructure. Addressing these risks requires a multi-faceted approach that includes better risk assessment, enhanced infrastructure resilience, early warning system and improved disaster preparedness to safeguard both the environment and the livelihoods of millions of people who rely on these energy sources.

Table 6: Status of Major Dams and Hydropower Projects in Uttarakhand

S.No.	Dam Name	Owner/Agency	Status
1	Bhimgoda Barrage	UP WRD (NDSA)	Active
2	Banbasa Barrage	UP WRD (NDSA)	Active
3	Ram Ganga Saddle Dam	UP WRD (NDSA)	Active

S.No.	Dam Name	Owner/Agency	Status
4	Ram Ganga Dam	UP WRD (NDSA)	Active
5	Dhora	UP WRD (NDSA)	Active
6	Baigul Dam	UP WRD (NDSA)	Active
7	Nanak Sagar Dam	UP WRD (NDSA)	Active
8	Tehri HPP	THDC	Active
9	Koteshwar HEP	THDC	Active
10	Tanakpur Barrage	NHPC	Active
11	Dhauliganga Dam	NHPC	Active
12	Naitwar Mori Project	SJVNL	Active
13	Lata Tapovan	NTPC	Under Construction
14	Vishnu Gad Pipalkoti HEP	THDC	Under Construction

Table 7: A. Agency-wise Status of Dam Projects in Uttarakhand

S.No.	Dam Name	Owner/Agency	Status
1	Ichari Dam	UJVNL	Active
2	Maneri Dam Stage I	UJVNL	Active
3	Jamrani Dam	Irrigation Dept.	Under Construction
4	Haripura Dam	Irrigation Dept.	Active
5	Tumaria Dam	Irrigation Dept.	Active
6	Baur Dam	Irrigation Dept.	Active
7	Tumaria Extension Dam	Irrigation Dept.	Active
8	Song Dam	Irrigation Dept.	Under Construction
9	Gola Barrage	Irrigation Dept.	Active
10	Vyasi Dam	UJVNL	Active
11	Lakhwar Dam	UJVNL	Under Construction
12	Srinagar Dam	AHPCL	Active
13	Vishnuprayag Barrage	JPVL	Active
14	Singoli-Bhatwari HEP	Renew Jal Urja	Active
15	Bhimtal Dam	Irrigation Dept.	Active

S.No.	Dam Name	Owner/Agency	Status
16	Phika Barrage	Irrigation Dept.	Active
17	Dhela Barrage	Irrigation Dept.	Active
18	Gagas Barrage	Irrigation Dept.	Under Construction
19	Kolidhek Dam	Irrigation Dept.	Active
20	Tharkot Dam	Irrigation Dept.	Active
21	Kosi Barrage (Ramnagar)	Irrigation Dept.	Active
22	Joshiyara Barrage MB-II	UJVNL	Active
23	Dakpathar Barrage	UJVNL	Active
24	Virbhadra Barrage	UJVNL	Active
25	Asan Barrage	UJVNL	Active

Table 8: Status of Major Dams and Hydropower Projects with Capacity

S. No.	Project Name	Stage (construction / feasibility / appraisal /DPR)	Installed Capacity (mw)
YAMUNA VALLEY			
1	Yamuna HEP Stage-I (Dakpathar, Dhakrani, Dhalipur)	Constructed	84.75
2	Yamuna HEP Stage-II Part 1 (Ichari Dam, Chibro)	Constructed	240
3	Yamuna HEP Stage-II Part 2 (Khodri)	Constructed	120
4	Yamuna HEP Stage-IV Part 1 (Asan Barrage, Kulhal)	Constructed	30
5	Yamuna HEP Stage-IV Part 2 (Khara)	Constructed	72
6	Hanuman Chatti - Syana Chatti	Feasibility	33
7	Barnigad - Naiangaon	Feasibility	34
8	Barkot - Kuwa	Appraisal	30
9	Syana Chatti - Gangani	Appraisal	45
TONS VALLEY			
10	Kishau Dam	DPR	600
11	Tuini - Plasu	DPR	45
12	Deora Mori	Feasibility	27
13	Mori - Hanol	Feasibility	27
14	Hanol - Tuini	Appraisal	45
15	Arakot - Tuini	Appraisal	70
16	Jakhhol Sankhari	Appraisal	60
BHAGIRATHI VALLEY			
17	Maneri Bhali HEP Stage-I	Constructed	90
18	Maneri Bhali HEP Stage-II	Constructed	304 (Dharasu)
19	Pala Maneri	DPR prepared	416
20	Loharinag Pala	DPR prepared	520
21	Bhairon Ghati-I	Appraisal	324
22	Bhairon Ghati-II	Appraisal	240
DHAULIGANGA VALLEY			
23	Tapovan Vishnugad	DPR prepared	360

S. No.	Project Name	Stage (construction / feasibility / appraisal /DPR)	Installed Capacity (mw)
24	Markura Lata	Feasibility	45
25	Lata Tapovan	Feasibility	108
ALAKNANDA VALLEY			
26	Bawla - Nandprayag	DPR	132
27	Vishnugad Pipalkoti	Feasibility	340
28	Utyasu Dam	Feasibility	1000
29	Bhuinder Ganga	Appraisal	20
30	Karnaprayag Dam	Appraisal	252
PINDER VALLEY			
31	Pinder Ghati Scheme	Appraisal	112
32	Padli Dam	Appraisal	27
MANDAKINI VALLEY			
33	Chunni – Semi	Feasibility	26
GANGA VALLEY			
34	Kotli Bhel Dam	DPR prepared	1000
SONG RIVER			
35	Song Dam (Drinking Water)	DPR prepared	6
RAMGANGA VALLEY			
36	Ramganga Project, Kalagarh	Constructed	198
37	Purvi Ramganga Dam	Identified	45
38	Hardhawa Cheena	Identified	10
KOSI VALLEY			
39	Babas Dam	Identified	88
40	Khairna Project	Identified	20
41	Barseemi Dam	Identified	12
42	Quarab Dam	Identified	20
SARYU VALLEY			
43	Chamgad Dam	Identified	400
44	Sheraghat Dam	Identified	45
45	Balighat Binola Dam	Identified	15
BHILANGANA VALLEY			
46	Bhilangana Project	Identified	19
SHARDA VALLEY			
47	Pancheshwar Dam	Identified	1000
48	Purnagiri Dam	Identified	1000
GOLA VALLEY			
49	Jamrani Dam Project	DPR prepared	14
CHILLA (GANGA CANAL)			
50	Chilla HEP	Constructed	144

Thus, climate change poses a serious challenge to Uttarakhand, with its natural environment, livelihoods, and infrastructure all at risk. Addressing these challenges requires comprehensive planning, better data, improved climate adaptation strategies, and enhanced resilience at both the state and local levels.

2.3. Vulnerability to Natural hazard

Uttarakhand is highly vulnerable to a range of natural hazards due to its rugged terrain, climatic conditions, and active seismic zones. Table 9 categorizes the risks associated with various hazards across different districts in Uttarakhand, followed by a description of each natural hazard.

Table 9: Multi-Hazard Vulnerability Profile of Districts in Uttarakhand

S.No.	District	Land Slides	Earth Quakes	Flash floods	Avalanches	GLOF
1.	Almora	Moderate	High	Moderate	Low	Low
2.	Bageshwar	High	Moderate	High	Moderate	High
3.	Chamoli	High	High	High	High	High
4.	Champawat	High	Moderate	High	Low	Low
5.	Dehradun	Moderate	Moderate	Moderate	None	None
6.	Haridwar	Low	Moderate	High	None	None
7.	Nainital	High	High	High	Low	Low
8.	Pauri Garhwal	High	High	Moderate	Low	Low
9.	Pithoragarh	High	High	High	High	High
10.	Rudraprayag	High	High	High	Moderate	Moderate
11.	Tehri Garhwal	High	High	High	Low	Moderate
12.	Uttarkashi	High	High	High	Moderate	Moderate
13.	US Nagar	Low	Moderate	High	None	None

2.3.1. Landslides

The steep and fragile terrain of Uttarakhand makes it highly prone to landslides, particularly during the monsoon season. Landslides often block roads, disrupt transportation, and result in fatalities. These landslides also cause significant environmental damage by uprooting trees, destroying forest cover, and disrupting local ecosystems. The debris flows into rivers, degrading water quality and harming aquatic life. The region has witnessed numerous landslides in its history, with some recent ones severely affecting connectivity and human settlements. According to the Geological Survey of India, 22% of area in Uttarakhand falls under high risk and 43% areas are of moderate risk to landslide (Figure 2). Every year, casualties due to landslides in various parts of Uttarakhand during monsoon are very common. In last year, i.e. 2023, about 100 people were reported dead due to landslides and associated natural events in Uttarakhand.

([http://timesofindia.indiatimes.com/city/dehradun/uttarakhanddisasterskill-100-in-3-months-most-in-landslides/ article show / 103768992.cms](http://timesofindia.indiatimes.com/city/dehradun/uttarakhanddisasterskill-100-in-3-months-most-in-landslides/article-show/103768992.cms)). As these events cannot be completely prevented, however, the intensity and severity of their impacts can be minimized by taking effective measures and by planning for disaster preparedness.)

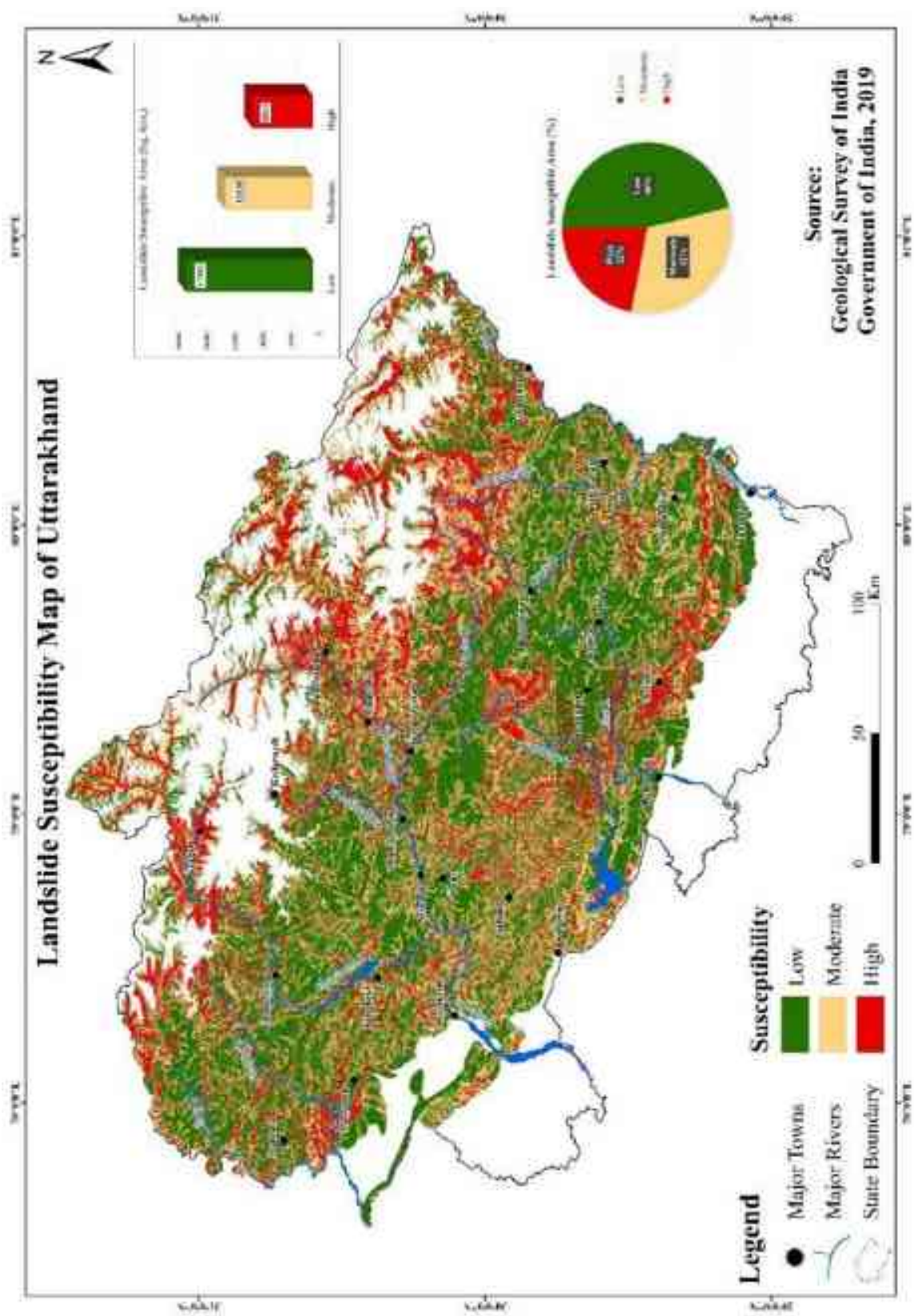


Figure 2: Landslide Susceptibility map of Uttarakhand

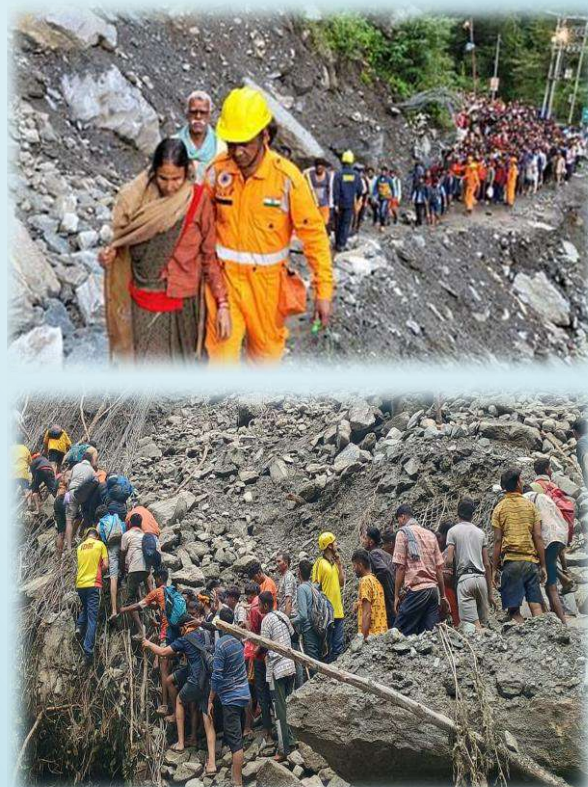
SONPRAYAG LANDSLIDE CRISIS – 2024

DISTRICT RUDRAPRAYAG

The rescue operation near Sonprayag on 23rd July 2024 was one of the most challenging disaster response efforts in recent years. It occurred on 23rd July 2024, a catastrophic weather event led to the complete washout of a 400-meter stretch of the Paidal Marg near Sonprayag, leaving approximately 15,000 pilgrims stranded between Kedarnath and Sonprayag. The situation became dire due to extreme weather conditions, including heavy rainfall and landslides, further complicating rescue operations. With no alternate route available and the Mandakini River flowing with high velocity at the base, the rescue effort presented an immense challenge. The Uttarakhand Disaster Response Force (SDRF), National Disaster Response Force (NDRF), Indo-Tibetan Border Police (ITBP), and local authorities were swiftly mobilized. Helicopter services from UCADA and private choppers were deployed for aerial rescue operations. Temporary rope bridges were constructed over the Mandakini River for safe evacuation of people in small groups. Within 48 hours, the majority of the 15,000 stranded pilgrims were safely evacuated due to the prompt response and effective coordination of authorities. The combined efforts of multiple agencies, the use of innovative rescue techniques, and the resilience of the stranded pilgrims contributed to the successful evacuation. The incident underscored the need for better infrastructure, early warning systems, and alternative routes in disaster-prone pilgrimage areas to prevent such crises in the future.



Entire road washout due to landslide



Rescue operation

Table 10: Major Landslide Events in Uttarakhand

S. No.	Year	Location	District	Cause	Impact
1	1998	Malpa Landslide	Pithoragarh	Heavy rains, slope failure	221 deaths including pilgrims & Army Kailash-Mansarovar route blocked
2	2003	Varunavat Landslide	Uttarkashi	Weathered rocks, human activity	Major damage in town 300+ buildings affected
3	2012	Okhimath Landslide	Rudraprayag	Cloudburst	69 killed massive damage to houses and terrain
4	2013	Kedarnath Valley Disaster	Rudraprayag	Heavy rain falls, Chorabari lake outburst	Thousands of dead, entire Rambada town destroyed
5	2016	Bastari (Didihat) Landslide	Pithoragarh	Heavy rainfall	18 dead road and property damaged
6	2010–Now	Baliya Nala Landslide	Nainital	Chronic slide zone, rainfall	Affected settlements at Rahis colony, Risk to infrastructure
7	Frequent but major in 1998, 2008, and 2024	Mansa Devi Hill landslide	Haridwar	Unfavourable geological conditions, erosion triggered by heavy rainfall	Risk to Mansa devi hill bypass road, railway track settlements, and pilgrims
8	2022	Lansdowne–Satpuli Landslide	Pauri	Rainfall + weak terrain	Roads blocked, prone to repeated failures
9	August 2023	Jakhan Landslide	Dehradun	Rainfall, geologically faulted area	Affected 17 families, buried houses, road washed away
10	2023	Gopeshwar Landslide	Chamoli	Continuous rainfall	Several houses and road (NH-07) affected
11	27 August 2024	Tingad Landslide	Uttarkashi	Debris flow due to continuous rainfall	Damaged entire Tingad Village, affected 35 (approx.) families
12	6 August 2025	Buransi and Sainji Landslide	Pauri	Landslide due to continuous rainfall	Damaged Buransi and Sainji village with casualties
13	22 August 2025	Tharali Landslide	Chamoli	Debris flow/ Landslide due to continuous rainfall	Damaged entire tharali bazaar, Kotdeep, Saangwada and chepro bazar
14	28 August 2025	Taljaman Landslide	Rudraprayag	Landslide due to continuous rainfall	residential structures were buried. twenty cattle were lost
15	29 August 2025	Chenagaad Landslide	Rudraprayag	Debris flow due to continuous rainfall	Damaged bridge

2.3.2. Glacial Lake Outburst Flood (GLOFs) /Snow Avalanche

Uttarakhand, with its many glaciers, is also at risk from Glacial Lake Outburst Floods (GLOFs). The primary cause behind global warming and the rising surface temperature has increased the risk of GLOFs. Even warmer average temperatures change our mountains, glaciers are melting faster, reducing the amount of water locked up in ice. The glacial lakes are growing in an exponential manner and pushing up against their natural capacity. The melting of glaciers due to rising temperatures increases the risk of GLOFs, which occur when a glacial lake breaches its banks, sending massive amounts of water and debris downstream.

Two major glacial lake outburst floods (GLOF)/snow related hazard took place in Uttarakhand in last decade. The first was the lake outburst in Kedarnath valley in June 2013 which led to 6000 deaths. Avalanches follow, sometimes causing floods even without a GLOF, such as those that inundated the state of Uttarakhand in 2021. In 2021, GLOF occurred in Chamoli's Rishiganga valley, experienced a catastrophic event when a glacier broke off, causing flash floods that claimed several lives and severely damaged infrastructure. In another incident during 2025, 54 people were buried near Mana village due to snow avalanche, however 46 were safely evacuated due to prompt planning and efforts by various agencies. This incident highlights the growing threat posed by GLOFs in the region.

Uttarakhand's vulnerability to GLOF incidents is underscored by the presence of 13 glacial lakes identified by National Disaster Management Authority (NDMA) in Uttarakhand. as potential hotspots for such disasters. These lakes have been categorized into three risk levels, denoted as 'A', 'B', and 'C'. There are 5 most vulnerable glacial lake prone to GLOFs classified under the 'A' category, including Vasudhara Tal in the Dhauliganga basin of Chamoli district, and four others situated in Pithoragarh district - Maban Lake in Lassar Yangti Valley, Pyungru Lake in the Darma basin, and two unclassified lakes in the Darma and Kuthi Yangti valleys. **(Figure 3).**

Currently, an NDMA-sponsored project under the National Glacial Risk Mitigation Program (NGRMP) is being implemented to address risks associated with critical glacial lakes. The project focuses on the establishment of robust early warning systems, continuous monitoring using advanced technologies, and the development of appropriate mitigation measures to reduce the potential impacts of Glacial Lake Outburst Floods (GLOFs). In addition, it emphasizes capacity building of local communities and stakeholders through training, awareness programs, and institutional strengthening to enhance preparedness and response at these vulnerable sites. In this project, high-resolution bathymetric surveys are being conducted to estimate lake storage volumes accurately. Remote sensing and GIS-based analysis are being used to map probable affected areas, and hydro-meteorological data analysis will provide long-term insights into weather patterns and glacial melt rates. The program will deploy automated real-time monitoring systems, including hydro-meteorological stations, remote sensors, and telemetry units. Also Controlled drainage systems, siphoning techniques, and reinforced outlet channels or spillways to regulate lake water levels. Additionally, structural reinforcements for moraine dams, as well as debris flow barriers and check dams, will be established to minimize the impact of potential floods. To enhance awareness and capacity building, the program will conduct community workshops, training sessions, and evacuation drills. Hazard maps, simulation exercises, and educational materials will be developed to improve disaster preparedness.

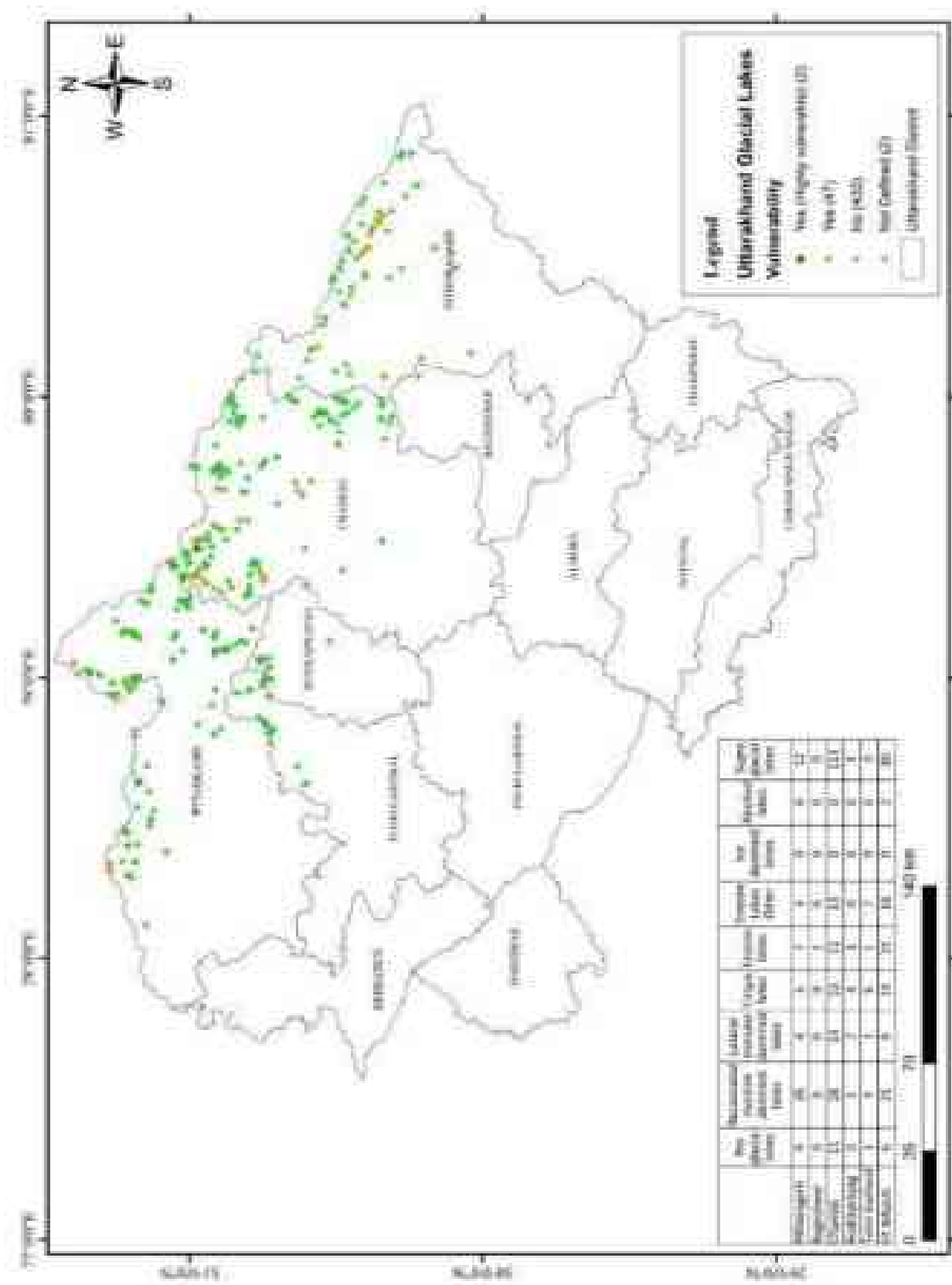


Figure 3: Map Uttarakhand Glacial Lakes Vulnerability

KEDARNATH DISASTER – 2013

DISTRICT RUDRAPRAYAG

The Kedarnath disaster occurred in June 2013 in Uttarakhand, primarily due to unprecedented rainfall (300% above average) from June 16 to 17, 2013 that resulted Chorabari glacial lake outburst caused flash flood led to the loss of thousands of lives. Many people were stranded, and large areas were submerged. Critical infrastructure, including roads, bridges, and buildings, was washed away. The village of Rambada was destroyed, and the damage caused was extensive, leaving the region in ruins. The disaster is often referred to as a "Himalayan Tsunami" due to its scale and impact. The disaster led to the loss of over 5,700 lives, with thousands more missing.

Rescue operations involved a coordinated effort by the Indian Army, Navy, and Air Force, which deployed helicopters to evacuate thousands of stranded people. Central and State agencies like the National Disaster Response Force (NDRF) and State Disaster Response Force (SDRF) and local authorities played a key role in the relief work, providing food, medical aid, and shelter to the survivors.

The disaster highlighted the need for better disaster preparedness, sustainable development, and environmental protection to prevent future calamities in other region with similar threat in the Uttarakhand



Condition at Kedarnath area before (Left) and after (Right) the disaster in 2013

MANA SNOW AVALANCHE – 2025

DISTRICT CHAMOLI

On March 2, 2025, a devastating avalanche struck Mana village, near Badrinath, burying 54 labourers from the Border Roads Organization (BRO) under several feet of snow while they were housed in eight containers. The workers had been inside the container at an elevation of 10,500 feet above sea level when the avalanche occurred in the early morning

The rescue operation proved to be extremely challenging due to continuous heavy snowfall and the difficult terrain. The rescue teams worked tirelessly, often operating under 60-hour shifts in harsh conditions. The operation was marked by an intense, coordinated effort involving personnel from various sectors. To reach and evacuate the workers, helicopters played a critical role in overcoming the obstacle of snow-blocked roads. A total of eight helicopters were deployed for the evacuation, including five from the Indian Army, two from the Indian Air Force, and one civilian helicopter.

In addition to the physical effort involved in extracting the labourers, a drone-based detection system was employed to locate the buried containers, which were trapped under snow. Due to the tireless efforts of the rescue teams, the majority of the workers were safely evacuated. Those rescued were transported to the Jyotirmath Army Hospital for further medical treatment. The operation showcased the dedication, skill, and collaboration of various State and Central forces in overcoming one of the most difficult and dangerous rescue missions.



Rescue operation after snow avalanche near village Mana

2.3.3. Heat Waves

In recent years, Uttarakhand has begun experiencing an increasing number of extreme heat events, a trend that was once uncommon in this predominantly hilly state. Heat waves are emerging as a serious public health concern, leading to reduced overall well-being and rising cases of heat-related illnesses and fatalities, particularly among vulnerable groups such as the elderly, children, and outdoor workers.

Although temperature thresholds for health impacts vary with region and season, even moderate increases in temperature can have significant effects in areas not traditionally accustomed to high heat. The direct and indirect health risks associated with heat waves, including dehydration, heatstroke, and chronic illnesses—are becoming increasingly evident across the state. Given the rising frequency, intensity, and duration of heat waves, it is virtually certain that these events will continue to grow more severe in the coming decades. Without timely and targeted intervention, Uttarakhand may face a sharp increase in heat-related mortality and morbidity. Thus, it is important to develop and implement heat wave management plans tailored to the region's unique geography and climate include public awareness campaigns, improved healthcare response, urban planning strategies (such as increasing green cover), and community-based adaptation measures to protect vulnerable populations.

2.3.4. Cold Waves

In places like Uttarakhand, where both the terrain and weather patterns can be unpredictable, cold waves are a serious concern during the winter months. They often require preparedness and coordination between local authorities, the community, and emergency responders to minimize loss of life and property. A cold wave refers to a prolonged period of unusually low temperatures, typically caused by an influx of cold air from polar or subpolar regions. These waves can be harsh, especially in mountainous areas, and have several consequences like adverse impact on health, Disruption to Infrastructure, damage to Agriculture and sometimes lead to natural hazards like Avalanches. In some cases, a cold wave can cause melting snow to freeze, and when temperatures rise abruptly, it can lead to rapid snowmelt, causing floods and accelerating landslides due to freeze and thaw action. Therefore planning, responses and alerts are utmost necessary along with Emergency Shelters and medical care of individuals. Uttarakhand is one of the states where cold wave events indicate rising trends. **(Figure 3).**

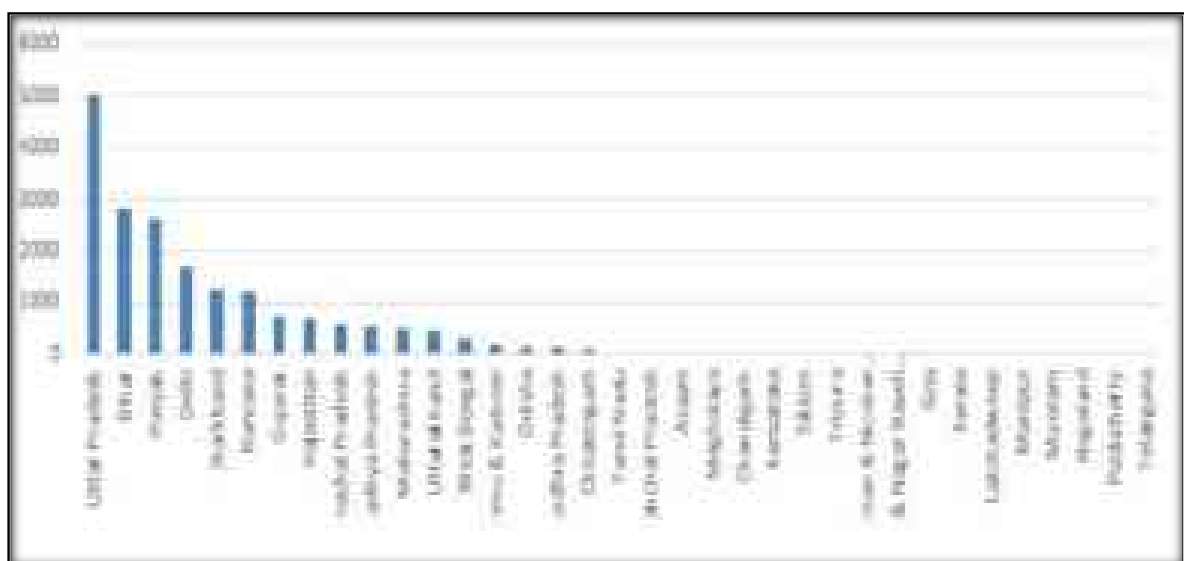


Figure 4: Total numbers in death due to cold waves in different states during 1995-2020

2.3.5. Earthquake

Uttarakhand's seismicity stems from the ongoing India-Eurasia collision, spawning frequent moderate-to-large quakes. IS 1893:2016 maps highlight proximity to faults like the Main Central Thrust (MCT), responsible for historical events. Probabilistic hazard assessments show PGA ranging 0.20g-0.61g for maximum credible earthquakes, urging soil-specific adjustments. Uttarakhand, situated in the Himalayan foothills, faces intense seismic activity as outlined in IS 1893:2016. This code classifies the state predominantly in seismic zone V, the highest risk category, reflecting its position along active thrust faults like the Main Himalayan Thrust. The zone factor (Z) of the seismic zone-V is 0.36, indicating peak ground acceleration (PGA) up to 0.36g for a 2,475-year return period. Northern districts near Nepal and China borders remain in this severe zone, consistent with prior maps but with refined contours in 2016. Some southern plains edge into Zone IV (Z=0.24), yet the entire state demands robust design due to uniform high vulnerability. For hill buildings, IS 1893:2016 mandates higher importance factors, response reduction via ductility, and site-specific spectra, driving the code's emphasis on ductile structures and dynamic analysis.

National Earthquake Risk Mitigation Project (NERMP) aims to enhance resilience of the infrastructure. NERMP project is proposed by National Disaster Management Authority (NDMA) and financed by Ministry of Home Affairs (MHA), Government of India, New Delhi. NERMP project focuses on the five key areas: Earthquake Hazard Risk Assessment, Earthquake Hazard Monitoring and Early Warning System, Earthquake Safety Regulation and Enforcement, Earthquake Resistant Technology Practice, and Community Based Mitigation Initiatives- Funding from P&CB Window.

Key Outcomes of NERMP

- Improved earthquake data recording through advanced seismic sensors network.
- Geodetic recording through GNSS/GPS network for the state.
- Seismic Risk Scenario of the ten identified towns and state at broader level.
- Strengthened EEWS with a denser sensor network and wider siren coverage, enabling faster and more accurate earthquake alerts.
- Improved enforcement of earthquake-resistant building codes through regulatory reforms and digital permit systems.
- Increased resilience of public and private structures through seismic retrofitting initiatives.

Under the Earthquake Safety Regulation and Enforcement component the Uttarakhand government is planning to revise the existing building byelaws under the National Earthquake Risk Mitigation Project (NERMP) to align the guidelines mentioned in the BIS code. The Government has constituted a technical committee to review the adequacy of existing building byelaws and to update new one in accordance with the BIS code.

The Uttarakhand government is monitoring earthquake event throughout the state by establishment of Uttarakhand Earthquake Early Warning System (UEEWS) throughout the major fault lines with the help of Indian Institute of Technology, Roorkee. UEEWS continuously monitors the activity on the basis of 24 x 7 with the help of established networks BSNL and SWAN. The UEEWS systems rely on a network of seismic sensors strategically placed near fault lines and potential earthquake zones. Uttarakhand, with its numerous faults such as the Main Central Thrust, Main Boundary Thrust, and Main Frontal Thrust, has significant potential for great earthquakes. A total of 169 sensors is installed to cover all these earthquake-prone zones, ensuring

comprehensive monitoring. These sensors are strategically placed at BSNL and SWAN offices, and the data is streamed to the server at the EEWS lab at IIT Roorkee via dedicated network lines provided by BSNL and SWAN. A total of 112 sirens has been installed throughout the state to disseminate the alerts and notifications to public. Bhukamp Disaster Early Vigilante (BhuDeV) is a smartphone application developed to provide early warnings for earthquakes, helping users take precautionary actions before damaging earthquake waves reach their location. The app issues public warnings for impending damaging earthquakes with a magnitude above 4.5, while notifications are sent for non-damaging earthquakes with a magnitude below 4. This approach is intended to avoid causing unnecessary panic among the public with warning sounds for less severe quakes.

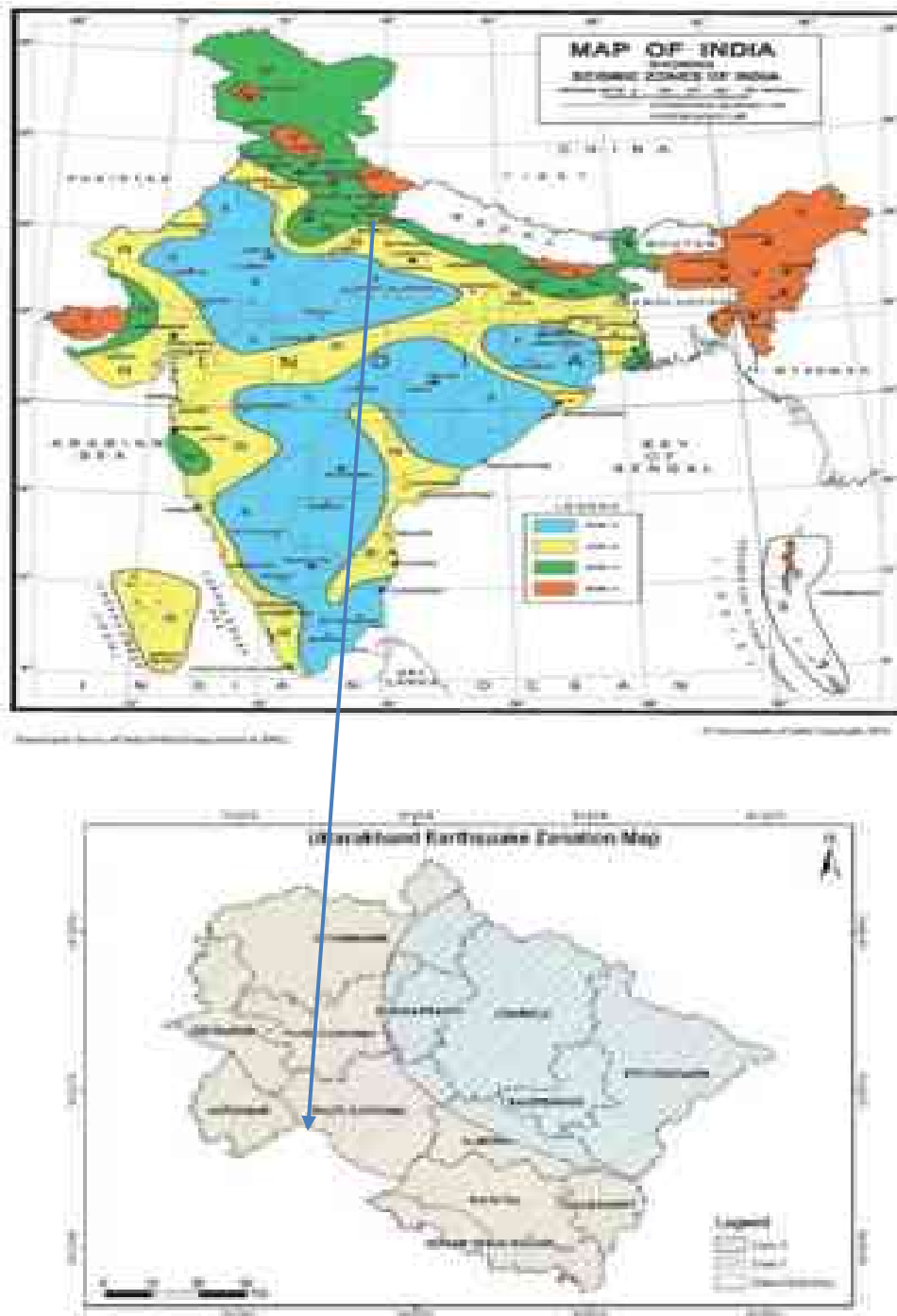


Figure 5:Earthquake Zone of India and Uttarakhand as per IS 1893 (Part I):2016

UTTARKASHI EARTHQUAKE – 1991

The 1991 Uttarkashi earthquake struck the Garhwal Himalayas at 02:53 IST on 20 October, registering a magnitude of 6.8. The epicenter was located near Uttarkashi along the Main Central Thrust, at a depth of approximately 11–12 km. The earthquake caused intense ground shaking across a ~20 km² area, with severe effects observed in towns such as Uttarkashi, Bhatwari, Maneri, Budhakedar, Krishanpur, and Mahinanda. The disaster affected over 3,00,000 people across nearly 1,300 villages. Thousands of homes were either damaged or destroyed. Around 768 fatalities and over 5,000 people injured. Infrastructural damage was widespread roads, bridges, power lines, and telecommunications systems were severely disrupted, significantly hampering rescue and relief operations. Overall, the 1991 Uttarkashi earthquake was a landmark event in the seismic history of the Indian Himalayas. Though devastating, it provided critical lessons that catalyzed significant advancements in structural engineering, seismic safety awareness, and disaster management planning across the state is essential

CHAMOLI EARTHQUAKE – 1999

The 1999 Chamoli earthquake struck the Chamoli district in the Garhwal Himalayas of Uttarakhand at 12:35 AM IST on 29 March 1999. It recorded a magnitude of 6.6 on the Richter scale, with its epicentre near Chamoli town, at a depth of approximately 15 km along the Main Central Thrust (MCT) a major tectonic fault zone. The earthquake caused moderate to severe damage across several districts, including Chamoli, Rudraprayag, Pauri and Almora. Over 100 people lost their lives, and several hundred were injured. Thousands of houses particularly those made of unreinforced stone masonry collapsed or were damaged, displacing large numbers of residents. Key infrastructure such as roads, bridges, and communication systems suffered disruption. Post-quake investigations by agencies including the Geological Survey of India and IITs revealed that many of the affected structures failed due to lack of earthquake-resistant features.

This earthquake served as a reminder of the region's vulnerability to moderate-to-strong seismic events and emphasized the need for sustained efforts in earthquake preparedness, public awareness, retrofitting of vulnerable structures, and enforcing seismic codes in hill towns of northern India.

2.3.6. Lightning

Lightning incidents in Uttarakhand, especially during the pre-monsoon and monsoon seasons, have been a growing concern due to the region's hilly terrain, high-altitude zones, and vulnerable rural communities. The lightning-related fatalities and injuries, affecting both human and animal life in Uttarakhand thus the role of a management plan in mitigating its impact is utmost important: A comprehensive lightning management plan can greatly reduce casualties and property damage. An attempt has been made to generate Real-time lightning alerts using networks like the Indian Meteorological Department's (IMD) Lightning Detection System or Mobile alerts (e.g., Damini app) to warn people in real-time. Also, need of Installation of lightning arresters in schools, hospitals, and community centers are important along with providing the emergency kits and first-aid training for lightning injuries. The awareness Campaigns at schools, village centers, and through social media to educate about "lightning-safe" behavior is important part of disaster management plans at district and state levels. Promoting research on lightning hotspots using satellite data and ground-based observation could be helpful in minimizing the risk and losses

In addition to the above recurring natural hazards, the state has experienced numerous catastrophic events in the past which highlighted the vulnerability of Uttarakhand and emphasized the urgent need for better planning and preparedness to address such scenarios. There are several major disasters witnessing Emergency Situations in Uttarakhand. Few of these devastating events are Kedarnath disaster 2013, Chamoli flash flood event 2021, Jyotirmath Subsidence crises 2023, Silkiyara tunnel collapse 2023, Sonprayag Landslide 2024 and Mana Ice Avalanche 2025.

2.3.7. Risk due to Anthropogenic activity

Human-induced risks in Uttarakhand have become a significant concern due to increased human activities in recent decades. These hazards result from the interaction between human development, environmental degradation, and natural systems. The key human-induced hazards in Uttarakhand include deforestation and loss of vegetation that causes increased soil erosion, especially during monsoons, leading to landslides and flash floods. It also reduces water retention capacity in the soil, contributing to lower groundwater levels. Rapid and unregulated urbanization, expansion of infrastructure (roads, dams, resorts), and the construction of buildings in fragile areas without considering environmental impact led to disaster. Agricultural expansion, urban development, Road expansion and encroachment strengthening disaster risk reduction programs, early warning systems, and community and awareness to respond to the natural disasters is essential.

JOSHIMATH (JYOTIRMATH) SUBSIDENCE CRISIS – 2023

DISTRICT CHAMOLI

In January 2023, Jyotirmath, township faced a severe land subsidence crisis, leading to panic, situation among residents and thus requires government intervention. Numerous houses and civil structures were reported to affect due to subsidence. According to residents, this subsidence had been noticed over several years but became increasingly severe from January 2 to January 8, 2023. The local government reported that 355 families were evacuated and temporarily relocated to hotels, while a few families temporarily migrated to other parts of the state. As a response, team of 12 institutions were engaged to find out the causes and solution of the said disaster. The Experts linked the subsidence to geological fragility, unplanned urbanization, and underground water seepage. The investigation report submitted to Government of India suggested the need of implementing controlled drainage measures to manage water seepage along with compensation and rehabilitation plans for affected residents. The Jyotirmath subsidence crisis served as a wake-up call for other settlements in the Himalayan region. The event highlighted the need for scientific urban planning, sustainable infrastructure development, and proactive disaster management.



Cracks on walls due to ground



Cracks and Subsidence of ground

SILKIYARA TUNNEL COLLAPSED – 2023

On November 12th, 2023, a partial collapse of the Silkiyara - Barkot tunnel in the Uttarkashi district resulted in the entrapment of 41 workers. The incident created a life-threatening situation and necessitated a large-scale rescue operation. The workers were successfully rescued after 17 days with extensive coordinated efforts of various agencies, including the National Disaster Response Force (NDRF), state authorities, and the Indian Army. This event underscored the need for improved safety protocols and disaster preparedness for unforeseen events in high-risk infrastructure projects, especially in challenging and remote terrains like those in Uttarakhand. The collapse of the tunnel has been a stark reminder of the potential risks associated with infrastructure development in disaster-prone areas and highlights the importance of incorporating robust disaster risk reduction measures into planning processes. Given the region's susceptibility to both natural hazards and human-made accidents, there is an urgent need to enhance emergency preparedness, improve early-warning systems, and ensure better coordination between local, state, and national agencies during crises.



Portal of Silkiyara Tunnel

2.3.8. Risk due to Forest Fire

As per the Forest Survey of India (FSI) 2019 report, Uttarakhand has a significant portion of its geographical area under forest cover (**Figure 5**). The forest area is classified into three categories:

- Very Dense Forests: 5,046.76 sq. km (9.44% of the total geographical area)
- Moderately Dense Forests: 12,805.24 sq. km (23.94%)
- Open Forests: 6,451.04 sq. km (12.06%)

In total, forests cover approximately 45.44% of the state's land area, making Uttarakhand one of India's most forested states and thus act as natural barriers against landslides, floods, and soil erosion, which are common in the region due to its mountainous terrain. However, at the same time, Forest fires are a recurrent issue in Uttarakhand, particularly during the dry summer months leading to loss of biodiversity and damage to the ecosystem is also a major concern of the Uttarakhand state.

These fires have become more frequent and intense over the years, damaging forest cover, wildlife habitats, and human settlements. The increasing frequency of forest fires is intensified by climate change and inadequate forest management practices, leading to environmental degradation and loss of biodiversity.

The area under forest in Uttarakhand is 3.4 million hectares, which constitutes 61.45% of its total land available for utilization. By legal status, reserve forests constitute 71.08%, protected forests 28.51% and unclassified forests 0.41% of the total forest area. The major forest types occurring in the state are Tropical Moist Deciduous, Tropical Dry Deciduous, Sub-tropical Pine, Himalayan Moist Temperate, Sub-Alpine and Alpine Forests. Forests are largely distributed throughout the state, with conifers and Sal being the major forest formation.

Environmental factors contributing to the sudden increase in wildfires include decline in rainy days and rising temperatures in Uttarakhand. In 2024, forest fires were reported from 11 out of 13 districts of Uttarakhand. Fires scorched forests of many districts in the Garhwali and Kumaon Himalayas in the state. In the Garhwal unit, forest fires were reported from Uttarkashi, Pauri, Rudraprayag, Chamoli and Dehradun. In the Kumaon division, such incidents were recorded in Almora, Bageshwar, Pithoragarh and Udham Singh Nagar.

According to the Uttarakhand Forest Department, a total of 11,256 incidents of forest fires were recorded in the state between November 23, 2023, and June 19, 2024.

Forest fires in Uttarakhand pose a significant threat to the state's environment, biodiversity, and communities. While natural factors like lightning and climate change play a role, human activities remain the primary cause of these devastating fires. Mitigation efforts, ranging from improved forest management and community participation to technological advancements, are essential to controlling the damage caused by these fires. Uttarakhand's rich biodiversity and natural resources can only be preserved if forest fires are effectively managed, and awareness is raised at both the community and policy levels. Balancing development with conservation is crucial to ensure that the forests of Uttarakhand continue to thrive and provide ecological services for generations to come. Therefore, a Fire Protection Plan is must in Uttarakhand to carry out preparedness and response activities which include preparedness for the fire suppression, developing appropriate modern early warning capability of fire danger to reduce the hazards and potential losses along with the safety of firefighting personnel and the public.

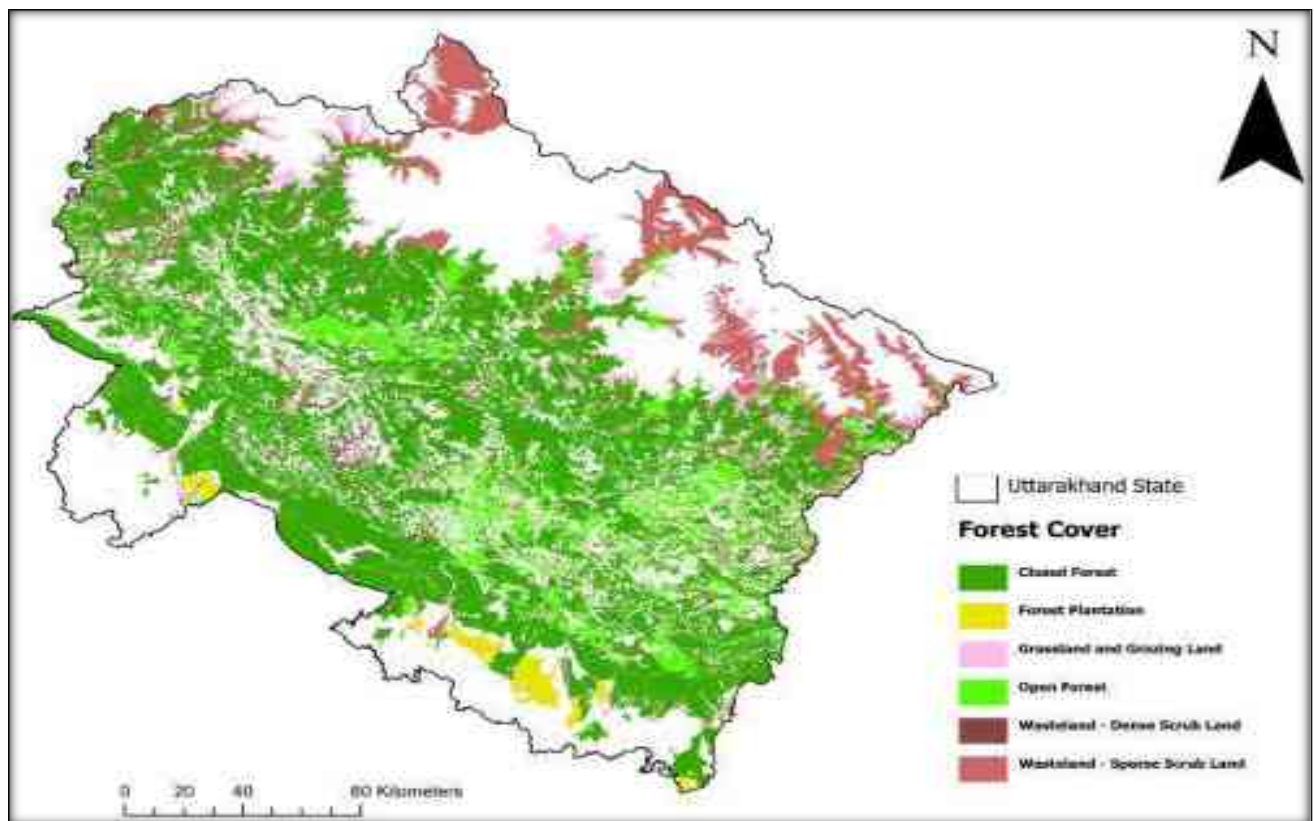


Figure 6: Distribution of Forest Cover in Uttarakhand

2.3.9. Risk due to Stampede

The term "stampede disaster" typically refers to incidents where large crowds gather in a confined space, and chaos ensues, resulting in numerous injuries or fatalities. In the context of Uttarakhand, one of the most notable stampede disasters occurred during the Kumbh Mela and other religious gatherings, particularly at the Char Dham Yatra. There are some stampede incidents in Uttarakhand at various time periods that emphasize the need for proper management plans. For e.g. a stampede occurred on January 14, 2013, at the Kumbh Mela in Haridwar, which is one of the largest religious gatherings in India. During the bathing ritual on the banks of the Ganges, many devotees surged forward, resulting in deaths and many injuries.

The stampede was aggravated by the overcrowding and the lack of proper crowd control measures, highlighting the need for better management plans for such massive events. Also, the Char Dham Yatra, a religious pilgrimage to four sacred shrines in Uttarakhand (Yamunotri, Gangotri, Kedarnath, and Badrinath), has been the site of multiple stampedes due to heavy crowds, especially during peak pilgrimage seasons. In 2017, a stampede occurred at the Kedarnath temple when many devotees were caught in a rush to enter the temple, resulting in injuries. Overcrowding and poor planning, lack of crowd control mechanisms, and mismanagement of resources have often been identified as key factors in the occurrence of stampedes. Many of the pilgrimage sites in Uttarakhand have narrow walkways or limited entry and exit points, making it difficult to manage large crowds, especially during peak times. Thus, it is utmost important in Uttarakhand to incorporate proper planning to help manage crowds using technological interventions, such as crowd tracking systems and the use of drones for monitoring large gatherings.

2.3.10. Flood Risk in Riverine area

Riverine areas in Uttarakhand are particularly prone to flooding during the monsoon season. The heavy rainfall in the state, combined with the steep terrain, leads to increased runoff into rivers, which causes flooding in downstream areas when overflow, inundating villages, farmlands, and infrastructure. These floods are particularly devastating in the low-lying plains and valleys. The erosion of riverbanks is another major issue in Uttarakhand. The powerful rivers, especially during the monsoon, erode the banks, resulting in the loss of agricultural land, destruction of homes, and displacement of people. Floods often occur in river valleys and along riverbanks, making the communities living in these areas particularly vulnerable.

Also, Changes in River Flow Patterns due to the increased melting of glaciers and changes in seasonal rainfall patterns have altered the flow characteristics of rivers, making them more prone to sudden and unpredictable changes. This irregular flow leads to both drought-like conditions in the dry season and catastrophic floods during the monsoon. Landslides block rivers and create temporary dams. When these dams burst, they release large volumes of water, which can cause flash floods downstream. The landslides also lead to the deposition of large amounts of silt and debris in the rivers, further increases the flooding risk. The accumulation of sediment, or silt, in the riverbeds is another serious issue in Uttarakhand. This reduces the rivers carrying capacity, making them more prone to flooding. The increased siltation is caused by soil erosion from deforestation, construction activities, and landslides in the mountainous regions and adversity impacted on the age of hydropower projects. Uttarakhand, a Himalayan state in northern India, is characterized by six major river catchments that originate from glaciers and high-altitude snowfields. These rivers are not only vital for the ecological and hydrological balance of the region but also present significant risks due to frequent natural hazards like floods, landslides, and glacial lake outburst floods (GLOFs).

The Yamuna Catchment, originating from the Yamunotri Glacier at the base of Bandarpunch peak. The Yamuna carves a deep V-shaped gorge and cuts across the Nag Tibba and Mussoorie ranges near Yamuna Bridge. Major tributaries include the Tons, Pabar, and Aglar rivers. Areas in the Tons valley is particularly vulnerable to cloudbursts and flash floods, as witnessed during the 2013 monsoon when heavy rains caused widespread damage in parts of Uttarkashi district.

The Bhagirathi Catchment is one of the two headstreams of the River Ganga and begins at Gaumukh, the snout of the Gangotri Glacier, beneath the Chaukhamba massif. Flowing through deep gorges in granitic terrain, it is joined by tributaries like the Janhavi and Bhilangana rivers. The Bhagirathi valley is prone to flash **floods** and landslides, particularly during the monsoon season. In 2012 and 2013, cloudbursts triggered major landslides and floods in Uttarkashi, leading to loss of life and infrastructure damage. The presence of the Tehri Dam has helped regulate flow but has also raised concerns about safety in this seismically active zone.

The Alaknanda Catchment is another critical system that merges with the Bhagirathi at Devprayag to form the Ganga. It originates from the Satopanth and Bhagirath Kharak glaciers on the eastern slopes of Chaukhamba and flows past the holy town of Badrinath. Major tributaries include the Khiraon Ganga, Dhauliganga (West), Pindar, Nandakini, Birahi, and Mandakini. This catchment is highly sensitive to glacial and meteorological events. The 2021 Chamoli disaster, caused by a glacial avalanche, led to a massive flood in the Rishiganga and Dhauliganga rivers, devastating infrastructure and Tapovan hydroelectric projects and killing over many people.

The Mandakini Catchment, fed by the Chorabari Glacier near Kedarnath, is one of the most disaster-prone regions in Uttarakhand. It cuts through glacial debris and forms terraces at Agustmuni and Tilwara before joining the Alaknanda at Rudraprayag. Tributaries such as the Vasukiganga and Lastar Gad drain into it. This catchment witnessed the catastrophic 2013 Kedarnath floods caused by a combination of glacial lake outburst and cloudburst. The resulting deluge swept through Kedarnath and downstream settlements, resulting in massive loss of life and damage to infrastructure.

The Pindar Catchment originates from the Pindari Glacier, situated between the Nanda Devi and Nanda Kot peaks. It is joined by the Sundardhunga River near Dhakuri and eventually merges with the Alaknanda at Karnaprayag. This catchment is known for its steep slopes and landslide-prone zones. Although relatively less populated, it remains highly vulnerable to extreme rainfall events, which can lead to landslides and flash floods, threatening small towns like Tharali and Kulsari. Hydropower projects in this region face challenges related to sediment load and slope instability.

The Easternmost Catchment, the Kali Catchment, forms the international boundary between India and Nepal. The Kali River, also known as the Sharda River, originates from the Kali Glacier near Limpiyadhura in Pithoragarh district. Its main tributaries include the Gori Ganga, Dhauliganga (East), Kuti Yangti, Ladiya, and the Sarayu-Ramganga East. This catchment experiences frequent landslides and cross-border flood threats. In 2020, a landslide blocked the river near Dharchula, causing significant flooding and displacing residents. Its complex topography and international dimension require coordinated flood management strategies between India and Nepal.

Uttarakhand's riverine areas are crucial to its economy, culture, and environment. However, the challenges posed by flooding, erosion, pollution, and unsustainable development threaten the health of these rivers and the well-being of the people living along them. Addressing these issues through comprehensive river basin management, pollution control, disaster preparedness, and sustainable development practices is vital for disaster preparedness and resilience.



Figure 7: River network of Uttarakhand



Figure 8: Timeline of Flood Disasters in Uttarakhand (1970–2022)

2.3.11. Risk to Livestock

Disasters impact both humans and animals, often causing significant challenges for livestock populations. Livestock is particularly vulnerable in precarious situations, with disasters like floods, landslides, and other extreme events affecting their well-being. In the Indian context, livestock are often tied outside or kept in thatched sheds, which may reduce physical injuries but limit their chances of escape when disasters strike. This highlights the critical need for a comprehensive disaster management plan to protect animals and mitigate the loss of livestock resources during such events. While animals often have a better chance of survival during disasters, efforts to include livestock in preparedness, mitigation, or rehabilitation plans remain insufficient. This gap needs immediate attention to ensure the safety and welfare of livestock during and after disasters. A well-prepared disaster management plan for livestock should have planning to protect animals during disasters by minimizing physical injuries and loss of life and to prevent and mitigate losses of livestock resources along with implementing mitigation strategies to safeguard live stocks.

Despite the large livestock population and infrastructure in Uttarakhand, more focused efforts are required to integrate livestock into disaster preparedness, mitigation, and rehabilitation plans. This includes strengthening infrastructure, training personnel, and developing comprehensive policies to protect livestock during disasters

2.3.12. Risk to Environment and Wildlife

Uttarakhand, with its incredible diversity of ecosystems, wildlife, and natural beauty, is not just a crucial part of India's ecological heritage but also an important area for global biodiversity conservation. Uttarakhand faces several environmental challenges like deforestation, water

scarcity, reduced forest covers due to integrated effects of climate change and rapid urbanization. It leads to vulnerability to the impacts of climate change, including glacial retreat, altered rainfall patterns, and increased frequency of natural hazards like floods and landslides

Thus, Integrating Disaster Risk Reduction (DRR) and climate change adaptation into a Wildlife Action Plan is essential to ensure the long-term conservation of biodiversity, particularly in the face of increasing environmental challenges. It is important to highlight the interconnected threats posed by disasters and climate change to wildlife and ecosystems and holistic approach for climate resilience in wildlife conservation strategies with proper policies and planning Building capacity in DRR and adaptation techniques for conservation professionals and community members Monitoring evaluation. Public Awareness and Capacity Building is important by informing the public and stakeholders about the links between climate change, disasters, and wildlife conservation. This can be tailored to specific regional contexts and ecological priorities to create an effective Wildlife Action Plan that addresses the dual challenges of disaster risks and climate change.

2.3.13. Risk to Infrastructure

Disasters have the potential to devastate infrastructure, causing significant setbacks to development and economic growth. In disaster-prone regions, resilient infrastructure plays a crucial role in mitigating the impact of such calamities and facilitating recovery. Hilly terrains are home to numerous critical structures such as reservoirs, tunnels, powerhouses, and bridges. Ensuring the safety and stability of these structures is of paramount importance due to their vulnerability to natural disasters. Proper planning and preparedness are essential to safeguard these infrastructures from unforeseen disasters. In the past, catastrophic events have demonstrated the devastating consequences of inadequate disaster preparedness. The Chamoli flash flood serves as a grim reminder, where extensive damage was inflicted on under-construction bridges and tunnels, resulting in significant economic losses. Similarly, multiple bridges have collapsed during flash floods and cloudburst events, placing an additional financial burden on the government and disrupting critical connectivity. In 2024, a rock fall in Patalganga damaged the portal of an open tunnel that took several days to remove debris. In another event a bridge totally collapsed due to a landslide at Govindghat that was a single passage to reach Hemkund Sahib, a famous pilgrim site where every year thousands of people visited.

Incorporating infrastructure health monitoring into the State Disaster Management Plan (SDMP) is essential to ensure the longevity and resilience of these vital structures. Regular inspections and maintenance can help identify vulnerabilities before they escalate into catastrophic failures. Moreover, effective evacuation planning is a vital component of disaster management. Preparedness measures must include comprehensive evacuation strategies to ensure the safety of communities residing near critical with well infrastructure. By emphasizing resilient infrastructure and integrating health monitoring infrastructure. By emphasizing resilient infrastructure and integrating health monitoring structured evacuation plans, governments and stakeholders can mitigate the impact of disasters, reduce economic losses, and ensure the safety of both infrastructure and human lives.

UTTARAKHAND MONSOON DISASTERS - 2025

Underline the increasing frequency of extreme weather events in the Himalaya. Cloudbursts, debris-flows, landslides, and flash floods caused widespread destruction across multiple districts of Uttarakhand from late June through mid-September 2025. Major events included

Date	Location/Incident	Impact
23th Jun	Kainchi Band Landslide	4–5 pilgrims have been buried in the landslide
28th Jun.	Silai Band–Syana Chatti	Flooding, lake formation, missing workers
5th Aug	Dharali–Harsil	Debris flow, destruction, missing persons
12th Aug	Upstream Harsil	Temporary lake, increased risk, submerged of 500 m National Highway
21st Aug	Syana Chatti (Yamunotri)	Temporary lake of 18 feet depth, Many settlements submerged
22th Aug	Tharali (Chamoli)	Rainfall, landslides, disruptions
29th Aug	Basukedar, ChenaGad (Rudraprayag)	Landslides, debris flows, Fatalities
15th –16th Sep.	Dehradun (Sahastradhara)	Cloudburst, flooding, fatalities
18th -20th Sep	Chamoli (Nandanagar)	Cloudburst, landslides, Fatalities

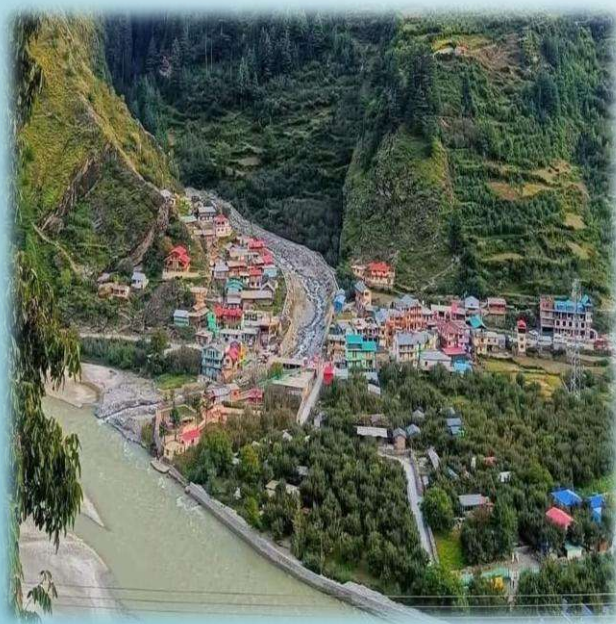
DHARALI DISASTER — 5TH AUGUST 2025

District Uttarkashi

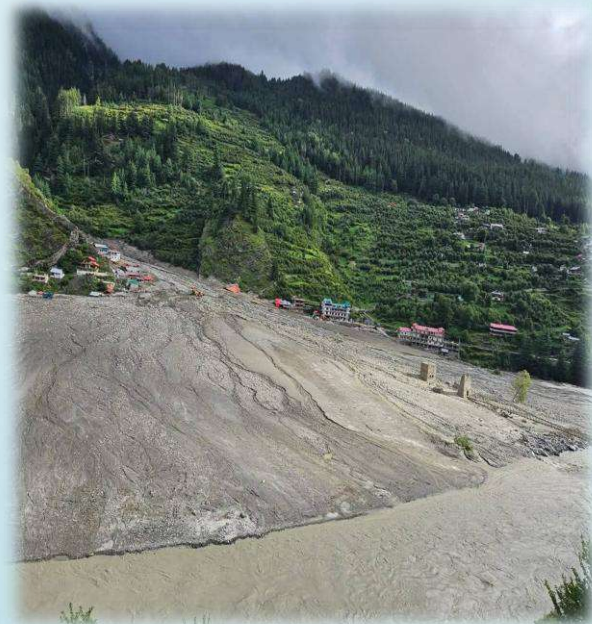
A large glacial/alluvial debris mass mobilized by intense rainfall triggered a debris flow in Kheerganga/Kheer Gad near Harsil, sweeping through Dharali's market area and riverside hotels/homestays. Around 70 persons missing in this event along with damaged and washout of 2 bridges and activated several landslides along NH 107 leading to Dharali that enhance the complexity of rescue and search mission. Also, Army infrastructure at Harsil and Helipad severely damaged. Several houses and hotels/homestays destroyed. After the event, a 400–500 m lake formed upstream near Harsil due to landslide damming at downstream located at doodhganga, raising breach-flood concerns. Also, at Limchigad the whole bridge was washed away and at Netala, block road making the environment and rescue task more challenging.

After the event, a 400–500 m lake formed upstream near Harsil due to landslide damming at downstream located at doodhganga, raising breach-flood concerns. Also, at Limchigad the whole bridge was washed away and at Netala, block road making the environment and rescue task more challenging. to evacuated stranded civilian, tourists and affected resident amidst challenging weather and terrain condition.

The rescue operation in Dharali, Uttarakhand has been large scale multi agency effort preliminary led by Indian army along with the NDRF, SDRF, ITBP, Army, UPCL, Irrigation, Communication, Revenue, PWD, BRO and civil administration. The total 1056 persons in various teams have worked intensively to evacuated stranded civilian, tourists and affected resident amidst challenging weather and terrain condition.



Before Disaster



After Disaster

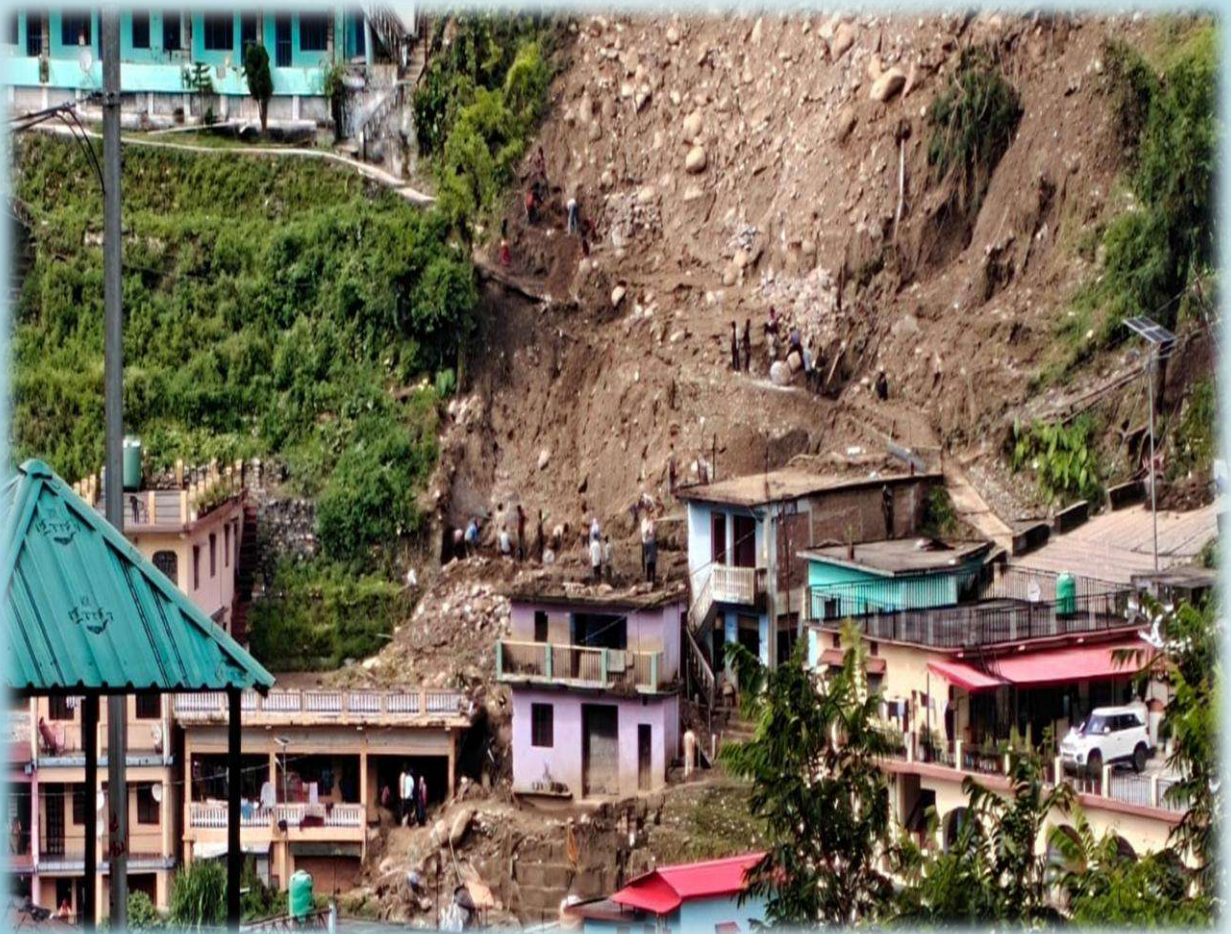
THARALI APADA – 22ND AUGUST 2025

District Chamoli

The "Tharali Aapda" refers to the severe disaster that struck the Tharali region of Chamoli district, Uttarakhand on 22 August 2025. Triggered by intense midnight rains on August 22, a major cloudburst and subsequent debris flow caused flooding in the Toonri Gad drain, which spread massive amounts of mud and debris over a large area

As an impact, several areas, including the Tehsil office, residential complexes, Tharali market, and multiple neighbourhoods like Radibagh and Chepadon, were hit hard by the sludge and deluge. Many houses and shops were damaged or filled with debris, and several vehicles were buried under the mud along with few mission persons.

Local police and district administration initiated immediate rescue and relief work. Emergency response teams were mobilized despite access difficulties caused by the muddy and blocked road. Schools and Anganwadi centres in Tharali Tehsil were closed as a precaution, while officials ensured the swift evacuation and safety of residents in dangerous zones. The incident has highlighted the region's vulnerability to recurring monsoon-related disasters, bringing renewed focus on preventive planning and early warning system.



Houses Filled with Debris – Tharali Bazaar

SAHASTRADHARA TOWNSHIP CLOUDBURST

15TH -16TH SEPTEMBER 2025

District Dehradun

During the night of 15–16 September 2025, intense rainfall (~192 mm in Sahastradhara) triggered flash floods and slope failures. Streams such as Karligad swelled rapidly, causing debris flows, road washouts, and inundation of urban sectors.

Major impacts included Human casualties, loss of Infrastructure and urban sectors submerged. The famous Tapkeshwar temple also flooded and filled with the mud. About 100 m road section washed out, and bridges collapse. The field buried under rubble and loss of paddy fields.

Rescue and relief operations involved NDRF, SDRF, police, fire brigade, and district administration. Key actions included evacuations, use of machinery to clear debris, rescue of stranded individuals, provision of shelters, food, and medical aid, and restoration of utilities.

These disasters called the urgent need for comprehensive hazard assessment and resilient infrastructure in the Himalayan state.



Ruined Building after cloudburst at Sahastradhara in Dehradun

NANDANAGAR CLOUDBURST 17TH SEPTEMBER 2025

District Chamoli

In mid-September 2025, extremely heavy rainfall and a cloudburst struck the Nanda Nagar (Nandanagar) area of Chamoli district. The intense precipitation triggered massive landslides, debris flows, and flooding in several villages including Kuntari Dhurma, and Sera. Multiple houses, shops, and cow sheds were buried under debris, and access roads were blocked.

The Impacts Includes casualties and loss of houses and shops, livestock and animal sheds lost. NDRF, SDRF, police, and local administration led rescue operations, clearing debris and searching for survivors. People were evacuated to safer zones. heavy rain hampering operations and As a Challenges, continued blocked or damaged roads limiting access, thick debris layers complicating search efforts, Risk of secondary landslides threatening rescuers.

These disasters called the urgent need for comprehensive hazard assessment, resilient infrastructure, early warning systems, and community-based preparedness are urgent priorities for reducing disaster risk in the fragile Himalayan ecosystem.

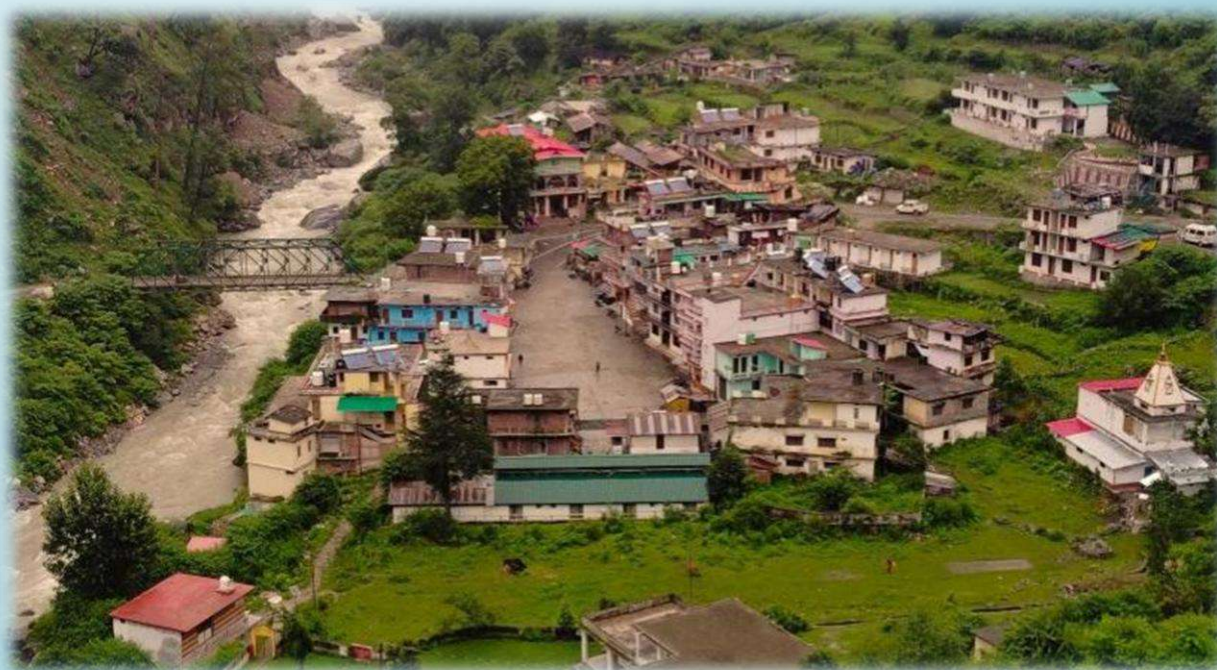


Condition of Nandanagar Ghat area after the Cloudburst Event

ARTIFICIAL LAKE FORMATION AT SYANA CHATTI

District Uttarkashi

Lake Formation at Syana Chatti (Yamuna Valley): Syana Chatti lies in the Yamuna Valley of Uttarkashi district, Uttarakhand. In August 2025, heavy rains triggered debris flows in the Kupada stream, which blocked the Yamuna River. This blockage formed a temporary artificial lake, expanding over 350 meters and submerging local infrastructure (bridges, hotels, and roads). There was a fear of Flash flood risk in downstream due to breaching of lake. Thus, controlled breaching, evacuations, dredging, monitoring, and silt clearance were taken into account as Mitigation planning



Syanachatti Before the Lake Formation



Submerged Syanachatti After the Lake Formation

ARTIFICIAL LAKE FORMATION AT HARSIL

District Uttarkashi

An artificial Lake Formation at Harsil (Bhagirathi Valley) Harsil: On 5 August 2025, heavy debris flow along Telgad stream, juxtaposition of Harsil township that blocked the Bhagirathi River, forming a temporary lake stretching nearly 400–500 meters that submerge the 300 MT stretch of National Highway led to Gangotri. Also, there was Flash flood risk, disruption of Gangotri highway and damage to downstream villages. As Mitigation measures, manual drainage, widening of channels, road restoration, and evacuation of vulnerable settlements has been considered and successfully mitigate the risk by proper planning



An artificial lake has formed on the Bhagirathi River at Harsil after Dharali Cloudburst Event

2.3.14. Vulnerability to Road accident

Economic growth and increase in per capita income of the State has resulted in phenomenal growth in the number of motor vehicles in the State. Road transport is the principal mode of transportation of the people of the State. As a result, the annual death toll in road accidents in the State is increasing exponentially. The topography of the State of Uttarakhand is also a contributing factor for rise in road accidents in the State.

The following are the main factors contributing to road accidents in the State:

- Lack of Maintenance of vehicles to make them road worthy.
- Poor visibility due to Fog or Smog
- Poor or untrained driving
- Over speeding and overtaking at blind curves in narrow roads
- Non-use of horns
- Use of Mobiles and Headphones while driving
- Driving under the influence of liquor and non-adhering to traffic rules.

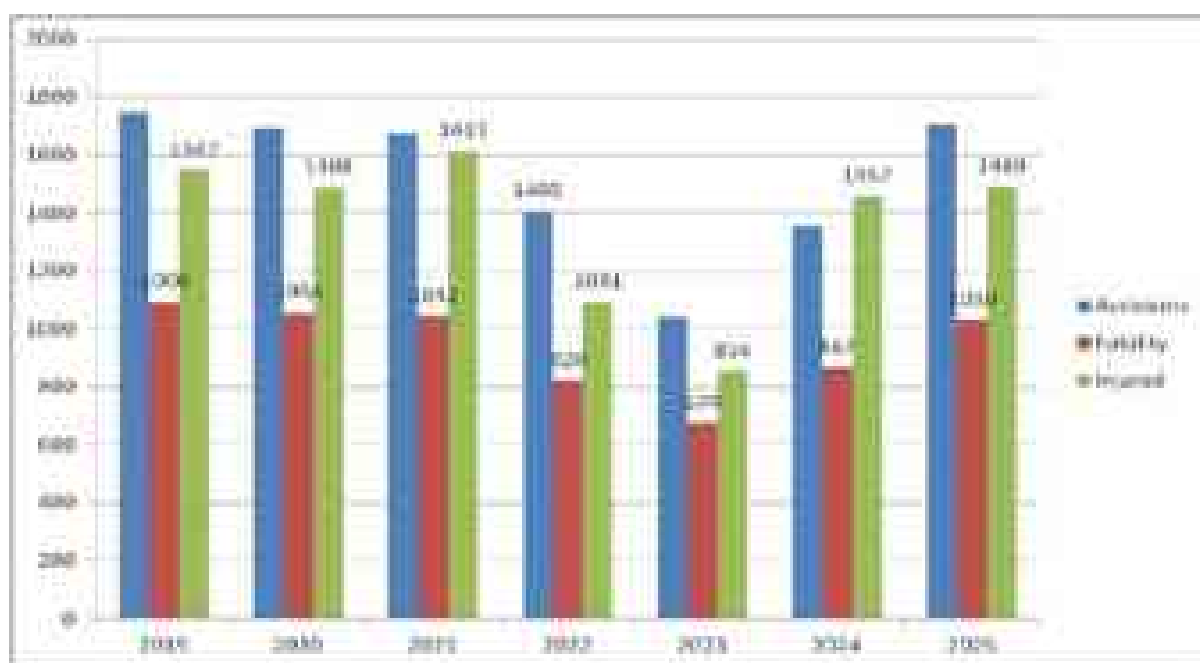


Figure 9: Road Accident Data (2019-2025)

2.3.15. Risk to Trekkers of High Altitude

The Himalayan region, particularly in states like Uttarakhand, attracts thousands of trekkers and mountaineers each year due to its stunning landscapes and challenging terrain. However, these remote and high-altitude areas also pose significant risks to trekkers, including sudden weather changes (snowstorms, avalanches, and cloudbursts), altitude sickness, glacial lake outburst floods (GLOFs), lack of connectivity and communication infrastructure and navigational challenges in poorly marked trails. During October 2024, a rescue operation was launched at Chaukhamba-3 Peak, in the region of Uttarakhand, where 2 female foreign Mountaineers from the United States and Europe after their equipment and bag slipped into a gorge during an expedition. The prompt action by the State Disaster Response Force (SDRF), Indian Air Force, and local mountaineering guides, the group was successfully located and airlifted to safety after being stranded for nearly 48 hours. In an event during May 2024, 40 trekkers stranded at Kedartal in the Uttarkashi district

due to the sudden snowstorm that cut off the route and communication. These trekkers were successfully rescued afterward however one portal was buried in avalanche. This incident highlights the urgent need for better trekking management systems, including Mandatory registration of trekkers and expeditions, Use of satellite-based tracking systems, Deployment of trained mountain rescue teams, Weather forecasting and real-time alert systems and availability of emergency shelters and evacuation protocols

Proper planning and preparedness can not only save lives but also boost confidence among domestic and international adventurers, strengthening Uttarakhand's position as a safe and sustainable trekking destination.

2.4. Char Dham Risk Yatra and Need for a Comprehensive Disaster plan

The Char Dham Yatra comprising Yamunotri, Gangotri, Kedarnath, and Badrinath, is one of the most revered Hindu pilgrimages in India, attracting millions of devotees each year. Located in the high Himalayan region of Uttarakhand, these sacred sites are not only religiously significant but also situated in some of the most ecologically fragile and disaster-prone areas in the country. While the spiritual experience draws vast numbers of pilgrims annually, especially during the Yatra season from May to October, the region's geographical and climatic vulnerabilities pose serious risks to both pilgrims' safety and the long-term preservation of these holy sites.

Geographical and Climatic Vulnerabilities: Uttarakhand lies in the highest active seismic zone and is frequently affected by landslides, flash floods, cloudbursts, earthquakes, and extreme weather conditions. The Char Dham sites are situated in steep, mountainous terrain where landslides and rockfalls are common, especially during the monsoon season. For example, the 2013 Kedarnath disaster, triggered by a cloudburst and glacial lake outburst, resulted in catastrophic loss of life and infrastructure. Also, during June 2024, a major landslide at Sonprayag washed away the 500 m road and bad weather conditions further worsen the situation. About 15000 pilgrims were rescued and airlifted. These recurring natural disasters increase the vulnerability of both the infrastructure and the pilgrims who undertake the journey.

Overcrowding and Infrastructure Strain: The seasonal influx of pilgrims causes overcrowding, particularly on auspicious dates when thousands assemble at one location. This overwhelms the existing transport, accommodation, medical, and sanitation facilities. Inadequate road widths, poor traffic management, and steep mountain roads increase the risk of vehicular accidents and stampedes. Temporary shelters and camps often lack basic amenities, making them unsuitable for elderly or ill pilgrims, especially under extreme weather conditions like cold waves or heavy rains. Delays in rescue and relief during such times further endanger lives.

Impact of Sudden Weather Changes: sudden and unpredictable climatic events, such as cloudbursts or snowfall, frequently disrupt the Yatra. These conditions can strand pilgrims in remote areas with limited access to food, water, and medical support. Temperature extremes—from scorching heat in lower altitudes to freezing conditions near glacier zones—pose additional health risks, particularly to the elderly and children. The lack of real-time weather alerts and inadequate dissemination of emergency protocols add to the challenge.

Challenging Road Safety: Many pilgrims rely on shared taxis, buses, or jeeps, which are often overloaded or poorly maintained. This significantly raises the risk of road accidents, especially on winding hill roads. Additionally, the lack of routine health checks, availability of first-aid services, and proper crowd regulation have led to frequent medical emergencies, including cases of altitude

sickness, dehydration, and cardiac arrests. These challenges call for enhanced medical preparedness and emergency response systems.

To mitigate these risks, there is an urgent need for a comprehensive and integrated disaster management strategy. This must include –

- Strengthening infrastructure, including landslide-proof roads, wider paths, weather-resilient shelters, and dedicated medical units.
- Advanced warning systems for floods, landslides, and weather-related events.
- Real-time crowd management and surveillance using digital tools, CCTV, and drone monitoring.
- Pre-Yatra health screenings, emergency response training, and first-aid booths at regular intervals.
- Strict regulation of vehicular movement and load limits.
- Community and volunteer training for local disaster response.
- Promotion of environmental sustainability through waste management, afforestation, and reducing plastic use.

2.5. Uttarakhand and Climate Changes

Climate change can increase disaster risk in a variety of ways - by altering the frequency and intensity of hazard events, affecting vulnerability to hazards, and changing exposure patterns. Uttarakhand are already experiencing these impacts of climate change, such as changing temperatures, upward-moving snowlines, receding glaciers, erratic rainfall, reduction of snow in winter, changed cropping seasons, shifting cultivation zones for certain crops, and drying up of perennial streams. Climate change in Uttarakhand will increasingly force people to abandon farming at high altitudes and influence the movement of people in the state. Most people in Uttarakhand live in rural areas and 71% depend on rainfed agriculture, through terrace farming on hill slopes. Due to climate changes, food security, income and resources in Uttarakhand are adversely affected. Climate Change is affecting agricultural livelihoods and contributing to internal migration in Uttarakhand state.

2.5.1. Effect of Variation in Temperature

Uttarakhand has witnessed an increase in average temperatures over recent decades. This warming trend accelerates the melting of glaciers in the region, contributing to glacial retreat and the formation of unstable glacial lakes. Changes in precipitation patterns, including irregular and intense rainfall, are increasingly common. These erratic weather events contribute to flash floods, landslides, and soil erosion. The region has seen a rise in extreme weather events, such as cloudbursts, which lead to sudden and catastrophic flooding.

According to the Intergovernmental Panel on Climate Change (IPCC), Uttarakhand is "above-average warming" region with respect to its vulnerability to climate change that could lead to increased flooding and disruptions to water resources within the coming decades as glaciers retreat. It was studied that Pindari glacier has retreated about 2,840 m since the last 121 years at an average rate of 23.47 m/year. It retreated at the rate of 26.22 m/year between 1845 and 1906, 20 m/year between 1906 and 1958 and 25 m/year between 1958 and 1966. The Thelu and Raktavarna glaciers have retreated 1,248 m (at the rate of 30.66 m/year) and 1,585 m (at the rate of 37.73 m/year) during the years (1962 -2004). With more glacial melt, the risk of flooding downstream increases. In some cases, this can lead to "glacial lake outburst floods", in which a natural dam fails and suddenly releases meltwater with devastating consequences, thus needing the attention of proper planning to cope up with the hazardous situation. Presently, 5 glacial lakes were identified in Uttarakhand that need in depth study and monitoring as comes under the red

zone out of 13 glacial lakes mapped. The work has been initiated in which many institutional along with disaster management authorities are engaged.

2.5.2. Integrating disaster Risk Reduction (DRR) and Climate change Adaptation (CCA)

The intensification of climate-related hazards due to climate change significantly impacts disaster risk. Climate change alters weather patterns, leading to highly variable precipitation rates, accelerated glacial melting, and cloudbursts, among other phenomena. These changes increase the frequency and intensity of hazards, escalate the exposure and vulnerability of communities, and heighten stress on water and food security. Many communities, despite knowing the risks, have returned to building homes in flood-prone areas, including regions affected by land subsidence. For instance, in Ghansyali in September 2024, several lives were tragically lost due to a sudden cloudburst, as houses were constructed near the "gadera" (seasonal stream). This area had previously experienced similar disasters, underscoring the critical need for proactive measures.

From a policy perspective, disaster risks can be mitigated or avoided by reducing exposure to hazards, decreasing vulnerabilities of people and property, and enhancing preparedness for effective responses. This approach forms the core of Disaster Risk Reduction (DRR), which integrates considerations of weather-related hazards into policy development, spatial planning, and climate change impacts.

Complementing DRR is Climate Change Adaptation (CCA), which focuses on adjusting and modifying human systems or natural environments to cope with actual or predicted climatic changes. Both DRR and CCA share the common goal of reducing disaster risks by minimizing vulnerabilities and enhancing community resilience to natural hazards, including those influenced by climate change. Thus, integration of DRR and CCA is essential for addressing both climate and non-climate-associated risks. By combining efforts, policies and practices can more effectively reduce vulnerabilities, protect the environment, and build resilient communities capable of withstanding and adapting to the challenges posed by a changing climate.

2.6. Risk Management and Insurance

Uttarakhand is highly vulnerable to natural hazards, including floods, landslides, earthquakes, and Glacial Lake Outburst Floods (GLOFs). These disasters not only cause immediate loss of life and property but also result in long-term socio-economic disruptions for individuals, communities, and the economy. Given the increasing frequency and intensity of such hazards, the need for effective disaster management strategies has become more critical than ever. One such crucial strategy is insurance, which serves as a powerful tool for disaster resilience by providing financial protection and promoting risk mitigation measures. But, as a present Scenario, there has been no significant work in insurance management for disaster risk mitigation in Uttarakhand. Despite the region's high vulnerability to natural calamities, insurance remains an underutilized tool in disaster resilience. The absence of comprehensive insurance policies, lack of awareness, and limited government intervention have contributed to weak financial protection for individuals and communities affected by disasters. Strengthening insurance mechanisms is crucial to ensuring economic stability and faster recovery in the wake of disasters.

Insurance is a critical component of disaster risk management, offering financial protection and promoting resilience against natural calamities. However, to realize its full potential, a multi-stakeholder approach involving government agencies, insurance companies, and local communities is essential. By expanding coverage, enhancing awareness, and integrating insurance

with risk reduction strategies, Uttarakhand can build a more resilient future, reduce the economic and social burden of disasters while ensure the safety and stability of its residents

2.6.1. Importance of Insurance in Disaster Resilience

Insurance plays a vital role in strengthening disaster resilience by offering financial security to the insured population. Its significance can be understood through the following key aspects:

Financial Protection Against Economic Hardship

Disasters often lead to severe financial losses, pushing affected individuals and businesses into economic distress. Insurance helps mitigate these financial burdens by compensating for property damage, business interruptions, and personal losses.

Expedited Recovery and Rebuilding

One of the primary advantages of insurance is its ability to provide quick post-disaster funding, allowing for immediate rebuilding and recovery. This reduces dependency on government relief efforts and enables faster restoration of normalcy in affected regions.

Encouraging Risk Reduction and Hazard Mitigation

Insurance can incentivize policyholders to adopt risk reduction measures, such as earthquake-resistant construction, flood-proofing techniques, and improved drainage systems. Some insurance models include provisions for additional funding dedicated to hazard mitigation efforts after an event, ensuring better preparedness for future disasters.

2.6.2. Challenges in the Current Insurance Scenario in Uttarakhand

Despite its significance, insurance penetration remains limited in Uttarakhand, particularly in rural and disaster-prone areas. Several factors contribute to this:

Low Awareness: Many individuals, especially in remote areas, are unaware of insurance products and their benefits.

Premium Costs and Affordability Issues: The cost of insurance premiums can be a deterrent for low-income individuals and small businesses.

Limited Coverage for Non-Property Risks: Most insurance policies primarily focus on property damage, neglecting other critical aspects such as livelihood loss, livestock mortality, and health impacts.

Lack of Integration with Disaster Risk Reduction (DRR) Policies: There is insufficient coordination between insurance providers and government agencies working on disaster risk management. Integrating insurance into broader DRR policies can improve coverage and encourage pre-disaster mitigation efforts is utmost required.

2.6.3. Expanding the Scope of Insurance for Disaster Risk Management

To enhance the role of insurance in disaster resilience, the following measures should be undertaken:

Government-Private Partnerships (PPP) for Insurance Expansion: It is required to have collaboration between the government and private insurers can help design and implement affordable and effective insurance products.

Introduction of Comprehensive Risk Insurance: Insurance products should be designed to cover not only property damage but also livestock losses, health impacts, and business interruptions caused by extreme weather events.

Awareness and Capacity Building Programs: Community-based awareness campaigns can help educate people about the benefits of insurance and how to avail it. Therefore, Training programs for local officials and community leaders can enhance grassroots-level implementation of insurance schemes.

Incentivizing Disaster-Resilient Practices: Policyholders who adopt disaster-resilient construction and **preparedness** measures should be rewarded with premium discounts or additional coverage benefits.

Strengthening Claim Settlement Mechanisms: Simplifying claim procedures and ensuring timely disbursement of funds can improve trust in insurance services.

2.7. Conclusions

Uttarakhand, located in the Himalayan region of India, is highly vulnerable to a range of natural hazards, including earthquakes, landslides, floods, cloudbursts, and glacial lake outburst floods (GLOFs). Strengthening disaster resilience in Uttarakhand requires a multi-pronged approach that integrates scientific research, community involvement, sustainable development practices, and policy interventions.

Building disaster resilience in Uttarakhand is vital for safeguarding lives, infrastructure, and the environment in this ecologically fragile region. By proper planning for each type of disaster along with combining traditional knowledge with modern science, promoting sustainable development, and engaging communities, the state can effectively mitigate risks and adapt to future challenges.

Chapter 3

"Disaster risk reduction is a frontline defence
against the impacts of climate change. "

“Margareta Wahlstrom”

3. Global Frameworks for DRR

3.1. Introduction

Sustainable development cannot be attained while disasters continue to undermine economic growth and social progress. No country or sector is immune to the impacts of natural hazards, many of which are increasing in frequency and intensity due to the impacts of climate change.

Over the past several decades, we have witnessed steady increase in the numbers of disasters. Many factors have contributed to this trend: growing population, increased number of people living in hazard-prone areas, environmental degradation, unsustainable development patterns, and rapid and unplanned urbanization, amongst others. Globally, risk reduction initiatives have failed to keep pace with the increase in exposure to natural hazards and higher levels of vulnerabilities. These trends are set to continue and will be compounded by the impact of climate change.

While critical, simply preparing for disasters is not enough. To realize the transformative potential of the 2030 Agenda for Sustainable Development, governments and stakeholders have affirmed that disaster risk reduction needs to be at the core of sustainable development.

3.2. The Sendai Framework for Disaster Risk Reduction

The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 was the first agreement of the post-2015 development agenda. It includes seven global targets accompanied by a comprehensive set of guiding principles that give direction to reduce the impact of disasters, while also addressing the underlying drivers of disaster risk and safeguarding current and future development gains.

The year 2015 emerged as a landmark year for ongoing efforts towards disaster risk reduction. The 3rd World Conference on Disaster Risk Reduction (WCDRR) was held in March 2015 in Sendai, Japan. The conference was attended by representatives from 187 countries who deliberated on the post-2015 agenda for disaster risk reduction (DRR) and adopted the SFDRR. Building upon the experiences of implementing the Hyogo Framework for Action (2005), the International Strategy for Disaster Reduction (1999), the Yokohama Strategy for a Safer World (1994), and the International Framework for Action for the International Decade for Natural Disaster Reduction (1989), the SFDRR is a comprehensive 15-year (2015-30) framework with 5 guiding principles, 7 global targets and 4 priority areas.

3.3. The Four Priorities of Actions

3.3.1. Understanding disaster risk

Disaster risk management should be based on an understanding of disaster risk on all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment. Such knowledge can be used for risk assessment, prevention, mitigation, preparedness and response.

3.3.2. Strengthening disaster risk governance to manage disaster risk

Disaster risk governance at the national, regional and global levels is very important for prevention, mitigation, preparedness, response, recovery, and rehabilitation. It fosters collaboration and partnership.

3.3.3. Investing in disaster risk reduction for resilience

Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of people, communities, countries and their assets, as well as the environment.

3.3.4. Enhancing Preparedness for Effective Response and Build Back Better (BBB) Recovery

The growth of disaster risk means there is a need to strengthen disaster preparedness for response, act in anticipation of events, and ensure capacities are in place for effective response and recovery at all levels. The recovery, rehabilitation and reconstruction phase are a critical opportunity to build back better (BBB), including through integrating disaster risk reduction into development measures.

3.4. The Seven Global Targets

- Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality rates in the decade 2020-2030 compared to the period 2005-2015.
- Substantially reduce the number of affected people globally by 2030, aiming to lower average global figure per 100,000 in the decade 2020 - 2030 compared to the period 2005-2015.
- Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.
- 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.
- Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
- Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this Framework by 2030.
- Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

7 Global Targets	REDUCE	INCREASE
	(A) Mortality/ global population 2030 Average <<2005-2015	(E) Countries with national & local DRR strategies 2030 Value >>2005-2015 Values
	(B) Affected people/Global population 2030 Average <<2005-2015	(F) International Cooperation to developing countries 2030 Value >>2005-2015 Values
	(C) Economic loss/ Global GDP 2030 Average <<2005-2015	(G) Availability & access to multi hazard early warning systems & disaster risk information & assessments 2030 Value >>2005-2015 Values
	(D) Damage to critical infrastructure & disruption of basic services 2030 Average <<2005-2015	

Figure 10: Global targets of Sendai Framework for DRR

3.5. Initiatives of Government of Uttarakhand

In light of the experiences, insights and inspiration from 3rd WCDRR, the Government of Uttarakhand (GoUK) decided to organize a workshop in Uttarakhand to formulate a strategy for the implementation of SFDRR for the State. Accordingly, a workshop on “Strategizing SFDRR Implementation in Uttarakhand” was organized on 20th August 2018 in Dehradun.

This workshop was an attempt to prepare an implementation strategy for SFDRR Roadmap for the State. During the workshop the 4 Priority Areas of SFDRR and recommended action points were interpreted and contextualized in accordance with local ground realities and priorities of the state. This contextualization process accounted for,

- The progress already made towards DRR in the state,
- Vulnerability of the state to various hazards
- The DRR needs emerging from different risks the state faces, and
- The priorities and expressed aspirations in this regard by the people and Government of Uttarakhand.

As a follow-up and review of the recommendations of the previous workshop, another meeting with representatives of 17 pertinent Departments of GoUK was held on 6th March 2019 in Dehradun. As endorsed by the representatives at these two deliberations, the Government of Uttarakhand endorsed the activities for DRR Framework to achieve the **vision of a Disaster Resilient Uttarakhand**. This framework for the period 2015 to 2030 comprises the following commitments:

- Inclusion of DRR in plans and schemes conceived by Gram Panchayat
- DRR related awareness and training in induction and mid-career courses of state government services
- Addressing DRR related requirements in all Infrastructure development works
- Securing livelihoods from disaster impact
- Inclusion of DRR in plans and schemes conceived by Urban Local Bodies

3.6. Implementation of SFDRR in Uttarakhand

The Uttarakhand DRR Framework is being operationalized by the Government of Uttarakhand by implementing a DRR Roadmap which is being implemented by the Uttarakhand State Disaster Management Authority, upholding multi-stakeholder engagements, accountability, transparency and establishment of a robust monitoring system. This process is to be strengthened through adequate investments in capacity building, knowledge management and public awareness.

Table 11: State's Initiatives as per SFDRR Priorities

S.No.	Priorities of Sendai Framework for DRR	Uttarakhand State's Initiatives
1	Priority 1: Understanding Disaster Risk	• Seismic vulnerability of 3,344 houses in Mussoorie, 2,865 in Nainital & 1165 in Bageshwar towns assessed using RVS technique. • Seismic vulnerability of 11,239 lifeline buildings across the State assessed using RVS technique. • Disaster Risk Assessment of entire State for 05 hazards (Earthquake, Landslide, Flash flood, Flood & Industrial hazards) • River morphology analysis • Development of Uttarakhand River Information Management System (URMIS): Web based database
2	Priority 2: Strengthening Disaster Risk Governance to manage Disaster Risk	• Constitution of Uttarakhand SDMA • Constitution of DDMA's in all 13 Districts • State Emergency Operation Centre • District Emergency Operation Centers in all 13 Districts • Establishment of Tehsil level Emergency Operation Centers in 128 Tehsils in progress • State & 13 District DMPs • 10 Departmental DM Plans & SOPs • Land use zonation/Flood plain zonation & Building bye laws • Uttarakhand Rehabilitation Policy • Community Radio Policy • Establishment of Uttarakhand Landslide Mitigation & Management Centre (ULMMC)
3	Priority 3: Investing in Disaster Risk Reduction for Resilience	• MoU with Technical Institutions (IITR, IIRS, WIHG, IMD) • Strengthening Hydro-meteorological network: 107 AWS, 28 ARGs, 16 snow gauges & 25 surface field observatories are being set-up • Strengthening warning generation & dissemination infrastructure • Earthquake early warning system with IIT Roorkee-200 sensor installed across the State • Development of Bhudev App • Installation of Weather impact-based Forecast Services is in progress • Establishment of Multi-hazard Early Warning Dissemination System in progress • SMS service (CAP) being utilized for sending alert warnings

S.No.	Priorities of Sendai Framework for DRR	Uttarakhand State's Initiatives
4	Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction	• SDRF raised & strengthened • 15,300 community volunteers trained through 612 training programs of 10 days duration organized at Nyay Panchayat level • 248 State Govt engineers trained under NPCBEERM (National Program on Capacity Building of Engineer in earthquake risk mitigation) • 1,664 Masons trained in earthquake safe construction • 58 demo units constructed at Tehsil/ Block level • Guidelines for earthquake safe construction prepared in vernacular • Adoption of IRS for effective response • 298 community volunteers Haridwar & U S Nagar trained as Aapda Mitra • 1700 community volunteers trained as Aapda Mitra • 2486 volunteers trained (till date) under ongoing Yuva Aapda Mitra scheme

3.7. Conclusions

Global DRR frameworks, particularly the Sendai Framework, emphasize proactive risk reduction, resilience-building, and multi-stakeholder collaboration. In conclusion, for Uttarakhand to fully align with the Sendai Framework, it must integrate disaster risk reduction into all levels of governance and community life. The state's geographical challenges require targeted policies and measures that address its unique vulnerabilities. By prioritizing prevention, resilience, and sustainable development, Uttarakhand can better manage its disaster risks, reduce the impact of natural hazards, and build a more secure future for its citizens. The state's alignment with the principles of the Sendai Framework is essential for ensuring the safety of its residents and the millions of pilgrims who visit annually.

Chapter 4

"We must build resilience in our communities and reduce disaster risk to achieve sustainable development."

“Ban Ki-moon”

4. Social Inclusion in DRR

4.1. Background

In the prevailing disaster management practices in general, there is a tendency to view the affected people of a disaster as a homogenous group particularly in the relief and recovery processes. This leads to an inherent inability to address the existing disparities and inequalities across gender, caste or class in the course of disaster management. While hazards do not discriminate, people do. Disaster management could become unfair by being blind to prevailing inequalities. Existing socio-economic conditions mean that disasters can lead to dissimilar outcomes even for what may seem demographically similar communities. Inevitably, the most vulnerable groups suffer more than others because of their place within the social system. Addressing the enormous challenge of social marginalization, social exclusion and other inequalities is beyond the scope of DRR. However, DRR must take cognizance of social realities to ensure that every possible effort is made to make DRR socially inclusive.

Chapter 11, Section 61 of the Disaster Management Act 2005, prohibits all forms of discrimination be it based on sex, caste, community, descent or religion in any activities related to disaster risk reduction, disaster relief or humanitarian assistance. The preamble of the National Policy of Disaster Management 2009 notes that the economically weaker and socially marginalized sections, women, scheduled castes and scheduled tribes tend to suffer more during disasters. A community's vulnerability to disasters depends on the social, cultural, economic and political environment. A cycle of deprivation not only increases their vulnerability but also slowly alienates them from the decision-making process denying accessibility to their basic entitlements.

4.2. Social Inclusion & Global Framework

When countries formulated the global guidance frameworks on disaster risk reduction in 2015, the consensus was to focus on the capacities, empowerment and leadership role of women, as well as on the engagement of all marginalized groups in risk reduction and resilience-building. Countries also recognized the specific vulnerabilities and concerns that various groups face due to social, economic and institutional conditions.

The Sendai Framework for Disaster Risk Reduction 2015-2030, the global guidance for building resilience to disasters, captured key issues of gender and social inclusion at policy and practice levels and addressed vulnerabilities as well as capacities. It acknowledged that, "Overall, women, children and people in vulnerable situations were disproportionately affected from disasters over the decade of 2005-15." It also said: "Governments should engage with relevant stakeholders, including women, children and youth, persons with disabilities, poor people, migrants, indigenous peoples, volunteers, the community of practitioners and older persons in the design and implementation of policies, plans and standards."

Recommendations for addressing these issues are contained in the Sendai Framework's Guiding Principles for implementation, the Priorities for Action, and the Role of Stakeholders. One of the 13 Guiding Principles is: "A gender, age, disability and cultural perspective in all policies and practices; and the promotion of women and youth leadership". The Role of Stakeholders states: "Women and their participation are critical to effectively managing disaster risk and designing, resourcing and implementing gender-sensitive disaster risk reduction policies, plans and programs; and adequate capacity building measures need to be taken to empower women for

preparedness as well as build their capacity for alternate livelihood means in post-disaster situations.”

Sendai Priority 4 is: “Enhancing disaster preparedness for effective response and to ‘Build Back Better’ in recovery, rehabilitation and reconstruction”. It states that, “Empowering women and persons with disabilities to publicly lead and promote gender equitable and universally accessible response, recovery rehabilitation and reconstruction approaches are key.” It recommends that countries “invest in and develop people-centered multi-hazard, multi sectoral forecasting and early warning systems, disaster risk and emergency communications mechanisms, social technologies and hazard-monitoring telecommunications systems, tailoring them to the needs of users, including social and cultural requirements, in particular gender.”

4.3. Key Aspects of Social Inclusion in DRR

Social inclusion in Disaster Risk Reduction (DRR) ensures that vulnerable groups—including women, children, persons with disabilities, and the elderly—are active participants, not just victims, in resilience building. Key aspects include leveraging disaggregated data for targeted, equitable planning and ensuring accessible, inclusive risk communication and infrastructure.

The key aspects can be elaborated as follows: -

i. Identifying Vulnerable Groups

- **Women and Girls:** Often face disproportionate impacts due to social roles, care giving responsibilities, and barriers to participation.
- **Children and Youth:** Have unique needs and potential to contribute as agents of change.
- **Persons with Disabilities:** Encounter challenges in accessing information, evacuation, and recovery services.
- **Elderly:** May experience mobility and health issues, making them highly vulnerable during disasters.
- **Indigenous Peoples:** Possess traditional knowledge but may lack access to modern DRR resources.
- **Low-Income Communities:** Often live in hazard-prone areas with limited resources to cope or recover.
- **Migrants and Refugees:** Face language barriers, social exclusion, and limited access to services.

ii. Promoting Participation and Leadership

- **Community-Based DRR:** Engage local communities in identifying risks, planning, and implementing solutions.
- **Leadership Opportunities:** Encourage leadership roles for underrepresented groups, especially women and youth.

iii. Ensuring Accessibility

- Physical Accessibility: Design shelters, infrastructure, and evacuation routes accessible to everyone, including persons with disabilities.
- Information Accessibility: Provide early warnings and risk communication in multiple languages, formats (visual, auditory, and tactile), and culturally relevant ways.

iv. Addressing Systemic Inequalities

- Tackle structural barriers such as poverty, discrimination, and lack of education that increase vulnerability.
- Incorporate gender-sensitive and culturally appropriate measures in DRR policies.

4.4. Approaches to Social Inclusion in DRR

Social inclusion in Disaster Risk Reduction (DRR) ensures that marginalized groups—including persons with disabilities, women, children, the elderly, and indigenous communities—are actively involved in, and benefit from, disaster management policies and practices. It involves shifting from treating vulnerable populations as passive victims to empowering them as active agents of change.

Key approaches to social inclusion in DRR include:

i. Inclusive Policy and Planning

- Ensure DRR policies explicitly address the needs of marginalized groups.
- Conduct vulnerability and capacity assessments (VCA) to identify and understand risks faced by specific groups.

ii. Capacity Building

- Train marginalized groups on DRR knowledge, skills, and technologies.
- Empower communities with resources and support to implement local DRR initiatives.

iii. Community-Based and Participatory Approaches

- Involve communities in hazard mapping, risk analysis, and resource allocation.
- Foster partnerships between governments, NGOs, and local organizations to ensure widespread inclusion.

iv. Leveraging Technology

- Use technology to improve accessibility, such as mobile apps for early warning tailored for persons with disabilities.
- Digital platforms can also be used to connect vulnerable groups with resources during emergencies.

v. Education and Awareness

- Integrate inclusive DRR education into school curricula.
- Promote public campaigns that emphasize the roles and contributions of all groups in building resilience

4.5. Challenges in Social Inclusion in DRR

Social inclusion in Disaster Risk Reduction (DRR) faces significant challenges, including a lack of sex, age, and disability-disaggregated data, systemic discrimination that marginalizes vulnerable groups, and limited participation of these groups in decision-making. These issues result in poorly designed, non-inclusive infrastructure and inadequate disaster preparedness for people with disabilities and marginalized communities.

Key Challenges in Social Inclusion for DRR

- **Lack of Disaggregated Data:** A major hurdle is the scarcity of data categorized by sex, age, and disability, which prevents a clear understanding of how disasters differently impact various demographics.
- **Marginalization & Stigma:** Marginalized groups (e.g., persons with disabilities (PWD), sexual and gender minorities, migrants) are often overlooked in disaster planning, experiencing discrimination or social stigmas that exclude them from aid, shelters, and decision-making.
- **Tokenistic Participation:** While community participation is often mandated, it frequently remains superficial or tokenistic, meaning the voices of vulnerable groups are not genuinely incorporated into disaster management plans.
- **Institutional & Technical Gaps:** Many DRR agencies lack the capacity, training, or budget to implement inclusive strategies. Furthermore, there is often poor collaboration among stakeholders, creating fragmented and overlapping initiatives.
- **Inaccessible Infrastructure:** DRR, early warning systems, and shelters are often not designed with universal accessibility in mind, leaving PWD, the elderly, and women with specific needs at higher risk.
- **Limited Resources & Data Privacy:** Collecting detailed data is often hindered by financial constraints, time limitations, and data privacy concerns.

4.6. Examples of Social Inclusion in DRR in Uttarakhand State

In the context of Uttarakhand, the added emphasis on social inclusion in DRR will be the following:

- Gender-based Vulnerabilities.
- Scheduled Castes and Scheduled Tribes (SC&ST)
- Elderly
- Children
- Persons with Disabilities (PwD)

The few examples of social inclusion in DRR in context of Uttarakhand State are as follows-

4.7. Social Inclusion in Post Disaster Recovery Housing in Uttarakhand

The government of India and the government of State of Uttarakhand have integrated gender into their disaster response and recovery efforts through the Uttarakhand Disaster Recovery Project.

In June 2013, the state experienced unprecedented monsoon rains that triggered India's worst natural disaster since the 2004 tsunami. The 2013 flash floods and landslides affected more than 4,200 villages, damaged 2,500 houses, and claimed the lives of 4,000 people.

Due to the unequal distribution of roles, resources, and power, evidence shows that women and girls disproportionately suffer the impacts of disasters, including in Uttarakhand. As male members of the household in the state usually migrate to towns to earn a living for their families, a large percentage of women single handedly manage family assets including homes, crops and livestock. Yet even though women in villages effectively become heads of the household, they have little legal rights over the land.

Recognizing the need to prioritize women and girls in disaster recovery, the government of India and the government of Uttarakhand, with the support of the Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank, have placed a strong emphasis on gender inclusion in implementing the Uttarakhand Disaster Recovery Project (UDRP). Key components of the project, which aims to advance the state's post-disaster recovery as well as strengthen its capacity for disaster risk management, are explicitly designed to reduce the vulnerability of women and girls. These include:

The housing reconstruction component strives to adhere to an Owner Driven Construction of Houses (ODCH) methodology whereby beneficiaries, including women, rebuild their houses on their own with technical and social support from a local NGO, using guidelines issued by the project for disaster-resilient housing. By linking beneficiaries with the local NGO, the project also increased women beneficiaries' awareness of their rights and entitlements. In order to strengthen the local economy, the project encouraged the use of local materials during the reconstruction.

Households were given US\$7,800 to finance the reconstruction of their homes. This was distributed in four instalments after a quality check. In an effort to empower women beneficiaries, the project actively encouraged joint titling of land and bank accounts. Over 50% of the beneficiaries received their instalments in joint bank accounts.

In order to curb open defecation as well as provide women and girls with privacy and safety, the project ensured that toilets were constructed in every reconstructed house.

4.8. Social Inclusion in National Rural Livelihood Mission

The mission of NRLM is "to reduce poverty by enabling the poor households to access gainful self-employment and skilled wage employment opportunities, resulting in appreciable increase in their incomes, on a sustainable basis through building strong grass-root institutions of the poor. These institutions enable and empower the poor households to build-up their human, social, financial and other resources, solidarity, voice and bargaining power. They, in turn, enable them to access their rights, entitlements and opportunities."

In order to ensure that no poor family is left out, under NRLM, the State of Uttarakhand is implementing differential strategies for social inclusion of all identified rural poor households into functionally effective and self-managed institutions, with particular focus on more vulnerable sections like Scheduled Castes (SCs), Scheduled Tribes (STs), Primitive Tribal Groups (PTGs), single women and women headed households, Persons With Disabilities (PWDs), landless, migrant labour, isolated communities and communities living in remote, hilly and disturbed areas. It would identify the poorest and vulnerable through participatory identification of poor (PIP). The

mobilization would begin with them first. The mobilization effort would progress with the satisfactory community readiness and milestones for various stages of mobilization and graduation as evolved and tested in a participatory manner. Existing institutions, their leaders, staff and community resource persons (CRPs) would support the processes of inclusion and mobilization.

4.9. Social Inclusion in Panchayati Raj Institutions in Uttarakhand

50% of seats in the Panchayati Raj Institutions (PRIs) in Uttarakhand State are reserved for women. Implemented on March 25, 2010, this 50% reservation applies to all levels of PRIs, including Gram Panchayats, Kshetra Panchayats, and Zila Panchayats, significantly increasing women's representation in local governance. The Uttarakhand Panchayati Raj (Amendment) Act 2019 also solidified this provision. Notably, the Uttarakhand State is among the early states to increase women's representation from the mandatory 33% (1/3rd) to 50%.

4.10. Social Inclusion in Aapda Mitra Schemes

Social inclusion is a core component of the Aapda Mitra scheme, which aims to create a trained force of 1,00,000 community volunteers across 350 highly vulnerable districts in India. By training local volunteers, the scheme ensures that disaster response is community-centric, diverse, and representative of the local population.

Key aspects of social inclusion in the scheme include:

- **Women's Participation (Aapda Sakhi):** The scheme actively encourages the leadership and participation of women in disaster risk management, with many female volunteers (Aapda Sakhi) involved in, for example, over 650 participating in various operations.
- **Youth Engagement (Yuva Aapda Mitra):** A significant focus is placed on engaging youth through organizations like the National Cadet Corps (NCC), Nehru Yuva Kendra Sangathan (NYKS), National Service Scheme (NSS), and Bharat Scouts & Guides, ensuring at least 20% of volunteers come from these groups.
- **Inclusive Representation:** The scheme encourages the inclusion of diverse groups, including ex-servicemen, personnel from Fire Services, Civil Defence, and Home Guards, to build a robust and experienced network.
- **Community-Specific Focus:** Volunteers are trained to support the most vulnerable groups during disasters, such as senior citizens, persons with disabilities, women-headed households, and children, particularly during evacuations and relief distribution.
- **Regional Accessibility:** Training modules, handbooks, and awareness campaigns are provided in regional languages to ensure effective communication and participation. The scheme is designed to create a "people's movement" for disaster resilience, strengthening the link between community and formal response agencies.

COMMUNITY ENGAGEMENT AS FIREFIGHTER: A SHITLAKHET MODEL

The **Shitlakhhet Model** is a remarkable public participation initiative aimed at preventing forest fires in the Almora district of Uttarakhand, India. This model, which has gained significant recognition for its effectiveness, involves local communities, particularly women, actively engaging in forest conservation and fire management efforts.

The Key Features of the Shitlakhhet Model:

1. **Community Involvement:** The model relies on the collective efforts of villagers, especially women, who are trained to be the first line of defence against wildfires. The community is connected via WhatsApp, which facilitates quick communication and coordination when fires break out. Once informed by local communities or the Forest Department, the group rushes to the fire location to help contain it.
2. **Preventive Measures:** The group takes proactive steps before the fire season, such as clearing dried grass, leaves, and other flammable materials from the forests. These measures reduce the fuel available for wildfires and help in preventing the spread of fire.
3. **Encouraging Sustainable Practices:** The initiative focuses on reducing harmful practices that contribute to forest fires, such as the burning of leaves and bushes by farmers to clear fields for sowing. Additionally, the group has worked to reduce tree felling for making wooden ploughs by providing nearly 10,000 farmers in nine hilly districts with iron ploughs, an initiative supported by the Vivekananda Hill Agriculture Research Institute. The effectiveness of the Shitlakhhet Model has been widely acknowledged and stands as a strong example of how community-driven efforts, especially by women, can play a crucial role in environmental conservation. Its success has set a benchmark for other regions to follow and replication across the state to address forest fire issues more effectively and contributing to the long-term sustainability of Uttarakhand's forests.



A group of women collecting dried grass as forest fire prevention measures

Chapter 5

"We should not be focusing on quick solutions. The really important concern for policymakers everywhere is to prevent disasters - that is, the outlier events that matter the most"

“Robert J. Shiller”

5. Mainstreaming Disaster Risk Reduction (DRR)

5.1. Introduction and Context

Disasters often disrupt development by causing widespread devastation, sometimes reversing decades of progress. The scale of loss—lives, assets, livelihoods, and infrastructure—can hinder long-term development goals as resources are diverted to immediate response and recovery efforts. However, integrating Disaster Risk Reduction (DRR) measures into development planning and practices can significantly reduce these impacts. This integration minimizes vulnerabilities and builds resilience, protecting development gains against potential disasters. A study by the United Nations Development Program (UNDP, 2012) found that for every dollar invested in DRR, seven dollars could be saved in disaster response and recovery costs. This demonstrates the economic value of proactive risk reduction measures. Moreover, the development process itself can either reduce or exacerbate disaster risks. Poor planning, unsafe infrastructure, and inadequate regulations often increase vulnerabilities, creating new risks or amplifying existing ones. Therefore, embedding DRR into all stages of the development process is essential.

The Disaster Management (DM) Act of India mandates that all Ministries, States, Union Territories (UTs), and relevant agencies prepare their Disaster Management Plans (DMPs). However, DRR cannot merely be treated as a sub-component of these plans. Instead, it must be integrated across all policies, programs, and projects. This approach—mainstreaming DRR—ensures that risk reduction becomes an intrinsic part of development planning, resulting in sustainable development outcomes that are resilient to disasters. Mainstreaming DRR also includes addressing the increasing risks posed by climate change, which acts as a multiplier of hydro-meteorological hazards.

Development strategies must, therefore, incorporate risk management and climate adaptation as core components, particularly in high-risk areas. It means radically expanding and enhancing DRR so that it becomes a standard practice, fully institutionalized within each agency's regular planning and programs, in addition to the preparedness for disaster response. For over two decades, there has been increasing attention on the need to 'mainstream' disaster risk reduction into development. This prompted many nations to address risks from natural hazards within their development frameworks in various ways and at different levels - spanning the legislative, institutional, sectoral strategies and financial planning (Benson and Twigg, 2007). Development does not necessarily reduce disaster risk. It can unwittingly create new risks or exacerbate the existing ones, with disasters likely to be both a cause and a product of development. The experiences worldwide have highlighted the crucial importance of social inclusion in DRR. Social exclusion adversely affects both development and the capacity to cope with disasters. In addition to the special emphasis on making DRR socially inclusive, mainstreaming DRR must also make social inclusion one of the intrinsic features. The Oslo Policy Forum (2008) concluded that rather than reducing disaster risk, development processes often give rise to new forms of vulnerability, impeding efforts to reduce poverty and promote growth. 'Win-win' solutions for securing sustainable development, reducing poverty, and strengthening hazard resilience, therefore, need to be explicitly and actively sought, mainly as climate change is likely to increase extreme weather events (Benson and Twigg, 2007). This process should take account of the impact of climate change on the intensity and frequency of hydro-meteorological events in the future, as well as historical hazard records. The recognition of close linkages between development, disaster risk reduction, and global climate change has resulted in all the major global frameworks having a shared emphasis on building resilience. The

concept of coherence and mutual reinforcement of the diverse initiatives to achieve the national goals and those of the significant global frameworks has also emerged. Given the highly cross-sectoral nature of these challenges, it is evident that they are naturally inseparable and almost indistinguishable from mainstreaming.

Over the last three decades, there has been considerable national concern about mainstreaming disaster risk reduction into the development process for sustainable development. It was articulated first during the International Decade for Natural Disaster Reduction (1990-1999) and Yokohama Strategy for a Safer World (1994), followed by the Hyogo Framework of Action (2005-2015), when a detailed strategy for it was worked out. It mentioned seven principles and twelve sectors of mainstreaming. While the Hyogo Framework of Action (HFA) was replaced by the Sendai Framework for Disaster Risk Reduction (SFDRR) in 2015, the following is still relevant in mainstreaming.

5.2. Key Sectors for DRR Integration

Over the last three decades, there has been considerable national concern about mainstreaming disaster risk reduction into the development process for sustainable development. It was articulated first during the International Decade for Natural Disaster Reduction (1990-1999) and Yokohama Strategy for a Safer World (1994), followed by the Hyogo Framework of Action (2005-2015), when a detailed strategy for it was worked out. It mentioned seven principles and twelve sectors of mainstreaming. While the Hyogo Framework of Action (HFA) was replaced by the Sendai Framework for Disaster Risk Reduction (SFDRR) in 2015, the following is still relevant in mainstreaming.

Hyogo Framework of Action 2005-2015—12 Sectors for Mainstreaming

- **Food security-** Promote food security as an essential factor in ensuring the resilience of communities to hazards, particularly in areas prone to drought, flood, cyclones, and other hazards.
- **Livelihood-** Promote diversified income options for populations in high-risk areas to reduce their vulnerability to hazards and ensure that their income and assets are not undermined by development policies and processes that increase their vulnerability to disasters.
- **Health-** Integrate disaster risk reduction planning into the health sector promotes the goal of “hospitals safe from disaster” by ensuring that all new hospitals are built with a level of resilience that strengthens their capacity to remain functional in disaster situations.
- **Infrastructure-** Protect and strengthen critical public facilities and physical infrastructure, particularly schools, clinics, hospitals, water and power plants, communications and transport lifelines, disaster warning and management centres, and culturally significant lands and structures through proper design, retrofitting, and re-building to render them adequately resilient to hazards.
- **Urban planning-** Incorporate disaster risk assessment into the urban planning and management of disaster-prone human settlements, mainly highly populated areas and quickly urbanizing settlements. The issues of informal or non-permanent housing and the location of housing in high-risk areas should be addressed as priorities, including in the framework of urban poverty reduction and slum-upgrading programs.

- **Building codes-** Encourage the revision of existing or the development of new building codes, standards, rehabilitation, and reconstruction practices at the national or local levels, as appropriate, to make them more applicable in the local context, particularly in informal and marginal human settlements, and reinforce the capacity to implement, monitor and enforce such codes, through a consensus-based approach, to foster disaster-resistant structures
- **Land use planning,** upgrade and encourage the use of guidelines and monitoring tools for the reduction of disaster risk in the context of land-use policy and planning.
- **Rural development-** Incorporate disaster risk assessment into rural development planning and management, in particular concerning mountain and coastal floodplain areas, including through the identification of land zones that are available and safe for human settlement.
- **Social protection-** Strengthen the implementation of social safety-net mechanisms to assist people experiencing poverty, older people and people with disabilities, and other populations affected by disasters.
- **Post-disaster recovery-** Incorporate disaster risk reduction measures into post-disaster recovery and rehabilitation processes and use opportunities during the recovery phase to develop capacities that reduce disaster risk in the long term.
- **Risk Insurance-** Promote the development of financial risk-sharing mechanisms, particularly insurance, and reinsurance against disasters.
- **Private sector-** Promote the establishment of public-private partnerships to engage the private sector in disaster risk reduction activities encourage the private sector to foster a culture of disaster prevention, emphasizing and allocating resources to pre-disaster activities such as risk assessments and early warning systems. Although the Hyogo Framework of Action concluded in 2015, the above principles and the sectors where disaster risk reduction must be mainstreamed are still valid and must be pursued vigorously.

5.3. Thematic Areas for DRR Mainstreaming

These areas must be integrated into government agencies and development stakeholders' planning, implementation, and evaluation processes to ensure sustainable and risk-informed development. The key thematic areas of mainstreaming disaster risk reduction in developmental plans and projects are:

- Generating awareness and understanding of disaster risk among all stakeholders.
- Adequate legal mandate and better disaster governance strategies
- Efficient disaster risk management strategy
- Social inclusiveness in disaster risk management
- Promoting Alignment Between Global Frameworks and National Initiatives
- Institutional arrangements and capacity development for disaster risk management
- Inter and intra-government coordination
- Budget allocation for mainstreaming DRR concerns into developmental projects/plans within the overall cost of the project in disaster-prone areas

- Comprehensive project appraisal and scrutiny of development projects and plans to stress multi-hazard resilient infrastructure and
- Set realistic targets, time frames, and monitoring mechanisms to integrate disaster risk reduction in development

5.4. Enhancing Risk Awareness and Understanding

Awareness and understanding of disaster risk are fundamental to effective DRR, as they enable informed decision-making, reduce vulnerabilities, and enhance resilience. The Sendai Framework for Disaster Risk Reduction underscores the critical need to foster risk awareness and promote proactive measures at all levels. This includes educating communities about potential hazards and preventive measures, training officials in risk assessment and management, and encouraging private sector and civil society participation in DRR initiatives. A comprehensive understanding of disaster risks—encompassing their cascading impacts across sectors and the influence of development choices on risk—is essential.

Policies and practices must integrate disaster risk considerations, ensuring key line agencies, local authorities, and high-risk communities are equipped to take proactive measures. The cascading nature of disaster risks, where decisions in one sector can influence risks in another, highlights the importance of a coordinated approach. Decision-makers across sectors, levels of government, the private sector, and civil society must collaborate to incorporate disaster risk considerations into all projects, programs, and initiatives, fostering a holistic and resilient approach to DRR.

5.5. Legal and Institutional Framework for Disaster Governance

Effective disaster governance is underpinned by strong legislative arrangements that institutionalize disaster risk reduction (DRR) and ensure its integration into development planning. Key actions include revising land-use regulations and building codes to promote hazard-resistant infrastructure, strengthening enforcement mechanisms, and explicitly incorporating DRR responsibilities at all levels of government. Vertical and horizontal coordination among government agencies, line departments, and neighboring local bodies is critical for a unified approach. Periodic reviews and updates of laws, regulations, and policies are essential to address emerging risks and ensure that DRR remains a priority.

The Disaster Management Act of 2005 provides a comprehensive legal framework for mainstreaming DRR into development plans and projects across national, State, and district levels. It mandates formulating and implementing disaster management plans with explicit provisions for prevention, mitigation, capacity building, and integrating DRR measures into development processes. Specific provisions include:

- The National Plan integrates disaster prevention and mitigation measures into development plans (Section 11(3)).
- State Plans incorporating vulnerability assessments and mitigation measures into development projects (Section 23(3)).
- District Plans addressing disaster-prone areas, mitigation strategies, and capacity-building efforts at local levels (Section 31(3)).

- State governments and departments are responsible for allocating resources and integrating DRR measures into policies, projects, and regulations (Sections 38 and 39).

The Act's uniform mandate for mainstreaming DRR is complemented by the National Policy on Disaster Management, which emphasizes disaster resilience in development projects and ensures resource allocation by entities like NITI Aayog. Together, these frameworks establish a robust foundation for disaster governance, ensuring a proactive, integrated, and sustainable approach to risk management.

5.6. Disaster Risk Transfer

Risk transfer mechanisms, such as insurance and disaster risk financing instruments (DRFI), are vital for mitigating the financial burden of disasters. These mechanisms must be part of a broader disaster risk reduction (DRR) strategy, addressing various layers of risk and integrating with development planning. For example:

- High-frequency, low-severity risks (e.g., minor floods) can be managed through self-financing measures like contingency funds or budget reallocations.
- Low-frequency, high-severity risks (e.g., significant earthquakes) require risk transfer to third parties such as insurers or international agencies

Effective implementation of risk transfer mechanisms relies on understanding risk profiles, developing enabling policies, and fostering collaboration among stakeholders, including governments, private sectors, communities, and civil society. These mechanisms should be embedded within a comprehensive DRR strategy that aligns with broader development goals. The focus must shift from disaster event management to proactive risk management, recognizing these processes' continuous and integrated nature within the development framework.

Disaster risk financing instruments can be categorized as ex-post (e.g., budget reallocations, borrowing) or ex-ante (e.g., insurance, contingency credit, reserve funds). Insurance, a type of ex-ante mechanism, transfers some or all of the risk exposure to a third party in exchange for a premium. However, insurance alone is insufficient for comprehensive DRR and should be complemented by other tools. Not all perils are insurable, and decisions about appropriate instruments must consider factors like risk frequency, severity, and stakeholder capacity.

Risk layering is essential for selecting suitable financial instruments. High-frequency, low-severity risks are best managed through self-financed mechanisms, while low-frequency, high-severity risks should involve risk transfer to more capable entities. Policymakers must integrate risk transfer mechanisms into disaster risk-informed development, supported by enabling policies and legal frameworks. This integration requires identifying various risk layers, determining who bears each level of risk, and selecting appropriate instruments for each. While challenging, embedding these mechanisms in a holistic DRR strategy ensures more resilient and sustainable risk management.

5.7. Social Inclusion and Equity in Disaster Risk Management

Social inclusiveness in disaster risk management (DRM) ensures that all individuals, regardless of social background, gender, age, or ability, have equal access to disaster risk reduction (DRR)

measures. It focuses on equality of rights, equal opportunities, and the dignity of individuals while addressing the specific needs of marginalized and vulnerable groups such as women, children, the elderly, persons with disabilities, and economically or socially disadvantaged communities.

Inclusive DRR involves engaging vulnerable groups in decision-making processes, promoting community-led resilience initiatives, and addressing the unique challenges faced by groups such as Scheduled Castes and Tribes, expectant women, nursing mothers, and transgender individuals. These practices foster community, strengthen social bonds, and ensure no one is left behind in disaster preparedness, response, and recovery efforts.

The Disaster Management Act 2005 reinforces this principle through Section 61, which prohibits discrimination in relief and compensation based on sex, caste, community, or religion. Similarly, Article 15 of the Indian Constitution prohibits discrimination based on religion, race, caste, sex, or place of birth. The National Policy on Disaster Management, 2009 also acknowledges the disproportionate vulnerability of economically and socially weaker segments, emphasizing the inclusion of these groups in DRR planning and implementation.

A community's vulnerability to disasters often stems from cycles of deprivation, which increase susceptibility to risks and alienate affected individuals from decision-making and basic entitlements. Therefore, inclusive DRM must actively recognize diversity and empower all individuals to contribute to resilience. The World Summit for Social Development (Copenhagen, 1995) defines an inclusive society as one in which every individual, with rights and responsibilities, plays an active role.

In the Indian context, the State Disaster Management Plans (SDMPs) and District Disaster Management Plans (DDMPs) emphasize social inclusion in DRR by addressing vulnerabilities of:

- Women and transgender people
- Scheduled Castes and Scheduled Tribes (SC/ST)
- The elderly
- Expectant and nursing mothers
- Children
- Persons with disabilities (PWD)

By integrating social inclusion as a cross-cutting theme, DRM ensures resilience-building efforts are equitable, comprehensive, and effective for all members of society

5.8. Aligning DRR with Global Frameworks for Resilience and Sustainability

Achieving coherence among national disaster risk reduction (DRR) strategies and major global frameworks such as the Sendai Framework, Sustainable Development Goals (SDGs), and the Paris Agreement ensures mutual reinforcement, cost-effective implementation, and enhanced disaster resilience. Aligning these frameworks enables shared targets and indicators, streamlining monitoring and evaluation processes and fostering integrated approaches to address overlapping challenges like climate change and disaster risks.

The 2030 global agenda highlight the potential for aligning plans, targets, actions, and indicators across these interlocking frameworks, enabling policies and financing mechanisms that deliver on

multiple objectives. Coherence goes beyond formal inter-agency coordination to create measures that strengthen goals across all frameworks, promoting synergies that improve efficiency and accelerate progress.

Integrating coherence into mainstreaming efforts requires moving beyond conventional planning mechanisms to incorporate disaster resilience into all aspects of decision-making. Key actions include:

- Enhancing understanding of disaster risks, including natural hazards and those amplified by developmental activities.
- Recognizing the cascading nature of risks, where decisions in one sector influence vulnerabilities in others.
- Assessing both vulnerabilities and capacities to manage, absorb, and mitigate risks.
- Embedding disaster risk considerations into all projects, programs, and initiatives across government, private sectors, and civil society.
- Aligning risk management approaches to foster consistency and collaboration.
- Improving horizontal and vertical integration of DRR within government using decision-making tools and advanced technologies. Establishing clear targets, timeframes, indicators, and monitoring mechanisms to consolidate efforts across sectors.

By aligning national efforts under these frameworks, governments, and stakeholders can create resilient societies while advancing sustainable development and addressing climate change. This integrated approach ensures that actions taken under one framework simultaneously strengthen objectives across others, fostering holistic and sustainable disaster resilience.

5.9. Institutional Strengthening and Capacity Development

Mainstreaming Disaster Risk Reduction (DRR) requires robust institutional frameworks equipped with the authority, resources, and expertise to implement risk reduction measures effectively. This necessitates national, State, and local leadership to drive the integration of DRR into development planning and governance. Key actions include:

- **Establishing Leadership:** Designating roles at national and State levels to advocate for and oversee the integration of DRR into broader development policies.
- **Building Capacities:** Enhancing technical and managerial skills among government officials, community leaders, and other stakeholders to effectively manage disaster risks.
- **Strengthening Community Institutions:** Empowering local organizations to build resilience and address risks at the grassroots level.

DRR is inherently multi-sectoral, cutting across government departments, private enterprises, and civil society organizations. This requires institutions to explicitly recognize DRR as a crosscutting responsibility, ensuring accountability and fostering stakeholder collaboration. Institutions must also implement cohesive arrangements to align Authority, Responsibility, Accountability, and

Capacity (ARAC) across sectors and levels of governance.

Nodal agencies at national, State, and district levels are pivotal in providing leadership, formulating disaster risk management policies, overseeing their implementation, and advocating for the inclusion of DRR in development initiatives. Similarly, private sector and civil society organizations must integrate DRR concerns into their operations and projects, contributing to a unified approach to resilience-building.

An integrated and cohesive framework for institutional arrangements and capacity development is essential for ensuring effective DRR. This involves aligning policies, enhancing coordination, and leveraging technology to address disaster risks comprehensively. By embedding DRR considerations into all sectors, institutions can create a resilient society prepared to effectively manage and mitigate disaster risks.

5.10. Intergovernmental Coordination and Policy Integration

Effective Disaster Risk Reduction (DRR) requires robust horizontal and vertical coordination across government agencies to ensure that risk reduction measures are seamlessly integrated into planning and implementation processes. Key mechanisms for achieving such coordination include regular consultations among ministries, departments, and local bodies to foster collaboration and align efforts ensuring that risk assessments, hazard data, and other critical information are shared across sectors for informed decision-making and synchronizing national and state and local policies to create a cohesive framework for DRR initiatives.

Effective inter-agency coordination is essential given disaster risk management's multi-sectoral and multi-stakeholder nature. Horizontal coordination is required among departments at the same administrative level, such as state or district agencies, to address crosscutting responsibilities and mitigate the impacts of one agency's decisions on another. Vertical coordination is equally crucial, linking national, state, district, and local levels to ensure alignment in planning, implementation, and response.

The State Disaster Management Authority (SDMA) plays a pivotal role in coordinating the implementation of the State Plan, which includes inter-departmental collaboration and integration with Civil Society Organizations. The State Executive Committee is a coordinating and monitoring body tasked with implementing National and State Plans, monitoring disaster responses, and aligning efforts across government and non-government entities.

The District Disaster Management Authority (DDMA) acts as disaster management's planning, coordination, and implementation body at the district level. It is responsible for aligning district plans with national and State policies, coordinating training programs, and managing disaster responses.

To mainstream DRR effectively, coordination mechanisms must ensure that locally identified risks and vulnerabilities are incorporated into higher-level plans and strategies, promote collaboration across various line agencies and sectors to address the multifaceted nature of disaster risks and strengthen the alignment between national, State, and district-level plans for cohesive action.

Given the cross-cutting nature of DRR, horizontal and vertical integration are indispensable for creating a unified approach to risk reduction. This ensures that DRR is embedded in all stages of

development, fostering resilience and reducing vulnerabilities across communities and sectors.

5.11. Budget Allocations

Adequate financial resources are essential for effectively mainstreaming Disaster Risk Reduction (DRR). Budgeting for DRR should be addressed from two key perspectives:

- Allocating funds for risk reduction activities within development programs.
- Establishing contingency funds to manage residual risks.

All government departments must ensure that DRR is reflected in their annual budgets, in compliance with the Disaster Management (DM) Act, 2005.

Integrating disaster risk concerns into government budgets requires ensuring sufficient public expenditure on risk reduction activities while making adequate financial arrangements to address residual risks. Residual risk necessitates the continuous development and maintenance of emergency services, preparedness, response, recovery capacities, and socio-economic policies, such as safety nets and risk transfer mechanisms, as part of a comprehensive approach. While specific budgetary allocations, such as the National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF), address relief needs, mainstreaming DRR requires that each department incorporate DRR into its core budget.

According to Section 49 of the Disaster Management Act of 2005, every Ministry or Department of the Government must allocate funds in their annual budget to support activities and programs outlined in their disaster management plan. This provision applies similarly to state departments.

Mainstreaming DRR should not treat these initiatives as standalone measures but as integral to sustainable development. When designing projects, departments must consider whether they might increase vulnerabilities or create new ones. Additionally, projects should be examined for their potential to reduce existing vulnerabilities. Any necessary measures to address these vulnerabilities must be integrated into the project, with associated costs factored into the overall project budget. Failing to incorporate such measures risks undermining the project's sustainability and contradicts the core principle of development.

Furthermore, it is crucial that public expenditure on risk reduction is sufficient and that financial provisions are in place to manage residual risks. Given the ongoing need to develop emergency response capacities and socio-economic safety nets, DRR should be embedded in the core budgets of all departments, with comprehensive measures to reduce vulnerabilities incorporated into development projects.

5.12. Risk-Sensitive Project Appraisal and Development Planning

Project appraisals must incorporate Disaster Risk Reduction (DRR) and climate change considerations to prevent the creation of new risks. This involves:

- Conducting comprehensive risk assessments during project planning.
- Adopting hazard-resilient designs for infrastructure.
- Integrating DRR into Environmental Impact Assessments (EIAs).

To ensure the sustainability of development gains, DRR must be integrated into the appraisal processes of various development projects. This approach ensures that the DRR and development components of the projects are mutually reinforcing. Examples of successful implementation have demonstrated that recognizing and addressing risks during the planning phase can prevent new risks, such as factoring in seismicity, estimating flooding probabilities, limiting urban sprawl in hazard-prone areas, and strengthening land-use regulations.

From the concept stage to the detailed project report, project evaluations should be informed by hazard likelihoods as much as possible. DRR and climate change concerns must be systematically incorporated into project appraisals and Environmental Impact Assessments (EIAs) rather than being treated as an afterthought, as is often the case in many regions.

To facilitate this, adjustments must be made to budget approval and financial sanctioning procedures employed by the Expenditure Finance Committee (EFC) and Standing Finance Committee (SFC), making DRR evaluation a mandatory component.

To integrate DRR into development projects from the outset, it should be incorporated into the initial appraisal process and subsequent supervision plans. Mainstreaming DRR is crucial for ensuring that development projects remain sustainable in the long term. The DRR and development components of projects must complement and enhance each other's effectiveness. DRR and climate change concerns should be addressed systematically before budget approval and financial sanctions are granted for project implementation.

5.13. Establishing Targets, Timelines, and Performance Indicators

Setting measurable targets, timelines, and indicators is crucial for monitoring and evaluating Disaster Risk Reduction (DRR) initiatives, ensuring accountability, and providing evidence to scale up successful practices.

The capacity to monitor and evaluate DRR initiatives, track inputs, outputs, results, and impacts, and learn from past experiences is vital for creating an enabling environment for mainstreaming. Although mainstreaming DRR is an ongoing and pervasive process, establishing clear targets with defined timeframes, responsibilities, and measurable indicators is essential. This approach should apply across all development and governance sectors as DRR will become increasingly integrated into all developmental initiatives.

Given the slow start of DRR mainstreaming, it is necessary to proceed in phases. The initial phase should focus on incorporating DRR into overall plans, followed by setting medium- and long-term goals. The phasing should align with the priorities outlined in the National Disaster Management Plan (NDMP), with specific actions for the central government, state governments, and Union Territories, as described in the responsibility framework for building disaster resilience.

Although state governments, district administrations, and local authorities are becoming more aware of DRR, actions to address disaster risks are still in the early stages. While DRR initiatives are identified at the state level and by various government departments, there is a need to strengthen the capacity to monitor and evaluate them effectively. Given that resistance to adopting DRR as an essential component of inclusive development still exists in some areas, setting clear targets, timelines, and indicators will be crucial for ensuring DRR is integrated systematically into the development process.

It is important to establish targets for DRR actions in advance, link them to specific timeframes, and develop indicators to monitor progress over time. This process should be applied across all development and governance sectors, as mainstreaming DRR must be ongoing and continuous. To accelerate the integration of DRR into development processes, DRR actions should be identified for each project or program, with targets, timelines, and indicators established. Regular monitoring of the progress of these initiatives should focus on DRR components and ensure that they align with the pre-determined timelines and indicators. Periodic meetings should be held to review the progress of development plans and projects, and the implementation and progress of DRR actions should be prioritized.

5.14. Implementation Strategy and Key Considerations

Successfully mainstreaming Disaster Risk Reduction (DRR) requires a phased approach, beginning with capacity-building and institutional strengthening, followed by integrating DRR into policies, programs, and projects. Each ministry, state, and agency must take ownership of DRR within their respective domains and align their efforts with national and global frameworks.

By institutionalizing DRR across all sectors, India can build a more resilient and sustainable future, safeguarding development gains against the increasing frequency and intensity of disasters. Mainstreaming involves internalizing risk awareness and incorporating risk reduction measures into overall policies and programs within and outside the government.

While the National Disaster Management Plan (NDMP) provides a broad perspective on mainstreaming DRR, each ministry, department, state, and agency must review existing programs and, where possible, integrate DRR measures cost-effectively into their central budgets. Furthermore, all new initiatives - whether policies, plans, programs, or projects must undergo comprehensive appraisal from a DRR perspective, as outlined in the NDMP.

DRR is a central theme in the post-2015 global frameworks, and the NDMP emphasizes the importance of coherence and mutual reinforcement across national efforts associated with these frameworks. This requires the integration of DRR into broader developmental efforts. The successful implementation of mainstreaming hinges on incorporating DRR considerations as integral components of key activities rather than being treated as separate elements within each ministry's Disaster Management Plans (DMP).

It is important to note that the NDMP, as a standalone document, cannot provide detailed guidance on how different central ministries and state governments will mainstream DRR. This integration will occur through the seamless incorporation of DRR into their main plans. The NDMP, through its various sections, thematic areas, and sub-themes, offers the foundational framework for mainstreaming DRR across all sectors.

5.14.1. Bridging Gaps in DRR Mainstreaming

Integrating disaster risk reduction (DRR) into development plans and projects has emerged as a significant concern. It was observed that while efforts to mainstream DRR have been initiated, the integration into the development process remains incomplete and has yet to gain momentum in most departments. Notably, the Departments of Agriculture, Urban Development, and Public Health Engineering expressed a clear need for DRR to be fully incorporated into the development process, from the state to the local level.

A key gap identified is the inadequate allocation of funds for DRR initiatives, which have not yet

been integrated as a core component of overall project costs. Other factors contributing to the insufficient mainstreaming of DRR include a lack of staff at the district and local levels and inadequate training for officers and staff at various administrative levels.

To address these gaps, it is essential that focused training programs be implemented and that DRR becomes an integral part of the design and execution of development plans and projects. Additionally, horizontal and vertical coordination needs to be significantly enhanced, particularly among state-level departments and their counterparts at the district and local levels. This will facilitate intensive supervision and monitoring of development projects, allowing for mid-course corrections where necessary to ensure full integration of DRR into the development process.

5.14.2. Challenges in Integrating DRR into Development Policies

In addition to the challenges identified by various State Government departments in Uttarakhand, there are several common challenges faced in the mainstreaming of disaster risk reduction (DRR) in development efforts:

- Mainstreaming DRR is a complex and challenging process that requires coordinated efforts across different departments and agencies.
- Securing adequate support for mainstreaming at all levels remains a significant hurdle.
- Many departments of both Central and State Governments have traditionally focused more on disaster management than disaster risk management. Although a shift in approach is beginning following the establishment of the National and State Disaster Management Authorities, the changes have not yet been fully realized at the district level.

Additionally, implementing intensive training programs at both the State and local levels is essential to ensure the effective integration of DRR into the development process, particularly for State and District departments and project implementers and supervisors.

Chapter 6

"Without science and technology, and their
blending with other disciplines, there can be no
world safer from natural disasters "
“UNESCO/UNISDR Statement”

6. Transforming Disaster Management with Technology & Evidence

6.1. Introduction

The State of Uttarakhand is situated in a highly active region of the Himalayas, making it extremely vulnerable to multiple and simultaneous hazards, including earthquakes, landslides, flash floods and glacial lake outburst floods. Past disasters have demonstrated that post-disaster relief alone is not a sustainable or effective long-term approach. Accordingly, this State Disaster Management Plan (SDMP) establishes Scientific Temperament as a core guiding principle. This implies that all decisions related to development planning, public expenditure, and emergency response must be guided by validated scientific models and credible data, rather than subjective assessments

This commitment starts with scientific analysis, with specialized technical studies. To accurately assess risk across the state, experts apply methods such as evaluating ground stability in urban areas through seismic micro-zonation, constantly mapping slopes to see which are likely to fail (landslide susceptibility mapping), and using computer models to predict river behavior (hydrological modelling). This rigorous process provides the objective truth needed for Evidence-Based Planning, ensuring that policies and financial investments are prioritized based on verifiable scientific risk scores, making public spending on resilience maximally effective and accountable.

To gather this precise information, the state relies on Technological Interventions. Advanced tools serve as the data engine for Data-Driven Planning. This includes high-resolution satellite technology (Remote Sensing and GIS) used by the Indian Institute of Remote Sensing (IIRS) and National Remote Sensing Centre (NRSC) to track glacial changes and land use. It also involves the operation of sophisticated systems like the Earthquake Early Warning System (UEEWS), managed by IIT Roorkee and supported by the National Centre for Seismology (NCS). The deployment of Doppler Weather Radars by the India Meteorological Department is used to monitor weather in real time and provide early, accurate warnings of extreme weather events to support disaster preparedness and response. These technologies provide continuous, real-time data that turn general warnings into clear and useful information for teams working on the ground.

This comprehensive approach formalizes a Scientific-Administrative Nexus, linking the Uttarakhand State Disaster Management Authority (USDMA) with elite national and state scientific partners through mandatory, real-time data-sharing protocols. These institutions serve distinct, critical functions: The NCS, IIT-Roorkee and the Wadia Institute of Himalayan Geology (WIHG) focus on seismic and geological threats; the IMD and the Central Water Commission (CWC) manage weather and flood forecasting; the Geological Survey of India (GSI) and Defence Geoinformatics Research Establishment (DGRE) handle geological and high-altitude hazards (like avalanches); the Forest Survey of India (FSI) provides forest fire intelligence; and the Central Building Research Institute (CSIR-CBRI) advises on safe construction. The ultimate goal is to transform the State Emergency Operation Centre (SEOC) into a Centre of Excellence where all this specialized technical data is synthesized in real-time.

However, the efficacy of this entire technological framework rests on Capacity Building and Technical Training. This is the critical human link that ensures all the scientific data is used correctly. Training is mandated across all levels from district administration to the State Disaster

Response Force (SDRF) to ensure personnel can accurately interpret FSI's geo-spatial data, understand GSI's geological reports, and immediately follow UEEWS alerts. By consistently investing in the skills of its personnel, the state ensures that these high-fidelity scientific outputs are seamlessly integrated into operational plans. This "Whole-of-Science" model secures Uttarakhand's path toward true, long-term resilience by protecting human life and critical infrastructure with the highest standards of scientific precision and rational inquiry.

6.2. Dedicated Institutional Roles and Data Sharing Protocols

The implementation of a scientific SDMP rests upon clearly defined mandates for each collaborating institution, ensuring that roles are non-overlapping and data sharing is systematic and reliable.

6.2.1. Role and Scientific Mandate: Nodal Institution for Seismic Hazard: IIT Roorkee

The IIT Roorkee, through its Department of Earthquake Engineering and the Centre of Excellence in Disaster Mitigation and Management, holds the critical mandate for Seismic Hazard Assessment and Engineering Solutions. This includes the continuous operation, maintenance, and expansion of the Earthquake Early Warning System (EEWS) across the state, providing precious seconds of lead time before destructive seismic waves reach high-population centers. A core mandate is conducting high-resolution Seismic Micro-Zonation Studies for all urban and sub-urban growth areas, which provides detailed scientific data on ground motion characteristics, soil-structure interaction, and liquefaction potential. This Micro-Zonation data forms the scientific cornerstone of the state's Techno-Legal Regime, specifically guiding the application of the Bureau of Indian Standards (BIS) seismic codes and dictating mandatory structural retrofitting policies. Furthermore, the institute certifies engineers and architects in seismic-safe construction practices relevant to Himalayan geology.

Data Sharing and Integration Mechanism with USDMA: The data sharing mechanism is a dual-layered strategy designed to simultaneously manage immediate crisis response and strategic, long-term disaster planning, with each layer employing purpose-built communication and data formats. The first, and most critical, pathway is dedicated to the dissemination of Operational EEWS (Earthquake Early Warning System) Alerts. This system prioritizes speed and resilience above all else. The real-time alert data is transmitted directly from the IIT Roorkee server to the State Emergency Operation Centre (SEOC) via a dedicated, redundant communication pathway comprising VSAT (Very Small Aperture Terminal) and OFC (Optical Fiber Cable) links. Critically, this communication explicitly bypasses standard internet infrastructure. This redundancy is vital: the OFC provides high-speed, low-latency transmission for primary reliability, while the VSAT satellite link ensures connectivity in remote or disaster-hit areas where physical fiber lines may have failed. The moment the SEOC receives this low-latency data, it is instantly translated into tangible actions: triggering the physical siren network and generating CAP (Common Alerting Protocol) messages for public warning.

The second pathway handles long-term planning and mitigation data, focusing on scientific accuracy and integration into policy. Annually, IIT Roorkee submits comprehensive datasets, specifically Micro-Zonation Maps and Seismic Hazard Probability Maps, to the USDMA (Uttarakhand State Disaster Management Authority). Unlike the real-time alerts, this data is submitted in standardized, easy-to-use GIS-compatible vector formats, such as GeoJSON or Shapefiles. This specific formatting is essential because it allows the USDMA to integrate these scientific layers seamlessly into the central UDRDB (Uttarakhand Disaster Risk Database). The

resulting consolidated database is then leveraged by District Disaster Management Authorities (DDMAs) and the Public Works Department (PWD) to inform and enforce site-specific building codes, thereby prioritizing and optimizing structural resilience investments in the regions identified as having the highest seismic risk.

6.2.2. Technical Partner for Multi-Hazard Safe Construction: CSIR-CBRI

Role and Scientific Mandate - The CSIR-Central Building Research Institute (CBRI), situated in Roorkee, functions as Uttarakhand's specialized technical authority for addressing disasters within the Built Environment. Its primary scientific mandate is to bridge the gap between geological hazard data and practical, safe engineering solutions, thereby minimizing the physical vulnerability of the state's infrastructure. This involves a comprehensive focus on Multi-Hazard Resistant Housing and Habitat, where CBRI researches, develops, and promotes innovative, cost-effective construction technologies specifically designed to withstand the combined threats of high seismicity, landslides, and high-altitude weather conditions prevalent in the Himalayan region. The institute's expertise is paramount in the crucial areas of Geotechnical and Landslide Risk Engineering, where it performs detailed slope stability assessments, designs site-specific foundations, and recommends robust physical mitigation measures—such as specialized retaining structures and deep anchors—for active landslide zones threatening critical settlements and arterial roads. Furthermore, CBRI plays a non-negotiable role in Post-Disaster Structural Audits, providing the scientific basis for governmental decisions regarding the repair, retrofitting, or demolition of damaged structures, ensuring that reconstruction adheres to the highest safety standards.

Data Sharing and Integration Mechanism with USDMA: The mechanism for data sharing between CBRI and the Uttarakhand State Disaster Management Authority (USDMA) is focused on advisory, regulatory, and prescriptive input that shapes long-term safety and recovery protocols, rather than real-time warnings. CBRI's technical outputs directly influence the state's Techno-Legal Regime. The institute submits vital inputs, including scientifically validated Standardized Building Designs and Guidelines for Construction in Hilly Areas, which the USDMA integrates into the State's Building Bye-Laws to mandate disaster-resilient construction practices. This policy-level data is essential for long-term Vulnerability Reduction within the Uttarakhand Risk Database (UDRDB).

For specific, acute risks, CBRI conducts specialized projects, such as establishing Landslide Early Warning System (LEWS) instrumentation at high-risk sites. The data generated from these instruments (like inclinometers and total stations) is transmitted to the USDMA and relevant executing agencies (e.g., PWD) to manage the immediate threat and guide the construction of permanent mitigation structures. Finally, following a catastrophic event, CBRI's Post-Disaster Structural Audit Reports are delivered directly to the USDMA and NDMA. These reports are the official scientific documentation of structural integrity and contain explicit, actionable recommendations for rehabilitation, retrofitting methodologies, or site-relocation criteria, thereby guiding the state's entire recovery and Build Back Better strategy.

6.2.3. Nodal Institution for Geological Mapping: GSI

Role and Scientific Mandate: The core of the (Geological Survey of India) GSI's contribution to disaster mitigation lies in its function as the state's primary scientific partner for Geological Mapping and Landslide Susceptibility Assessment. Through the National Landslide Susceptibility Mapping program, the GSI is mandated to continuously create and refine Landslide Susceptibility

Maps (LSMs). These maps are not based on guesswork; they are synthesized from a vast scientific database incorporating multiple critical variables: detailed geological structures (such as rock types, faults, and weak zones), topographical features like slope angles, hydrological conditions (water saturation and drainage), and a meticulous record of historical mass movement events. The resulting LSMs provide a scientifically rigorous classification of terrain based on the inherent likelihood of future landslides, offering a fundamental tool for risk identification.

In addition to large-scale mapping, the GSI provides crucial, on-the-ground validation. This involves conducting comprehensive field surveys to provide technical, site-specific assessments of vulnerable slopes. This effort is typically concentrated along critical corridors, such as pilgrimage routes and major state highways, where infrastructure failure poses the greatest risk to life and economy. This field validation serves as a vital bridge between generalized mapping and site-specific engineering needs. By precisely characterizing the geology of a particular slope, the GSI's findings provide the scientific justification and prioritization necessary for targeted mitigation efforts.

Data Sharing and Integration Mechanism with USDMA: The Geological Survey of India's (GSI) data contribution forms the scientific backbone of Uttarakhand's disaster management system, focusing on both long-term regulatory planning and real-time proactive warning. The primary output is the Landslide Susceptibility Map (LSM) GIS Layer, which serves as the foundational spatial dataset for landslide risk. This layer is dynamically updated bi-annually—specifically, pre- and post-monsoon—to account for changes in slope stability caused by seasonal weather and historical events. This GIS data is integrated directly into the Uttarakhand Disaster Risk Database (UDRDB), making it accessible for regulatory application. Its most critical regulatory function is informing land-use regulation and the issuance of "No-Construction Certificates" in areas classified as high-hazard zones, effectively preventing new development in high-risk areas to minimize future losses.

A crucial component of the GSI's real-time warning capability involves a specialized collaboration with the India Meteorological Department (IMD). The GSI scientifically determines Rainfall Thresholds that are specifically calibrated for the different geological formations across Uttarakhand's varied terrain. These thresholds define the level of antecedent or current rainfall that significantly increases the probability of slope failure in a given area. When IMD's real-time rainfall monitoring data breaches these established, scientifically determined limits, the GSI platform automatically generates and transmits a Probabilistic Landslide Risk Alert directly to the SEOC (State Emergency Operation Centre). This pre-emptive alert mechanism is vital, as it allows authorities to undertake proactive measures like the closure of vulnerable roads and the evacuation of at-risk communities before a landslide event actually occurs, shifting disaster management from reaction to prevention.

Finally, the GSI ensures that all major infrastructure development within the state undergoes rigorous scientific scrutiny. This is achieved by mandating the provision of Geotechnical Investigative Reports (GIRs) for all critical state infrastructure projects. These detailed reports analyze the ground conditions and engineering feasibility of the projects. The GIRs are then subject to scientific review by the USDMA, ensuring that bridges, tunnels, highways, and other vital infrastructure are designed and constructed to withstand the unique geological and seismic stresses of the Himalayan region, thereby embedding resilience directly into the state's structural assets.

6.2.4. Nodal Institution for Geo-Dynamics Research: WIHG

Role and Scientific Mandate: The Wadia Institute of Himalayan Geology (WIHG) is strategically positioned as the state's deep-research, analytical, and long-term advisory body, complementing the Geological Survey of India's (GSI) regional mapping and the Indian Institute of Technology's (IIT) engineering focus. WIHG's mandate centers on understanding the complex, long-term Earth Surface Processes, Glacial Monitoring, and Landslide Analysis unique to the nascent and highly dynamic Himalayan Mountain system. Its role extends beyond immediate forecasting to establishing the scientific foundation for sustainable mountain development. The Institute is mandated to conduct specialized, continuous research focused on Tectonic Triggers and long-term geological stability. This includes detailed studies on Active Fault Systems within Uttarakhand, assessing their strain accumulation rates and the potential for rupture, which is crucial for refining seismic risk models provided by IIT Roorkee. Concurrently, WIHG actively monitors the Effects of Glacial Retreat on slope stability. As glaciers recede due to climate change, they leave behind unstable moraine slopes and alter hydrological regimes, which significantly impacts the frequency and magnitude of flash floods and mass movements. WIHG's analysis helps to scientifically delineate these newly vulnerable zones.

Data Sharing and Integration Mechanism with USDMA: WIHG is mandated to conduct continuous ground-based and remote sensing-assisted glaciological studies to generate Glacier Health Status Reports. These reports quantify critical parameters such as Glacier Mass Balance, annual Retreat Rates, and changes in Glacier Snout Positions for key glaciers in the Garhwal and Kumaon regions. This scientific data is formally submitted to the USDMA on a periodic basis (e.g., annually or bi-annually). This information is not an immediate alert but rather a fundamental input for the State Climate Action Plan (SCAP) and for assessing the long-term hydrological and geological changes impacting river flows and sediment loads. The data is integrated into the Uttarakhand Risk Database (UDRDB) to visualize how glacial degradation is altering the state's long-term hazard profile. While IIRS tracks the immediate status of glacial lakes, WIHG provides the hydro-glacial mechanism research necessary to understand the physics of a potential Glacial Lake Outburst Flood (GLOF) and subsequent debris flows. This involves modeling the stability of moraine dams, calculating the potential flood volume and velocity, and predicting the extent of the subsequent debris flow path based on downstream valley geometry and sediment availability.

6.2.5. Nodal Institution for Hydro-Meteorological Forecasting: IMD

Role and Scientific Mandate: India Meteorological Department (IMD) is responsible for the continuous, high-resolution surveillance of atmospheric conditions across the state. This is accomplished through the meticulous operation and maintenance of a comprehensive monitoring infrastructure, including a network of Doppler Weather Radars (DWR), which provide immediate detection of precipitation intensity and movement; Automatic Weather Stations (AWS) for measuring surface conditions; and dense coverage of Automatic Rain Gauges (ARG) for accurate precipitation accumulation. The core scientific deliverable is Nowcasting generating high-precision, short-duration forecasts covering the 0–3-hour window. This ultra-short-range forecasting is essential for predicting highly localized, sudden events like cloudbursts, intense thunderstorms, and localized heavy snowfall, especially during the critical monsoon and winter months when mobility is severely impacted. By generating location-specific, minute-to-minute data, IMD transforms abstract weather potential into tangible, imminent hazards.

Data Sharing and Integration Mechanism with USDMA: The data integration between IMD and the State Emergency Operation Centre (SEOC) is designed as a 24x7 Real-Time Data Flow

Model to ensure zero latency between observation and administrative response. IMD maintains a continuous, direct connection with the SEOC, securely delivering all Weather Forecasts and Warnings through a dedicated, high-bandwidth API feed. The critical element of this mechanism is the use of the Common Alerting Protocol (CAP). This ensures that the data is universally structured and can instantly trigger downstream dissemination platforms, including the automated siren network and mobile alerts.

The forecast system uses a scientifically validated, color-coded warning hierarchy (Yellow, Orange, Red). Crucially, each color code is explicitly mapped directly to a set of pre-defined Standard Operating Procedures (SOPs) within the USDMA's response framework. For instance, a "Red Alert" for heavy rainfall is not merely an advisory; it is an administrative directive that automatically triggers immediate, mandatory actions, such as the evacuation of vulnerable riverside settlements, the closure of schools and universities, and the halt of major construction or pilgrimage traffic movements. This integrated system ensures that scientific observation is translated seamlessly into enforceable administrative action.

Furthermore, IMD's role is foundational to the entire hydro-geological warning chain. The granular, real-time rainfall intensity data collected by the AWS and ARG networks serves as the essential input data stream for the scientific models run by other nodal agencies. Specifically, this real-time data is fed into the Geological Survey of India's (GSI) specialized Rainfall Threshold Models for issuing landslide alerts, and into the Central Water Commission's (CWC) models for generating Flash Flood warnings. This dependency establishes a critical scientific loop, making IMD's data quality and reliability paramount to the overall functionality and robustness of Uttarakhand's entire multi-hazard warning system.

6.2.6. Nodal Institution for Hydrological Monitoring: CWC

Role and Scientific Mandate: The Central Water Commission (CWC) is the apex technical body and designated nodal agency for Riverine Flood Forecasting and Water Resource Monitoring within Uttarakhand. Given the state's geography, where major rivers like the Ganga and Yamuna are fed by numerous high-gradient Himalayan tributaries, CWC's role is critical in mitigating the threat of riverine and flash floods, particularly those exacerbated by cloudbursts and glacial melt events. CWC's mandate centres on providing accurate and timely hydrological assessments. This is achieved through the operation of an extensive, integrated network of telemetric gauge stations positioned at strategic control points along the river systems. These stations continuously measure and transmit essential hydrological parameters: river water levels, discharge rates (volume of water flow), and often sediment load. This scientific data is then rigorously analyzed using hydrodynamic models to produce forecasts on the timing and magnitude of potential flood inundation. This predictive capability is absolutely crucial for two primary administrative functions: protecting vulnerable downstream communities through timely evacuation, and managing the operational safety of major hydro-electric projects, dams, and barrages, ensuring controlled release protocols are followed to prevent cascading disasters.

Data Sharing and Integration Mechanism with USDMA: CWC's data exchange with the State Emergency Operation Centre (SEOC) is characterized by a high-frequency, dedicated data pathway. CWC shares its **Hydro-Meteorological Data** and formal **Flood Forecast Bulletins** with the SEOC, typically on an hourly basis throughout the critical monsoon season, via a secure, automated telemetry data stream. The USDMA, in close collaboration with CWC experts, has established scientifically calibrated **Threshold Levels (Warning, Alert, and Danger)** for every monitored gauge station. These levels correspond directly to the measured water level and

discharge rates. The continuous data feed is integrated directly into the SEOC's Decision Support System (DSS). When CWC data indicates that water levels have breached the pre-set **Alert Level**, the DSS automatically generates an immediate, high-priority alarm. This automated trigger bypasses human latency, initiating the immediate administrative sequence for flood response and preparedness protocols. For mitigation and preparedness, CWC provides the USDMA with comprehensive **Flood Inundation Maps** in standardized GIS format (e.g., Shapefiles). These maps delineate the spatial extent of flooding predicted for various **flood recurrence intervals** (e.g., 50-year and 100-year floods). This crucial geospatial data is integrated into the Uttarakhand Risk Database (UDRDB) to enforce rigorous **Flood Plain Zoning regulations**, scientifically restricting construction in high-risk river proximity zones and guiding the placement of future critical infrastructure to ensure long-term resilience.

6.2.7. Nodal Institution for Space Applications: NRSC/ISRO and IIRS /ISRO

Role and Scientific Mandate: The National Remote Sensing Centre (NRSC) and the Indian Institute of Remote Sensing (IIRS), both integral components of the Indian Space Research Organization (ISRO), are the designated scientific authority for providing Geospatial Intelligence, Remote Sensing, and Satellite-Based Monitoring to the USDMA. This partnership elevates the state's monitoring capability beyond ground-based sensors, offering a synoptic and continuous view of Uttarakhand's vast and often inaccessible high-altitude terrain. Data Sharing and Integration Mechanism with USDMA: IIRS shares Glacial Lake Status Reports and Satellite Imagery with the USDMA monthly during the melt season. In a disaster scenario, IIRS activates the emergency satellite acquisition protocol. The resulting Rapid Assessment Imagery (showing real-time damage and blocked access routes) is rapidly processed and shared with the SEOC and experts providing invaluable situational awareness for search and rescue operations.

IIRS utilizes its advanced processing capabilities to analyze data from a constellation of satellites, employing both **high-resolution optical imagery** (for visual confirmation of changes) and **Synthetic Aperture Radar (SAR) data**. SAR is particularly vital as it can penetrate cloud cover and operate day and night, ensuring continuous monitoring even during adverse weather conditions, which are common in the high-altitude areas. IIRS/NRSC is mandated to support the USDMA during and immediately after any major catastrophe. This involves providing **Rapid Disaster Mapping and Damage and Loss Assessment (DALA)**. In the event of a catastrophic landslide, flash flood, or earthquake, ISRO activates emergency satellite tasking protocols (including the International Charter on Space and Major Disasters) to acquire new imagery of the affected area as quickly as possible.

Data Sharing and Integration Mechanism: During a crisis, Rapid Assessment Maps are pushed directly to the SEOC's Decision Support System (DSS) via API, and made accessible to field commanders through mobile applications, often in GIS-compatible formats that can be viewed instantly on handheld devices. This ensures that the most current geospatial intelligence is available to guide search and rescue efforts, thereby maximizing the efficiency and safety of response operations. This space-based coordination is a cornerstone of the state's capability to manage hazards in remote, challenging environments. Reports and inventory updates are shared with the USDMA and the Scientific Advisory Council on a periodic basis (e.g., monthly during the melt season) for strategic mitigation planning.

6.2.8. Nodal Institution for Snow Avalanches and Glacial Hazards: DGRE

The Defense Geoinformatics Research Establishment (DGRE), operating under the Defense

Research and Development Organization (DRDO), holds a highly specialized and indispensable role in the high-altitude zones of Uttarakhand, particularly in managing the recurring threat of Snow Avalanches and Glacial Hazards. DGRE (formerly the Snow & Avalanche Study Establishment - SASE) is the nodal scientific authority responsible for developing avalanche mitigation technologies and providing predictive warnings for the state's snow-bound regions, which include critical pilgrimage routes, military installations, and remote settlements. Its mandate is centered on transforming complex atmospheric and terrain data into actionable avalanche risk intelligence, thereby safeguarding human life and maintaining operational continuity for both defense and civil populations in the Himalayas.

DGRE's technical support is founded on a sophisticated network of scientific sensors and advanced modelling capabilities designed specifically for the unique environment of the Himalayas. The institution maintains and expands a robust system that includes numerous Snow Meteorological Observatories and Automated Weather Stations (AWS) deployed across vulnerable zones in the state. These stations continuously transmit high-frequency, granular data on temperature, wind speed, precipitation, and snow depth/density back to the DGRE centre, sometimes at intervals as frequent as one to three hours. This raw data is then integrated with high-resolution weather forecasts provided by national agencies like the National Centre for Medium Range Weather Forecasting (NCMRWF). Using this synthesized data, DGRE employs expert opinion and specialized numerical models to conduct Operational Avalanche Forecasting, providing a predictive window of at least 24 hours for specific high-risk areas. Furthermore, DGRE develops Avalanche Hazard Maps, which are critical scientific documents indicating locations of potential slide paths, guiding long-term planning for road alignment and infrastructure defense measures.

Data Sharing and Integration with USDMA: DGRE's crucial data sharing protocol with the Uttarakhand State Disaster Management Authority (USDMA) is centralized through the Common Alert Protocol (CAP) platform, confirming its status as one of the designated Alert Generating Agencies. Once a validated avalanche forecast or early warning is generated, DGRE transmits the alert to the SEOC, where it is moderated and then disseminated to District Disaster Management Authorities (DDMAs) and, critically, to the civilian population in the geofenced snow-bound regions. This integration ensures that the state's response is immediate and targeted, allowing for swift administrative actions such as the temporary closure of high-altitude roads (like the Char Dham arteries during winter) and the evacuation of vulnerable populations. By providing these specialized, time-critical warnings and contributing technical expertise on Avalanche Engineering Solutions, DGRE ensures that the state's disaster management framework is scientifically robust in addressing its most unique and challenging natural hazards.

6.2.9. Technical Partner for Advanced Computing: C-DAC

Role and Scientific Mandate: The Centre for Development of Advanced Computing (C-DAC) is designated as the state's paramount technological partner, responsible for architecting the computational infrastructure and pioneering the scientific shift from reactive warning to predictive impact management. Its role is critical because it bridges the gap between raw scientific data provided by agencies like IMD and CWC, and the practical administrative decisions required by the USDMA. C-DAC's core mandate is centered on High-Performance Computing, Advanced Data Analytics, and Artificial Intelligence (AI) Modelling. This involves designing and maintaining the powerful computing backend required to host the high-volume Uttarakhand Risk Database (UDRDB) and the Decision Support System (DSS). Most importantly, C-DAC is responsible for pioneering Impact-Based Forecasting (IBF). This scientific advancement moves

the state beyond merely reporting hazard intensity to predicting the consequences of that hazard when superimposed upon the state's known vulnerabilities. C-DAC achieves this through the implementation of complex Machine Learning (ML) algorithms. These models dynamically integrate real-time sensor data (such as IMD rainfall, CWC flow rate, and DGRE snow data) with static vulnerability information (like GSI landslide susceptibility maps, IIT Roorkee micro-zonation data, and the state's inventory of critical infrastructure). The ultimate goal is to predict not simply *what* the hazard will be, but scientifically ascertain *what* the hazard will do in terms of infrastructure disruption (e.g., predicting specific road or bridge failures), potential losses to critical assets, and likely demographic exposure.

Instrumentation Generation and Data Sharing Mechanism: While C-DAC does not typically install physical sensors itself, it plays a vital and specialized role in EWS Instrumentation Generation by developing and managing the software and API infrastructure necessary for the thousands of existing monitoring devices to communicate effectively. C-DAC ensures that all inter-agency data transfer protocols are secure, standardized, and operating with minimal latency, effectively creating the digital highways through which all sensor data (from AWS, ARG, CWC gauges, etc.) flows. C-DAC manages the complex software and hardware architecture of the SEOC's Decision Support System (DSS). It translates the outputs of its AI/ML-driven Impact Models into simplified, actionable formats for administrators by providing a single, integrated numerical risk score for specific geographical areas (e.g., a Tehsil or a highway segment) and presenting the predictive impact visually on the SEOC's dashboard GIS interface. This integration allows administrative officers to receive a concise, scientifically derived risk assessment that directly recommends an administrative action. C-DAC ensures the robust security and stability of the entire digital ecosystem, including the UDRDB and all inter-agency data transfer APIs, thereby enabling the state's transition to a truly evidence-based and technologically governed response mechanism.

6.2.10. Technical Partner for Forest Fire Management: FSI

Role and Scientific Mandate: The Forest Survey of India (FSI), a central government organization based in Dehradun, is the principal technical agency providing remote sensing and spatial data intelligence for forest fire management in Uttarakhand. Its role is pivotal, shifting the state's forest fire strategy from reactive to proactive, and integrating scientific monitoring with field-level response. FSI's core mandate involves utilizing satellite-based thermal sensors (such as MODIS and SNPP-VIIRS) to identify and localize active fire spots across the country. Crucially, FSI processes the raw thermal anomaly data by filtering it against Uttarakhand's precise administrative boundaries, including detailed Forest Beat and Compartment levels, to generate highly accurate, location-specific fire alerts that are relevant only to forest areas. This meticulous filtering process significantly reduces false alarms and ensures that resources are directed precisely where needed.

Data Sharing and Integration with USDMA: The data sharing mechanism between FSI and the USDMA (and its implementing arm, the Uttarakhand Forest Department) is multi-faceted, focusing on both preparedness and real-time response. For preparedness and mitigation, FSI generates advanced Pre-Fire Alerts based on the Forest Fire Danger Rating System (FFDRS). This is a scientific model that predicts fire susceptibility by integrating daily meteorological data, forest fuel load, and terrain conditions, categorizing specific regions into risk classes (e.g., Extreme Risk, Very High Risk). As an official Alert Generating Agency, FSI uploads this predictive data onto the national SACHET Portal (India's integrated alert system), allowing the USDMA to issue

precautionary advisories and mobilize resources ahead of a major fire outbreak.

For real-time emergency response, FSI provides Near-Real-Time (NRT) Forest Fire Alerts. This time-critical information is disseminated automatically and rapidly—usually within 1 to 1.5 hours of a satellite overpass—directly to State Nodal Officers via SMS for immediate field action and email, which includes KML/CSV files for Geographical Information System (GIS) mapping. This data is also hosted on FSI's dedicated Van Agni Geo-portal, providing the State Emergency Operation Centre (SEOC) with a continuous, dynamic visualization tool to track the extent of active fires, monitor large-scale events, and strategically coordinate firefighting assets, including the State Disaster Response Force (SDRF). Furthermore, in the post-fire phase, FSI conducts Burnt Scar Assessment using satellite imagery, which provides the USDMA and Forest Department with an objective measure of the damage to inform ecological restoration planning and long-term risk reduction strategies.

6.3. Technical partner for Earthquake Monitoring

Role and Scientific Mandate: The National Centre for Seismology (NCS), under the Ministry of Earth Sciences (MoES), serves as the nodal agency for real-time monitoring of earthquake activity throughout India. The primary role of the NCS is to operate and maintain the National Seismological Network (NSN), a vast network of over 160 advanced seismic observatories deployed across the country, including the highly active Himalayan region where Uttarakhand is located. The NCS operates a 24x7 monitoring centre that detects seismic events, processes the raw data, and rapidly determines the earthquake's crucial parameters, such as its magnitude, epicenter, and focal depth. Beyond real-time monitoring, NCS is also vital in pre-disaster mitigation by conducting Seismic Hazard Microzonation studies for major cities. Given that entire Uttarakhand fall under highest seismic zone- IV and V as per new BIS code i.e. IS 1893 (Part-I):2016, this data is essential for the Uttarakhand State Disaster Management Authority (USDMA) to inform earthquake-resistant building codes, resilient urban planning, and effective retrofitting of critical infrastructure like hospitals and schools, in line with guidelines from the Bureau of Indian Standards (BIS).

6.4. Data Sharing and Earthquake Early Warning System (EWS)

NCS ensures rapid dissemination of earthquake information to state authorities, including the USDMA, through a Unified Dissemination System (UDS). The initial parameters of any significant earthquake are instantly communicated to the central and state disaster management centers via multiple channels, including direct alerts and the NCS's dedicated mobile application, BHUKAMP App. Crucially, the NCS works in close coordination with academic and state partners on specific regional initiatives. A prime example is the Uttarakhand State Earthquake Early Warning System (UEEWS). This specialized system, developed by IIT Roorkee under a project sponsored by the USDMA, consists of a dense network of approximately 170 accelerometers deployed in the seismogenic region. The UEEWS is designed to detect the faster, non-destructive P-waves of an impending earthquake and issue a warning before the damaging S-waves arrive, providing critical seconds of lead time. This warning is disseminated to the public via a mobile application, BhuDEV, and through sirens installed in public buildings, directly facilitating the USDMA's capability for immediate public safety actions, asset shutdown, and emergency response mobilization.

6.5. Capacity Building and Technical Training

The efficiency of all scientific outputs is entirely dependent on the capacity of state and local

personnel to use them. Capacity Building, therefore, is not a supporting function but a core operational component of the SDMP. Training mandates focus on developing proficiency in technical skills across all agencies:

Software and Data Proficiency: Training programs ensure that SEOC staff and field teams can proficiently utilize GIS platforms to interpret KML/CSV files from FSI and NRSC, and to rapidly map IMD and GSI hazard zones. This directly enhances the ability of the **State Emergency Operation Centre (SEOC)** to make informed deployment decisions.

System Operation and Maintenance: Specialized workshops are held for technical teams on the continuous operation, calibration, and maintenance of sensitive equipment, including the UEEWS accelerometers, IMD's hydro-met sensors, and CWC's river gauges, ensuring the reliability of early warning systems.

Response Protocol Integration: The **State Disaster Response Force (SDRF)** and other first responders receive mandatory training on response protocols tailored to specific scientific alerts, such as the pre-emptive actions required following a DGRE avalanche forecast or the immediate rescue deployment dictated by a **BhuDEV App** alert. These drills, often conducted in collaboration with central research institutions, transform technical data into practiced, life-saving Standard Operating Procedures (SOPs).

Chapter 7

"Preparation through education is less costly than
learning through tragedy "
"Max Mayfield"

7. Enhancing Disaster Resilience - Strategic Responsibility Framework (Part A)

7.1. Introduction

This chapter provides an overview of the responsibility framework for Disaster Risk Reduction (DRR) and resilience building, establishing the foundation for the detailed framework presented in the subsequent chapter. It highlights the principles of pre-disaster risk management, emphasizing the complexity and breadth of tasks involved. The responsibility framework comprehensively describes the actions, key agencies, and relevant timeframes required to achieve DRR goals.

The timeframes for DRR activities are categorized into four types, which typically operate concurrently:

- Recurring/Regular
- Short Term
- Medium Term
- Long Term

It is important to note that these timelines often run parallel rather than sequentially. While some tasks may be contingent on preconditions or phased over time, others must commence immediately to meet deadlines. Many actions outlined in this framework build upon prior iterations of the National Disaster Management Plan (NDMP), with a long-term objective of completing as many tasks as possible by 2030. In some instances, the starting year is not explicitly defined, as many actions are ongoing or were introduced in earlier versions of the State Disaster Management Plan (SDMP).

Over the years, disaster management has transitioned from a reactive focus on relief and response to a proactive framework emphasizing DRR and preparedness. This global shift from managing disasters to managing disaster risks seeks to reduce vulnerabilities, improve preparedness, systematically understand hazards, prevent the creation of new risks in development processes, and invest in DRR. The enactment of the Disaster Management Act (2005) and the National Policy on Disaster Management (2009) has significantly accelerated this transformation, fostering long-term DRR strategies.

International frameworks, such as the Hyogo Framework for Action (2005-2015) and the Sendai Framework for Disaster Risk Reduction (2015-2030), reinforce the integration of DRR into development initiatives. The SDMP aligns with these global frameworks and incorporates national policies emphasizing social inclusion and mainstreaming DRR into development practices to ensure resilience is integral to all development activities.

As outlined in Chapter 1, the SDMP is guided by five key pillars:

- Conformance to National Legal Mandates – Aligning with the DM Act 2005 and NPDM 2009.
- Global Engagement – Participation in international initiatives like the Sendai Framework, Sustainable Development Goals (SDGs), and the Paris Agreement (COP21).
- Prime Minister’s Ten-Point Agenda for DRR – Addressing national DRR priorities.

- Social Inclusion – Ensuring marginalized communities are included in DRR efforts.
- Mainstreaming DRR – Embedding DRR into all governance and development sectors.
- This chapter also introduces the Thematic Areas (TAs) for DRR, Sub-Thematic Areas (Sub-TAs), and the responsibility framework essential for DRR implementation. Mitigation, a critical component of DRR, involves actions to reduce disaster risks and impacts. The DM Act 2005 defines mitigation as efforts to lessen the risks and effects of disasters. Since hazards are often interconnected, comprehensive mitigation strategies are necessary. For instance, earthquakes may trigger cascading hazards such as landslides, while cloud burst may lead to flooding. Demographic factors, settlement patterns, and climate change further exacerbate vulnerabilities. The SDMP focuses on enhancing mitigation capabilities for multiple hazards, considering their cascading effects.

An informed understanding of existing and emerging risks is crucial for resilient development. Disasters impact development and governance, so risk assessment and understanding are vital for informed decision-making. The Government of Uttarakhand, for instance, has conducted a state-wide risk assessment, addressing all relevant hazards and vulnerabilities and their direct and indirect impacts. However, embedding disaster risk assessment into governance processes—policy, planning, implementation, and budgeting—remains an ongoing challenge. Gaps in risk information quality, data availability, and decision-makers ability to utilize this information in policy design, planning, and investment are issues that need to be addressed.

7.2. Thematic Areas for DRR

A core principle of the SDMP is fostering shared responsibility across government agencies, departments, and stakeholders to build a culture of disaster preparedness and risk reduction. Effective disaster risk reduction (DRR) requires robust coordination across all levels of governance and active participation from diverse sectors. The SDMP focuses on six thematic areas critical to disaster management and climate adaptation:

- Understanding Risk
- Inter-Agency Coordination
- Investing in DRR – Structural Measures
- Investing in DRR – Non-Structural Measures
- Capacity Development
- Climate Change Risk Management

7.2.1. Understanding Risk

This thematic area focuses on the priority of the Sendai Framework: understanding disaster risk. Building disaster resilience requires a thorough analysis of the risks posed by various hazards. The critical subcomponents within this area include:

- Observation Networks, Information Systems, and Research: Establishing advanced observation networks and real-time data systems to monitor hazards while supporting research initiatives to uncover emerging risks and vulnerabilities.
- Zoning and Mapping: Developing and updating hazard maps, land-use zoning regulations, and geographic information systems (GIS) to improve planning and reduce risks in vulnerable regions.
- Monitoring and Early Warning Systems: Deploying effective monitoring mechanisms and early warning systems to provide timely alerts, allowing communities to prepare and respond proactively to potential disasters.
- Hazard Risk, Vulnerability, and Capacity Assessments (HRVCA): Conducting comprehensive analyses of hazards, vulnerabilities, and community capacities to create targeted strategies that address specific challenges.

- **Effective Communication of Risk Information:** Ensuring that early warnings, hazard assessments, and relevant data are disseminated clearly and efficiently to all stakeholders, particularly at the community level, to enable timely and informed action.

This thematic area aims to enhance disaster preparedness, foster greater community resilience, and promote proactive measures through improved risk understanding and communication by integrating these components.

7.2.2. Interagency Coordination

Effective disaster governance, aligned with Priority 2 of the Sendai Framework, hinges on seamless inter-agency coordination to ensure coherent and efficient disaster risk management. Key components of this approach include:

- **Integrated Governance Framework:** Establishing a unified and comprehensive governance structure that aligns disaster risk management policies, strategies, and actions across all levels of government to ensure consistency and effectiveness.
- **Coordinated Disaster Response:** Facilitating collaboration among agencies during disaster response to enhance operational efficiency, minimize gaps, and eliminate redundancies.
- **Timely Communication and Information Sharing:** Ensuring the prompt dissemination of warnings, critical data, and actionable information to relevant stakeholders, enabling well-informed decision-making and timely action.
- **Non-Structural Resilience Measures:** Working collectively to implement non-structural interventions such as policy reforms, enforcement of regulations, and public awareness initiatives to strengthen community resilience.

A clear responsibility framework underscores the importance of collaboration between ministries, departments, and agencies with hazard-specific roles. Their coordinated efforts are vital for fostering robust disaster governance and achieving a unified, proactive approach to disaster risk management.

7.2.3. Investing in DRR-Structural Measures

Investing in structural measures focuses on developing physical infrastructure and facilities that enhance community resilience to disasters. These initiatives are vital for achieving the goals of the Sendai Framework, particularly Priority 4, which emphasizes disaster preparedness for effective response, and Priority 3, which targets risk reduction for resilience. Structural measures are integral to disaster risk management (DRM) strategies, addressing immediate and long-term risks.

The National Disaster Management Guidelines highlight embedding disaster prevention and mitigation measures within developmental plans and projects. These guidelines also stress the need for dedicated mitigation initiatives and ensuring sufficient funding for disaster management efforts.

Structural measures can be implemented across three timeframes:

- **Short-term:** Immediate infrastructure needs to support disaster response and preparedness, such as temporary shelters or early warning systems.
- **Medium-term:** Development of evacuation centres, embankments, or retrofitting critical infrastructure to withstand hazards.

- Long-term: Comprehensive projects that build resilient urban and rural infrastructure, including flood control systems, resilient housing, and large-scale hazard mitigation structures.

The National Disaster Management Plan (NDMP) further emphasizes the role of structural measures in strengthening disaster preparedness and mitigating risks. These investments address current vulnerabilities while building capacity to face future hazards, aligning with global and national disaster management priorities.

By integrating structural measures into disaster management policies and practices, governments and stakeholders can enhance communities' safety, preparedness, and resilience, ensuring sustainable development in the face of increasing disaster risks.

7.2.4. Investing in DRR-Non-Structural Measures

Non-structural measures, including laws, regulations, guidelines, and techno-legal frameworks such as building codes, enhance disaster risk governance. These measures establish the regulatory foundation to integrate disaster risk reduction (DRR) into development planning and implementation. The active participation of central and state governments in creating and enforcing these frameworks is critical for empowering authorities to enhance disaster resilience and ensure compliance.

Governments can promote sustainable development while minimizing disaster risks by implementing and enforcing non-structural measures, such as building codes, zoning regulations, and risk-sensitive land-use planning. These frameworks enable authorities to incorporate resilience into development activities, ensuring long-term community safety and stability.

The success of non-structural measures depends on robust institutional support for their enforcement, monitoring, and compliance. Governments and stakeholders must work collaboratively to ensure these measures are effectively implemented, fostering a culture of preparedness and resilience across all levels of society.

7.2.5. Capacity Development

Capacity development is fundamental to disaster risk reduction (DRR), focusing on enhancing individuals' and institutions' knowledge, skills, and resources to manage disaster risks effectively. This approach is closely aligned with Priority 2 (Strengthening disaster risk governance) and Priority 3 (Investing in DRR for resilience) of the Sendai Framework.

Key elements of capacity development include:

- Training Programs: Develop targeted training to improve the skills of disaster management professionals and community leaders.
- Curriculum Development: Creating and updating educational programs integrating disaster risk management (DRM) principles into academic curricula.
- Awareness Campaigns: Raising public awareness about disaster risks, preparedness, and resilience strategies.
- Mock Drills and Disaster Response Exercises: Conducting simulation exercises to improve response coordination and readiness at all levels of governance.

These initiatives are designed to build, sustain, and enhance human and institutional capacity to manage disasters effectively.

The National Disaster Management Policy 2009 underscores the importance of strengthening disaster management capacities across institutions and stakeholders. Capacity development requires a multifaceted approach, encompassing education, training, awareness-building, and research and development (R&D). Additionally, it involves establishing appropriate institutional frameworks, management systems, and resource allocation mechanisms to ensure efficient disaster prevention, response, and recovery.

To ensure effective implementation, enforcement, and monitoring of disaster risk reduction strategies, it is essential to strengthen capacities at all levels of governance, from local authorities to national institutions. By fostering a robust and responsive governance system, capacity development is pivotal in improving disaster risk management, enhancing resilience, and ensuring sustainable development.

7.2.6. Climate Change Risk Management

Climate change is reshaping hydro-meteorological events' frequency, intensity, and geographical distribution, amplifying their effects on vulnerable communities. In response, disaster risk reduction (DRR) investments are critical for building resilience and enabling communities to adapt to these changes. As the impacts of climate change become increasingly evident, there is an urgent need for additional financial and technical resources to support at-risk populations effectively.

Disaster risk management (DRM) strategies must integrate climate change projections and account for the evolving nature of hazards. Closing knowledge and data gaps regarding the effects of climate change is crucial for developing robust and effective DRR strategies.

Acknowledging climate change as a critical barrier to achieving sustainable development goals, the state government has proposed the creation of a Climate Change Management Society chaired by the Chief Minister. The State Action Plan on Climate Change (SAPCC) outlines strategies to tackle key challenges, including agricultural sustainability, energy efficiency, and public health.

Despite these efforts, significant gaps remain in understanding the precise impacts of climate change on various hazards. These gaps must be addressed to refine DRR strategies and ensure timely and adaptive actions for building long-term resilience. Enhanced data collection, research, and collaboration are essential to inform and strengthen disaster risk management efforts in a changing climate.

7.2.7. Disaster Risk Governance

Achieving effective disaster risk reduction (DRR) requires a collective effort from various stakeholders. Governments alone cannot address disaster risks effectively. A collaborative approach that includes national and local governments, civil society organizations, academic institutions, professional associations, the private sector, and local communities is essential. Each stakeholder, with distinct roles and capacities, must actively contribute to decision-making, planning, and implementing DRR initiatives. Clear roles and responsibilities are critical to ensure meaningful engagement and coordinated actions to reduce disaster risks and enhance resilience.

Disaster risk governance is founded on the principle that decision-making should not be centralized within governments alone. A consultative approach is necessary, involving all relevant stakeholders—particularly those directly impacted by the policies and practices being developed. Governance decisions influence the distribution of exposure and vulnerability across populations, often determining the level of disaster risk faced by different groups. Vulnerable populations, such

as marginalized or disenfranchised communities, are particularly at risk of significant harm during disasters, including loss of life, injury, and property damage.

Effective disaster risk governance must prioritize inclusivity and participation to address the root causes of disaster risks. This involves recognizing and mitigating disparities in age, ethnicity, gender, disability, economic status, and access to resources. Strengthening governance structures to be more participatory is recognized globally as a fundamental pillar of disaster management (UNDP, 2015). Core elements of robust governance include accountability, transparency, and active participation in all disaster management processes. It requires negotiation, consensus-building, agreement on formal mechanisms—such as policies, legislation, and standards—and informal social, economic, and political arrangements.

Communities with proactive, responsive, and accountable local governments that engage with local actors are more likely to build resilience effectively. Collaborative governance cultivates an environment where disaster risks are understood, managed, and reduced, fostering sustainable development and enhancing resilience to future disasters.

7.2.8. Strengthening DRR Governance in Alignment with NDMP and the Sendai Framework

The National Disaster Management Plan (NDMP) 2019 emphasizes the crucial role of governance at all levels in managing disaster risks effectively and efficiently. Successful disaster risk governance requires a clear vision, well-defined plans, strong institutional capacities, comprehensive guidance, and seamless coordination across sectors. It also demands the active engagement of all relevant stakeholders to ensure a unified and collective approach. Strengthening disaster risk governance is vital for fostering collaboration, building partnerships, and successfully implementing disaster risk reduction (DRR) strategies. This collaborative effort is essential for advancing sustainable development initiatives and enhancing disaster resilience at the state and local levels.

Chapter 8

"We won't be able to stop disasters from happening. On the contrary, climate change may increase the frequency and severity of floods, droughts and storms. But we are better equipped today to prepare for them and reduce their impact."
“Sri Mulyani Indrawati”

8. Enhancing Disaster Resilience – Hazard-Specific Risk Mitigation Framework (Part B)

8.1. Introduction

The DRR requires responsibilities to be shared by different divisions of governments and various agencies. Disaster risk reduction effectiveness depends on coordination mechanisms within and across sectors and with relevant stakeholders at all levels. For each hazard, the approach used in this plan incorporates the four priorities enunciated in the Sendai Framework into the planning framework for DRR under the five thematic areas for action:

- Understanding risk
- Inter-agency coordination
- Investing in DRR – Structural measures
- Investing in DRR – Non-structural measures
- Capacity development

For each of these thematic areas for action, a set of central themes has been identified for inclusion in the planning framework.

8.2. Hazard-wise responsibility matrices for DRR

The roles and responsibilities of identified stakeholders/agencies have been specified for the DM plan to succeed. At all levels - from local to state - the relevant authorities must institutionalize programs and activities at the ministry/department levels accordingly and increase inter-departmental and inter-agency coordination and networking. They should also rationalize and augment the existing regulatory framework and infrastructure. For each hazard, in the following subsections, themes for action are presented in a separate responsibility matrix for each of the five thematic areas for action.

This section covers the hazards listed below:

- Floods
- Seismic/Earthquakes
- Landslides and Snow Avalanches
- Urban Flood Risk Mitigation
- Lightning and Extreme Weather Risk Mitigation
- Cloudbursts
- Forest Fire
- Drought
- Heat and Cold Wave
- Chemical (Industrial)
- Nuclear and Radiological Emergencies
- Biological and Public Health Emergencies (BPHE)
- Fire Hazard
- Illegal Mining

Table 12: Flood Disaster Risk Reduction (DRR) Action Framework

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Observation networks, information systems, monitoring & forecasting	✓ Modernization of Observation Network Assessment, Monitoring and Scientific Studies	SDMA, DDMA, Irrigation, Info Dept	Oct-May
Zoning, mapping, and classification of prone areas	✓ Preparation of large-scale hazard maps of flood-prone areas of high vulnerability	SDMA, USAC, DDMA, Irrigation	Jan-Apr
Studies and monitoring of rivers flowing & research and development	✓ Studies on flood-related problems such as soil losses caused by flooding of rivers, sediment transport, river course changes, and appropriate use of embankments ✓ Studies on support systems for people living in flood-prone areas ✓ Promote research and studies – both in-house to researchers and institutions ✓ Evolving designs of shelters in flood-prone areas ✓ Enhanced risks from climate change and adaptations to change	SDMA, Irrigation Dept., WIHG, NIH, relevant technical institutions	Jan-May
Hazard risk vulnerability Assessment	✓ Undertake HRVA as part of preparing and periodic revision of DM plans ✓ Studies on vulnerability covering social, economic, ecological, gender, and equity aspects ✓ Change in vulnerability and risk due to climate change scenarios	SDMA, Irrigation Dept.	Oct-Dec
Monitoring, forecasting and warning systems	✓ Support, cooperation for data collection and updates ✓ Specialized efforts for different types of floods and causes of flooding, including cloudburst ✓ Developing forecasting models for discharge from dams	SDMA, Irrigation Dept., relevant technical institutions	May-Sep
Dissemination of warnings, data, and information	✓ Inter-state data and information sharing where applicable ✓ Coordination and cooperation with the central agencies ✓ Quick, clear, and effective dissemination among state and district agencies ✓ Dissemination of warnings to all, down to the last mile – remote, rural, or urban - Regular updates to people in areas at risk	SDMA, Irrigation Dept., Information Dept., DDMA, Panchayats, (ULBs), UJVNL	Jun-Sept
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks	SDMA, DDMA	Oct-Dec
Warnings, information, data	✓ Quick, clear, effective dissemination among state, District, and PRI agencies	SDMA, DDMA, Irrigation, Info Dept., UJVNL, ULBs & Panchayats	Jan-May
Response	✓ Organizing the IRS and seeking assistance from central agencies	SDMA, DDMA	Apr-May

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Non-structural measures	✓ Adapting the norms/ codes as per the district's requirement, enforcement, monitoring	SDMA, DDMA	Regular
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Social housing schemes	✓ Ensure that flood-resistant features are incorporated in the planning and executing of social housing schemes in flood-prone areas.	SDMA, DDMA. UHUDA, Rural and ULBs & Panchayats	Regular
Multi-purpose flood shelters	✓ Ensure the availability of shelters, undertake proper maintenance, and make arrangements to support the people who have been shifted to temporary shelters.	SDMA, DDMA, PWD, Irrigation Dept., Panchayats, ULBs	May
Waterways and drainage systems for roads, highways and expressways	✓ Coordination and cooperation with the central agencies and ensure proper alignment and design in all state projects	SDMA, Irrigation Dept, PWD, BRO,	Jan-May
Hazard-resistant construction, strengthening and retrofitting of all lifeline structures and critical infrastructure	✓ Collaboration with technical agencies and implementation	State/UT, SDMA, DDMA, Revenue, Rural & Panchayats, relevant technical institutions ULBs	Nov-Mar
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Regulation and enforcement of laws, norms	✓ Implementing land-use regulation for low-lying areas as per flood control norms. ✓ Regulation of inhabitation of low-lying areas along the rivers, gadera, and drains ✓ Implementing a flood management action plan ✓ Review and modification of operation manuals for all major dams/ reservoirs. ✓ Support and cooperate with central agencies Sponsor state-specific efforts support local efforts Cooperate with central efforts ✓ Prevention and removal of encroachment into the waterways and natural drainage systems	Revenue Department, CWC, UJVNL, Irrigation Dept., SDMA, DDMA	Nov-Feb
Wetland conservation and restoration catchment area treatment	✓ Discourage reclamation of wetlands and natural depressions. Action plan managing wetlands and natural drainage systems for flood moderation. ✓ Implementation of watershed management, including catchment area Treatment	SDMA, DDMA Irrigation Dept.	Jan-Apr
Regulations to promote flood resilient buildings & infra.	✓ Revise and implement the relevant rules in flood-prone areas	SDMA, DDMA Irrigation Dept.	Dec-Jan
Public Private Partnerships	✓ Promote private participation in disaster.	SDMA, DDMA	Regular

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
THEME: CAPACITY DEVELOPMENT			
Curriculum development	✓ Incorporate Crisis Management, emergency medical response/recovery, and trauma management at a Diploma. /UG/ PG levels for Health Professionals	SDMA, Health dept.	Regular
Empowering women, marginalized, and persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development, covering all aspects of disaster management at the state, district, and local levels	SDMA, DDMA SDRF, ATI, Panchayats, ULBs	Feb-May
Training	✓ Training and orientation programs for govt. Staff, professionals for veterinary care and support to disaster-affected animals ✓ Incorporating disaster response, search, and rescue in the training programs of youth, such as village volunteers, and for the protection of disaster-affected animals	SDMA, DDMA SDR, ATI, relevant institution	Feb-Apr
Community-based disaster management	✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach. ✓ Training for panchayat, SHG, NCC, NSS, Youth, and local community organizations	SDMA, DDMA SDRF, ATI, Panchayats, ULBs	Feb-May
Awareness generation & mock drills	✓ Carry out mass media campaigns. ✓ Promote a disaster risk prevention, mitigation, and better risk management culture. ✓ Promote attitude and behaviour change in the awareness campaigns/ IEC ✓ Promote the use of insurance/ risk transfer ✓ Promote community radio, strengthening the network of civil society organizations to generate awareness about DRR and DM. ✓ Information on the care and protection of disaster-affected animals ✓ Joint planning and execution of emergency drills	State/UT, SDMA, DDMA, Revenue, Irrigation Dept., SDRF, Fire and Emergency Services, Civil defence, Police, Panchayats, ULBs	Jan-May
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Undertake HRVCA as part of preparing and periodic revision of DM plans ✓ Develop strategies for structural and non-structural measures based on HRVCA ✓ Assess GACC risks of vulnerable and marginalized sections	SDMA/RD, Irrigation Dept. / WRD	Jul-Dec (for periodic updates)
Research, forecasting / early warning, data management, zoning, mapping	✓ Support national risk reduction efforts ✓ Coordination with central agencies ✓ Sponsor and promote state-specific efforts and local efforts for GACC mitigation and adaptation ✓ Document state-specific GACC impacts and coping mechanisms	SDMA, DDMA, PRIs, DoUD	Jan-Dec (Regular)
Climate change adaptation (CCA)	✓ Sensitization and awareness creation ✓ Support national CCA efforts	SDMA, DDMA, PRIs, DoUD	Jan-Dec (Regular),

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
	✓ Coordination with central agencies ✓ Sponsor and promote state-specific efforts and local efforts for GACC mitigation and adaptation ✓ Develop local adaptation strategies and pilot projects ✓ Sponsor and promote state-specific efforts and local efforts		Pilot Projects (February to August)

Table 13: Seismic/Earthquakes Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Earthquake monitoring services, real-time seismic monitoring network	✓ Estimate the earthquake parameters quickly after detection ✓ Disseminate information ✓ Share Seismic activity data with national and international scientific, academic, and R&D institutions	IIT Roorkee, NCS SDMA, DDMA, PWD, ULBs, Health	Regular
Earthquake hazard and risk assessment	✓ Carry out needs assessment from end-users, conduct micro-zonation studies, ✓ Prioritize important urban areas for micro-zonation, do professional review before adoption	SDMA, DDMA, PWD & relevant institution	Sep-Dec
Vulnerability assessment	✓ Ward Level Information System to be developed using high-resolution satellite images / aerial photos integrated with socioeconomic data covering natural resources and infrastructure facilities on the appropriate scale at the community level, social, economic, ecological, gender, and equity aspects ✓ Change in vulnerability and risk due to climate change scenarios	SDMA, DDMA, PWD, Town and Country planning departments, ULBs	Feb-Apr
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks	SDMA, DDMA	Regular
Response	✓ Organizing the IRS and seeking assistance from agencies	SDMA, DDMA	Oct-Nov
Non-structural measures	✓ Adapting the norms/ codes as per the district's requirement, enforcement, monitoring	SDMA, DDMA	Regular

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Social housing schemes	✓ Ensure that earthquake-resistant features are incorporated into the planning. and execution of social housing schemes ✓ Ensure compliance with relevant building codes	SDMA, DDMA, Panchayats, ULBs, PWD	Regular
Strengthening and seismic retrofitting of prioritized lifeline structures and buildings	✓ Implementation of strengthening and seismic retrofitting per recommendations of safety audits in all govt. Departments, agencies, public utilities, schools, colleges, community halls, etc.	SDMA, DDMA, Panchayats, ULBs, PWD, all relevant Dept./ Agencies	Feb-Apr
Hazard resistant construction, strengthening, retrofitting of all lifeline structures and critical infrastructure	✓ Collaboration with technical agencies and implementation	SDMA, DDMA, Panchayats, ULBs, PWD, all relevant Departments/ Agencies	Apr-May
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Regulations and model codes for town planning, civil works & Public infrastructure	✓ Adopt suitable bylaws for rural and urban areas, implement model codes, and ensure proper compliance. ✓ Ensure strict compliance with code implementation through relevant Departments and agencies.	SDMA, DDMA, Panchayats, ULBs, PWD, Town and Country planning departments all relevant Dept./ Agencies	Regular
Licensing and certification	✓ Implement licensing of engineers through appropriate legal framework and institutional mechanism.	SDMA, DDMA, relevant institution	Regular
Structural safety audit of lifeline structures & buildings, Prioritization of lifeline structures and buildings for strengthening and seismic retrofitting	✓ Carry out safety audits of lifeline buildings and critical infrastructure ✓ Ensure implementation, monitoring, enforcement, and proper compliance within state by public, private, and individuals	SDMA, DDMA, Panchayats, ULBs, PWD, all relevant Departments/ Agencies	Feb-Mar
Public private partnerships	✓ Promote private participation in disaster management facilities.	SDMA, DDMA, relevant institution	Regular
THEME: CAPACITY DEVELOPMENT			
Training	✓ Training and orientation programs for govt. Staff, professionals for veterinary care and support to disaster-affected animals. Incorporating disaster response, SAR in the training programs of youth, such as village volunteers and for the protection of disaster-affected animals	SDMA, SDRF, ATI, DDMA, relevant institution	Oct-Nov

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Curriculum development	✓ Introduction of Crisis Management, emergency medical response/ recovery, and trauma management at Diploma /UG/ PG levels for Health Professionals	SDMA, Health dept., PWD	Regular
Community-based disaster management	✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach. ✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach. ✓ Training for panchayat, SHG, NCC, NSS, Youth, and local community organizations	SDMA, SDRF, ATI, DDMA, Panchayats, ULBs	Nov-Feb
Awareness generation & mock drills	✓ Carry out mass media campaigns. ✓ Promote a culture of disaster risk prevention, mitigation, and better risk management ✓ Promote attitude and behaviour change in the awareness campaigns/ IEC ✓ Promote the use of insurance/ risk transfer ✓ Promote Community Radio, Strengthening network of civil society organizations for awareness generation about DRR and DM ✓ Information on the care and protection of disaster-affected animals ✓ Joint planning and execution of emergency drills	SDMA, Revenue Dept., Irrigation Dept., SDRF, Fire and Emergency Services, Civil Defence, Police, DDMA, Panchayats, ULBs	Nov-Feb
Empowering women, marginalized, and persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development, covering all aspects of disaster management at the state, district, and local levels	SDMA, SDRF, ATI, DDMA, Panchayats, ULBs	Regular

Table 14: Landslides and Avalanches Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Hazard zoning, mapping, geological, and geotechnical investigations in regions prone to landslides and snow avalanches	✓ Preparation of a comprehensive and user-friendly inventory of landslides and avalanche-prone areas and its updating as per widely accepted standards ✓ Studies and monitoring of risk-prone areas on site and using satellites Studies to classify vulnerable areas as per likelihood of hazard	ULMMC, GSI, CBRI, DGRE, SDMA, DDMA	Oct-Apr
Monitoring, warning systems	✓ Support the deployment of reliable monitoring and warning systems	SDMA, PWD, DDMA, ULBs Panchayats, ULMMC	Jun -Sep

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Research and development	✓ Scientific assessment for predicting the likelihood of landslides and a better understanding of driving forces. ✓ Impacts of climate change on landslides and snow avalanches risks R&D for methods to reduce factors driving landslide	WIHG, Research and Academic Institutes, GSI, ULMCC	Regular
Hazard risk vulnerability assessment	✓ Promote studies, provide guidelines ✓ Studies on vulnerability covering social, economic, ecological, gender, and equity aspects ✓ Change in vulnerability and risk due to climate change scenarios	SDMA, DDMA, Panchayats, ULBs,	Oct-Nov
Dissemination of warnings	✓ Ensure facilities and infrastructure of the implementation of adequate access to communities at risk ✓ Dissemination of warnings to all, down to the last mile – remote, rural, or urban Regular updates to people in areas at risk	NDMA, SDMA, PWD, DDMA, Panchayats, ULBs, BRO, Telecom Departments	Apr-May
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks	SDMA, DDMA, ULMCC	Apr-May
Response	✓ Organizing the IRS and seeking assistance from central agencies	SDMA, DDMA, ULMCC	May
Warnings, information, data	✓ Quick, clear, and effective dissemination among state, District, and PRI agencies	SDMA, DDMA, GIS, ULMCC	Jun- Sep
Non-structural measures	✓ Adapting the norms/ codes as per the district's requirement, enforcement, monitoring	SDMA, DDMA, ULMCC	Regular
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Protection of human settlements	✓ Improving infrastructure, roads, and land stabilization work ✓ Technical inputs and guidance	PWD, BRO, NHIDCL	Jan-Apr
Multi-hazard shelters	✓ Identification of safe buildings and sites to serve as temporary shelters for people and livestock evacuated from localities at risk ✓ Construction of multi-purpose shelters in high-risk areas at safe sites away from hazard-prone locations ✓ Proper maintenance of roads in risk-prone areas	SDMA, DDMA, ULBs Panchayats, ULMCC	Apr-May

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Protection of heritage structures	✓ Prepare lists of structures/ sites at risk due to landslides/ slope stability problems and prioritize them for hazard mitigation.	SDMA, State DGM, SRSC, DDMA, ULBs, Panchayats, ULMMC	Oct-Nov
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Site selection for human settlements in landslide and snow avalanche-prone areas	✓ Proper site selection for human settlements, amenities, and other infrastructure	SDMA, DDMA State DGM, Local Authorities, ULMMC	Apr
Public private partnerships	✓ Promote private participation in disaster management facilities.	SDMA, DDMA, relevant institution ULMMC	Regular
Regulations and building codes	✓ Ensure implementation and adherence to codes and guidelines.	SDMA, DDMA	Regular
Licensing and certification	✓ Implement licensing of engineers through appropriate legal framework and institutional mechanism.	SDMA, DDMA, relevant institution	Regular
THEME: CAPACITY DEVELOPMENT			
Training	✓ Support and collaboration with national agencies ✓ Training and skill upgrades for search and rescue ✓ Conduct regular training programs for professionals, including those for care and protection of disaster-affected animals	SDMA, SDRF, ULMMC, ATI, DDMA, relevant institution	Feb-Mar
Curriculum development	✓ Include information on landslides and snow avalanches in the curriculum	SDMA, ULMMC	Regular
Empowering women, marginalized, and persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development, covering all aspects of disaster management at the state, district, and local levels	SDMA, SDRF, ATI, DDMA, Panchayats, ULBs,	Regular
Community-based disaster management	✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach. ✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach. Training for panchayat, SHG, NCC, NSS, Youth, local community organizations	SDMA, SDRF, ATI, DDMA, Panchayats, ULBs, ULMMC	Feb-Apr

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Awareness generation & mock drills	✓ Carry out mass media campaigns ✓ Promote a culture of disaster risk prevention, mitigation, and better risk management ✓ Promote attitude and behaviour change in the awareness campaigns/ IEC ✓ Promote the use of insurance/ risk transfer ✓ Promote Community Radio, Strengthening network of civil society organizations for awareness generation about DRR and DM ✓ Information on the care and protection of disaster-affected animals ✓ Joint planning and execution of emergency drills	SDMA, Revenue Dept., Irrigation Dept., SDRF, Fire and Emergency Services, Civil defence, Police, DDMA, Panchayats, ULBs, ULMMC	Feb-May

Table 15: Urban Flood Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTM ENT	TIMELINE
Mapping/ zoning, estimation of possible inundation levels, monitoring networks	✓ Develop land use planning based on multi-hazard disaster risk assessment ✓ Place land-use planning maps in public domain ✓ Undertake adequate studies, evaluations, and planning considering land use constraints to prevent flooding ✓ Coordinate with the central agencies and implement recommendations ✓ Undertake HRVCA as part of preparing and periodic revision of DM plans ✓ Ward level assessment ✓ Constitute/ strengthen the mechanisms for consultation with experts and stakeholders ✓ Set up EOCs by the DoUD connected to the ARG network. ✓ Develop capacities to make quantitative forecasts and simulate inundation levels under various scenarios	SDMA, Revenue Department, USAC, DDMA, PRIs, IIRS, Irrigation, CWC	Jan – Dec (Regular)
Information systems, monitoring, forecasting, early warning	✓ Establish and maintain information systems for risk monitoring- Develop and enhance forecasting and Early warning mechanism	SDMA/RD (Rural Development), USAC, DDMA, PRIs, IIRS, UJVNL	May - Sep
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Conduct periodic HRVCA studies-Identify vulnerable populations and areas	SDMA/RD, USAC, DDMA, PRIs (peri-urban),	Jul- Dec

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTM ENT	TIMELINE
Disaster data collection and management	✓ Systematic data management of data on disaster damage and loss Assessments ✓ Disaster Damage and Losses 2005- 2015 baseline	SDMA/RD, USAC, DDMA, PRIs (peri-urban),	Feb- Sep
THEME: INTERAGENCY COORDINATION			
Response	✓ Organizing and coordinating the immediate response ✓ Coordinate with central agencies	SDMA/RD, DDMA, PRIs (peri-urban)	May - Oct
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks ✓ All aspects of disaster risk management and mainstreaming DRR ✓ Ensuring coherence and mutual reinforcement of DRR, CCA, and development	SDMA/RD, DDMA, PRIs (peri-urban)	Jan - Dec (Regular)
Warnings, information, data	✓ Coordinating the dissemination of warnings to all, down to the last mile – remote, rural, or urban Regular updates to people in areas at risk	SDMA/RD, DDMA, PRIs (peri-urban)	Jun - Sep
Non-structural measures	✓ Coordination among state agencies to ensure updated norms/ codes and their implementation, enforcement, and monitoring	SDMA/RD, DDMA, PRIs (peri-urban)	Jan-Dec (Regular)
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Civil works	✓ All road re-leveling works or strengthening/ overlay works are to be carried out by milling the existing layers of the road so that the road levels will not be allowed to increase ✓ Upgrade the existing drainage and stormwater systems Managing drainage systems Protection of Water Bodies ✓ Ensure the protection of Water Bodies and its restoration/ revival ✓ Bus and Metro Terminals, Railway stations, and Airports are to be made flood-proof by providing efficient drainage for a much higher rainfall intensity ✓ All future road and rail bridges in cities crossing drains are to be designed such that they do not block the flows, resulting in a backwater effect ✓ Remove encroachments and take strict action against the encroachers as per the byelaws/ regulations	PWD, BRO, UHUDA, Irrigation, SDMA, RD, PRIs, Forest Dept., RVNL, BRIDCUL, UTC	Jan - Dec (Regular)
Establishment/ strengthening of emergency operation centres	✓ Ensure round-the-clock operations of EOCs during the flood season with adequate human resources to respond to urban flood	SDMA, RD, PRIs	May- Sep

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTM ENT	TIMELINE
Hazard resistant construction, strengthening & retrofitting of all lifeline structures & critical infra.	✓ Collaboration with technical agencies and implementation	SDMA, PRIs	Oct- Mar
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Preparation of comprehensive urban storm drainage design manual	✓ Take initiative and collaborate with central agencies	SDMA, DDMA	Oct– Mar
Reparation of storm water drainage system inventory	✓ Coordinate with MHUA in preparing the inventory through DoUD	SDMA/RD, PRIs (peri urban)	Feb - Sep
Operation and maintenance of drainage systems	✓ Adequate budget to be provided to take care of the men, materials, equipment and machinery for O&M of drainage systems on a periodic basis	SDMA/RD, PRIs (peri urban)	Mar- Oct
Environmental impact assessment	✓ Ensure strict compliance with the guidelines and land-use planning consistent with sound stormwater management. Minimise loss of ecologically important areas and natural wetlands	SDMA/RD, PRIs (peri urban)	Apr- Aug
Techno-legal regime land use planning city/town planning	✓ Ensure strict compliance with the Techno-Legal Regime, especially of land use through DoUD ✓ Strengthen land-use planning ✓ Incorporate water-sensitive urban design considerations into land use planning ✓ Incorporate the topography and specific terrain elements, such as hilly, coastal, etc., in the land use plan to minimize flooding, allowing free flow of storm water along natural contours	Jal Sansthan, MDDA, SDMA, RD, PRIs	Jan - Dec (Regular)
Constitution of urban flooding cell for integrated UFDM	✓ The Nodal Department will constitute an urban flooding cell at the state level, and a DM Cell will be constituted at the DOUD level to manage urban flooding locally.	SDMA, Urban department	Jul- Dec
THEME: CAPACITY DEVELOPMENT			
Education and training	✓ Training for urban flood rescue and management for CDEF, community, volunteers, and others ✓ Upgrade equipment and skills of SDRF/DF&ES for UFDM ✓ Enlist professionals for veterinary care and support to disaster-affected animals ✓ State Governments will encourage their school boards to develop similar content in their school curriculum	SDMA, DOUD, PRIs, SDRF, ATI	Feb- Jul

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTM ENT	TIMELINE
Awareness generation	✓ Carry out mass media campaigns. ✓ Promote a culture of disaster risk prevention mitigation and be there risk management ✓ Promote attitude and behaviour change in the awareness campaigns/ IEC ✓ Promote the use of insurance/ risk transfer ✓ Promote Community Radio ✓ Strengthening the network of civil society organizations for awareness generation about DRR and DM Information on the care and protection of disaster-affected animals	SDMA, DDMA, SDRF, Police, PRIs (peri-urban)	May- Sep
Documentation	✓ Ensure accurate documentation of all aspects of disaster events for creating good historical records for future research and Risk Management planning	SDMA/, DDMA, State ATI	Jan - Dec (Regular)
Empowering women, marginalised communities and persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development covering all aspects of disaster management at the state, district, and local levels	SDMA/, DDMA, and other state-level institutions	Feb - Dec
Community-based disaster management	✓ Promotion, guidance, support, training for CDEF, community, volunteers ✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach ✓ Training for RWA, SHG, NCC, NSS, Youth, Ward Committees, local community organizations	SDMA/, SDRF, RD, DDMA,	Apr- Oct
Mock drills/exercises	✓ Joint planning and execution of emergency drills	SDMA/RD, DDMA, SDRF/ Police	May - Sep
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Climate change adaptation (CCA)	✓ Sensitization and awareness creation ✓ Support national CCA efforts ✓ Coordination with central agencies ✓ Sponsor and promote state-specific efforts and local efforts for GACC mitigation and adaptation ✓ Develop local adaptation strategies and pilot projects ✓ Sponsor and promote state-specific efforts and local efforts ✓ Implementation of GACC adaptation programs ✓ Promote appropriate combinations of green and blue infrastructure approach ✓ Integrate adaptive measures in social protection programs for vulnerable groups	SDMA/RD, IRD, FD, DDMA, DoUD, PRIs (peri-urban)	Feb - Oct

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Research, forecasting / early warning, data management, zoning, mapping	✓ Support national risk reduction efforts related to GACC ✓ Coordination with central agencies ✓ Sponsor and promote state-specific efforts and local efforts	SDMA/RD, WSD*, Forest, SDMA, DDMA, DoUD, PRIs (peri-urban)	Jan- Dec (Regular)
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Undertake HRVCA as part of preparing and periodic revision of DM plans ✓ Develop strategies for structural and non-structural measures based on HRVCA ✓ Assess GACC risks of vulnerable and marginalized sections	SDMA/RD, WRD,	Jul - Dec

Table 16:Lightning and Extreme Weather Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Preparation of state action plan and SOPs	✓ Develop action plans for thunderstorm risk reduction, prepare detailed departmental SOPs.	SDMA, RD, IMD	Jan - June
Data collection & hazard mapping	✓ Compile data on past events, map high-risk areas, and assess vulnerabilities.	SDMA, RD, DDMA, IMD, PRIs, DoUD	Feb - Aug
Installation of lightning arresters & doppler radars	✓ Expand lightning detection networks and Doppler radar coverage.	SDMA, DDMA, IMD	Apr - Oct
Strengthening early warning systems	✓ Create a network of community-based early warning systems, establish real-time weather monitoring stations.	SDMA, IMD, SDRF, PRIs, DoUD	May - Oct
THEME: INTERAGENCY COORDINATION			
Dissemination of Early Warnings	✓ Ensure warnings reach all stakeholders through print, electronic, and social media, along with push SMS alerts.	SDMA, DDMA, IMD, Telecom Providers	May - Oct
Activation of emergency response teams	✓ Ensure immediate response from the district administration, power supply agencies, and emergency services.	SDMA, DDMA, Electricity Dept., Health Dept., PRIs,	Jun- Oct
Coordination with central agencies	✓ Implement instructions from the central/state government, ensure multi-agency coordination.	SDMA, RD, IMD, DDMA	Jan - Dec (Regular)

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Evacuation & rescue operations	✓ Coordinate rescue and evacuation efforts with NGOs, local authorities, and volunteers.	SDMA, SDRF, DDMA, Police, Fire Dept., PWD, Health dept.	Jun - Oct
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Strengthening buildings & infrastructure	✓ Review and update structural safety measures for high-risk buildings, enforce building codes.	SDMA, DDMA, PWD, PRIs	Feb - Aug
Installation of lightning conductors/arresters	✓ Enforce the mandatory installation of lightning arresters in high-rise buildings, schools, industries, and public buildings.	SDMA, RD, DDMA, PRIs	Apr - Oct
Assessment & retrofitting of infrastructure	✓ Inspect structural integrity of billboards, communication towers, and old buildings, ensuring reinforcement where necessary.	SDMA, DDMA, PWD, PRIs	Mar - July
Storm-resilient urban planning	✓ Promote hazard-resistant urban planning, enforce guidelines for safe construction in high-risk areas.	SDMA, RD, DDMA, PRIs	Jan – Dec (Regular)
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Assessment & preparedness planning	✓ Conduct vulnerability assessments and preparedness plans for thunderstorms and strong winds.	SDMA, RD, IMD, DDMA, PRIs	Jan – Dec (Regular)
Public awareness & education	✓ Carry out extensive IEC campaigns, issue public advisories on thunderstorms, lightning, and strong winds.	SDMA, DDMA, IMD	May - Oct
Implementation of fire safety norms	✓ Ensure strict adherence to fire safety norms in high-risk areas, particularly regarding electrical hazards.	SDMA, DDMA, PRIs, Fire Dept.	Jan - Dec (Regular)
Protection of essential services & infrastructure	✓ Develop emergency communication systems, ensure rapid restoration of electricity and transport links.	SDMA, RD, DDMA, Electricity Dept., PWD	Jun - Oct
Risk transfer mechanisms	✓ Implement risk transfer mechanisms, including insurance for crops, property, and livestock.	SDMA, RD, DDMA, PRIs, Insurance Agencies	Jul - Dec
THEME: CAPACITY DEVELOPMENT			
Training of emergency responders	✓ Conduct training programs for first responders, local volunteers, and disaster management personnel.	SDMA, SDRF, DDMA	Feb - Jul
Community awareness programs	✓ Educate communities on safety measures, evacuation protocols, and emergency preparedness.	SDMA, DDMA, PRIs	Mar - Oct

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Mock drills & simulations	✓ Conduct simulation exercises to test preparedness and response efficiency for thunderstorm-related hazards.	SDMA, DDMA, SDRF, Fire Dept., Police	Apr - Sep
Incorporating risk reduction in school curricula	✓ Introduce thunderstorm and lightning safety measures into school and college curricula.	SDMA, Education Dept., DDMA	Jan – Dec (Regular)
Skill development for local communities	✓ Train local communities on first aid, emergency response, and post-disaster recovery.	SDMA, RD, SDRF, PRIs, NGOs	Feb - Sep
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Climate impact research & data collection	✓ Study climate change trends and their impact on thunderstorms and strong winds.	SDMA, RD, IMD, FD, PRIs,	Jan – Dec (Regular)
Vulnerability & capacity assessment for climate change	✓ Integrate climate change impact analysis into HRVCA updates.	SDMA, RD, IMD, WSD, DDMA	July - Dec
Climate adaptation strategies	✓ Develop local adaptation strategies, including heat and wind-resistant infrastructure.	SDMA, RD, IMD, PRIs, DoUD	Feb - Oct

Table 17: Cloudburst Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Data compilation & hazard mapping	✓ Compile and maintain data on cloudbursts, hailstorms, and their impacts, identify high-risk settlements.	WIHG, ISRO, IMD, SDMA, RD, FD, DRD, PRI, DDMA	Feb-Sept
Landslide hazard zonation (LHZ)	✓ Use satellite imagery, aerial photographs, and indigenous knowledge to map cloudburst-prone areas.	ISRO, IMD, SDMA, PRI, DDMA	Mar-Oct
Identification of unsafe settlements	✓ List and prioritize vulnerable households and communities for relocation or protective measures.	PWD, SDMA, DDMA, PRIs,	Apr-Nov
THEME: INTERAGENCY COORDINATION			
Disaster governance & response planning	✓ Prepare and implement cloudburst-specific DM plans, ensure coordination between agencies.	SDMA, DDMA, PRIs,	Jan– Dec (Regular)
Warning & communication system	✓ Strengthen early warning dissemination through mass media, mobile alerts, and community networks.	SDMA, DDMA, IMD, PRIs,	May-Oct

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Coordination with central agencies	✓ Ensure synchronization with national disaster management efforts and scientific research institutions.	SDMA, IMD, NDMA, MoES, DDMA	Jan –Dec (Regular)
Evacuation & relief coordination	✓ Set up designated evacuation zones and emergency response teams for rapid deployment.	SDMA, SDRF, DDMA, PRIs, Police, Fire Dept.	Jun - Oct
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Slope stabilization measures	✓ Implement bioengineering techniques, mechanical structures, and afforestation for slope stability.	ULMMC, Forest department, SDMA, RD, DRD, DoUD, PRI, DDMA	Mar-Nov
drainage & water diversion infrastructure	✓ Construct stormwater drains, repair and maintain natural water channels to prevent flooding.	SDMA, RD, DoUD, PRIs, PWD, Irrigation Dept.	Apr - Oct
Multi-hazard resilient shelters	✓ Identify safe shelters and upgrade existing structures for emergency evacuation.	SDMA, DDMA, PRIs, DoUD	May-Sep
Strengthening road & bridge infrastructure	✓ Ensure proper road design and maintenance to withstand cloudburst-induced flash floods.	SDMA, PWD, RD, DoUD, DDMA	Feb -Dec
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Risk transfer mechanisms	✓ Implement crop insurance, property insurance, and risk-sharing schemes.	SDMA, RD, PRIs, DoUD, Insurance Agencies	Jul - Dec
Review of building & land use regulations	✓ Amend town planning policies to include cloudburst risk mitigation measures.	UHUDA, SDMA, RD, DoUD, PRIs	Feb- Aug
Public awareness & IEC campaigns	✓ Conduct mass media campaigns, distribute educational materials on cloudburst preparedness.	SDMA, DDMA, PRIs,	May-Oct
Regulatory framework for risk reduction	✓ Establish guidelines for infrastructure development in cloudburst-prone areas.	SDMA, RD, PRIs	Jan– Dec (Regular)
THEME: CAPACITY DEVELOPMENT			
Training for disaster response teams	✓ Train local volunteers, SDRF personnel, and first responders in cloudburst response techniques.	SDMA, SDRF, DDMA, PRIs	Feb- Aug
Mock drills & evacuation exercises	✓ Conduct joint drills with community participation to test emergency response.	SDMA, DDMA, SDRF, Fire Dept., Police	Apr - Oct
Community-based disaster management (CBDM)	✓ Strengthen local disaster management capacities through participatory training programs.	SDMA, DDMA, PRIs, NGOs	Mar- Sep

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Knowledge sharing & documentation	✓ Maintain case studies and best practices for cloudburst mitigation	SDMA, RD, State ATI, PRIs,	Jan-Dec (Regular)
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Research on climate change & cloudburst patterns	✓ Conduct scientific studies on shifting climate trends influencing cloudburst frequency.	NIH, ISRO, SDMA, RD, IMD, FD, PRIs,	Jan-Dec (Regular)
Hazard risk vulnerability & capacity assessment (HRVCA)	✓ Integrate climate change impact scenarios into HRVCA updates.	SDMA, RD, IMD, DDMA	Jul - Dec
Climate adaptation strategies	✓ Develop local adaptation strategies, integrate blue-green infrastructure for resilience.	SDMA, RD, IMD, PRIs,	Feb-Oct

Table 18:Forest Fire Risk Mitigation

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Technical support	✓ Applying the classification system for hazardous industries in rural and urban areas based on norms laid down by the SFAC for fire services ✓ Vulnerability analysis of densely population clusters prone to high risk of fire	SDMA, DDMA, ULBS, & Envir., Forest Dept., Panchayats, other Relevant Departments	Sep-Dec
Hazard risk vulnerability assessment	✓ Undertake HRVA as part of preparing and periodic revision of DM plans. ✓ Mapping of hazardous sites that pose fire and explosion risks. Assess and fix the requirement of equipment and workforce ✓ Identifying areas prone to forest fires and taking preventive measures	SDMA, DDMA, ULBS, & relevant departments, environment/ forest dept., panchayats	Jan-Mar
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks	SDMA, DDMA Forest Dept.,	Regular
Response	✓ Organizing the IRS and seeking assistance from central agencies	SDMA, DDMA Forest Dept.,	Mar
Warnings, information, data	✓ Quick, clear, effective dissemination among state, District, and PRI agencies	SDMA, DDMA, ULBS, environment/forest panchayats & relevant dept.	Feb-Jun

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Enforcement of fire safety rules and regulation	✓ Enactment of Fire Act and other legal measures as per recommendations of SFAC and other official bodies - Institutional reform and significant changes in organizational setup - Legal regime for mandatory fire clearance from FES for different types of buildings, colonies, industries, and other installations ✓ Strict implementation of fire safety rules - Strict procedures for fire safety certification should be followed before issuing building use permissions ✓ Ensure frequent inspection of fire safety systems and equipment in public	SDMA, DDMA and relevant departments, ULBs, Environment/ Forest Dept., Panchayats	Nov - Feb
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Enforcement of fire safety line	✓ Provide Support Frame model rules, laws, and guidelines.	Forest Department	Nov - Feb
THEME: CAPACITY DEVELOPMENT			
Training	✓ Training and orientation programs for govt. Staff, professionals for veterinary care and support to disaster-affected animals ✓ Incorporating disaster response, search, and rescue in the training programs of youth, such as village volunteers, and for the protection of disaster-affected animals	SDMA, DDMA and relevant departments, ULBs, Environment/ Forest Dept., Panchayats	Nov-Feb
Empowering women, marginalized and persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development, covering all aspects of disaster management at the state, district, and local levels	SDMA, DDMA and relevant departments, ULBs, Environment/ Forest Dept., Panchayats	Jan - Mar
Awareness generation & mock drills	✓ Carry out mass media campaigns. ✓ Promote a disaster risk prevention, mitigation, and better risk management culture. ✓ Promote attitude and behaviour change in the awareness campaigns/IEC ✓ Promote the use of insurance/ risk transfer ✓ Promote Community Radio, Strengthening the network of civil society organizations for awareness generation about DRR and DM ✓ Information on the care and protection of disaster-affected animals ✓ Joint planning and execution of emergency drills	SDMA, DDMA and relevant departments, ULBs, Environment/ Forest Dept., Panchayats	Regular
Community-based disaster management	✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach ✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach ✓ Training for panchayat, SHG, NCC, NSS, Youth, local community organizations	SDMA, DDMA and relevant departments, ULBs, Environment/ Forest Dept., Panchayats	Regular

Table 19: Drought Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Vulnerability maps	✓ Annually, after the end of the South- West -monsoon, carry out a comprehensive assessment of water availability for drinking and irrigation in all the dry land farming/drought-prone areas in the state to demarcate blocks and preferably villages ✓ Prepare maps of areas likely to face water deficit before the onset of the next monsoon (demarcate blocks and preferably villages) ✓ Undertake a village-wise assessment of water storage in the vulnerable blocks.	SDMA, Agri. Dept., Jal Sansthan, Irrigation Dept., DDMA.	Oct -Dec
Drought declaration	✓ Monitor key indicators for drought declaration with the support of relevant State agencies/ Departments. ✓ State Govt. to issue a formal declaration of drought-affected areas, after which the Collector will notify the district and talukas ✓ Affected and initiated drought response measures	SDMA, DDMA Agri. Irri. Revenue. Dep.,	Feb-Mar
Hazard risk vulnerability assessment	✓ Undertake HRVA as part of preparation/ revision of DM plans, including change in vulnerability and risk considering climate change scenarios. ✓ Estimate the vulnerability of crops to rainfall uncertainties	SDMA, DDMA Agri. Revenue Dep.,	Nov-Dec
Research	✓ Conduct research through the university system to cope with water deficit, manage crops with less water, improve water conservation programs, and enhance the productivity of dry land/rain-fed farming.	SDMA, DDMA, Agri. Dept. & other,	Regular
Assessment, monitoring, and early warning	✓ Coordinate with central agencies in the compilation to refine forecast accuracy for the region and analyse all the drought, water deficit, and crop-related data. ✓ Ensure the functioning of DMC is under the control of SDMA with the requisite facilities and staff. ✓ Separately, at the end of SW and NE monsoon, as applicable, prepare and update a robust database of micro-level details on rainfall, reservoir/ lake water levels, surface water/ groundwater, soil moisture, sowing/ crop conditions, and socio-economic factors. ✓ Separately, at the end of the SW and NE monsoon, prepare crop advisory for blocks likely to face water deficit. ✓ Separately, at the end of SW and NE monsoons, prepare comprehensive water conservation, re-distribution, and management plans for the areas in the state that are likely to experience water deficit.	SDMA, Agri., Irrigation, Jal sansthan	Oct -Nov
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks	SDMA, DDMA, Agri dept.	Regular
Response	✓ Organizing the IRS and seeking assistance from central agencies		Feb

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Warnings, information, data	✓ Quick, clear, effective dissemination among state, District, and PRI agencies	SDMA, DDMA, GIS, Agri, Rev. Irrigation, dept.	Feb-Apr
Non-structural measures	✓ Adapting the norms/ codes as per the district’s requirement, enforcement, monitoring	SDMA, DDMA	Regular
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Storage facilities	✓ Drinking water storage and distribution facilities ✓ Fodder storage facilities to maintain fodder banks ✓ Rainwater harvesting systems – individual and community	SDMA, DDMA, Forest, Water Supply Dept., Panchayats, ULBs, DRD, PRD, Revenue other relevant Dept.	Feb-Mar
Water conservation structures	✓ Water harvesting and storage structures Check dams and reservoirs with excess capacity. ✓ Groundwater recharge augmentation systems		Nov-Dec
Social housing schemes	✓ Ensure rainwater harvesting and storage in the social housing schemes, especially in drought-prone areas.		Nov-Dec
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Mitigation measures	✓ Promote private participation in disaster management facilities. Improve the implementation of watershed development programs. ✓ Risk management for dry land/ Rain-fed farmers through agricultural extension and financial institutions based on assessments at the end of the monsoon (SW or NE as applicable) & Drought-Proofing.	SDMA, DDMA, Panchayats, ULBs, DRD, Rev., Irrigation Forest/ Envir. Dept., Other relevant departments	Nov-Feb
Promote water conservation, harvesting, efficient irrigation, and forestation.	✓ Promote water-efficient irrigation systems (sprinklers, drip, etc.) ✓ Promote protective irrigation through micro irrigation systems ✓ Provide advice to farmers to cope with drought, crop management under drought conditions, and efficient water management ✓ Training in water and soil moisture conservation ✓ Promote village-level information systems for natural resource management forestation, and other options using economically useful vegetation	SDMA, DDMA, Panchayats, ULBs, DRD, Revenue Irrigation Forest/ Environment Dept., Other relevant departments	Nov-April
Agricultural credit, agricultural inputs, finance, marketing, and crop insurance	✓ Need-based credit, Promote financial inclusion ✓ Monitor the availability of credit and other financial support from banks and other financial institutions to farmers in drought-prone areas. ✓ Ensure the insurance programs reach the target audiences (parched land/ rain-fed farmers) and dependent agricultural labour Marketing support ✓ Ensuring the availability of quality agricultural inputs	State/UT, Agriculture Dept., State Rural Coop. Banks, Rural Banks, NABARD, DDMA	Regular

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Reducing climate change impact	✓ Implement various water and soil conservation programs, considering climate change impacts.	SDMA, DDMA, Panchayats, ULBs, Rev, Irri, Forest/ Envir. Dept., Other relevant Dept.	Feb-Mar
THEME: CAPACITY DEVELOPMENT			
Empowering Women, marginalized, and persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development, covering all aspects of disaster management at the state, district, and local levels		Regular
Training	✓ Formulate and implement training and capacity-building programs for drought management, significantly better water conservation, integrated water management (surface and groundwater), and cropping systems. Implement different training programs for officials at various levels, elected representatives, community leaders, civil society organizations, and animal welfare organizations. ✓ Ensure availability of qualified and experienced trainers conversant with drought mitigation and management techniques (crop, animal care, integrated water resources –surface and groundwater) ✓ Professionals for veterinary care and support to drought-affected animals	SDMA, DDMA, Panchayats, ULBs, Revenue Dept., Irrigation Dept., Forest/ Environment Dept., Other relevant departments	Oct-Dec
Awareness generation & mock drills	✓ Carry out mass media campaigns. ✓ Promote a disaster risk prevention, mitigation, and better risk management culture. ✓ Promote attitude and behaviour change in the awareness campaigns/IEC ✓ Promote the use of insurance/ risk transfer ✓ Promote Community Radio Strengthening network of civil society organizations for awareness generation about DRR and DM Information on the care and protection of disaster-affected animals. ✓ Joint planning and execution of emergency drills	SDMA, Revenue Dept., DDMA, Panchayats, ULBs, Revenue Dept., Irrigation Dept., Forest/ Environment Dept., Other relevant departments	Oct-Feb
Mainstreaming drought management in developmental plans	✓ All relevant dept. Will mainstream disaster management efforts in their developmental plans		Regular
Curriculum development	✓ Include fundamental aspects of disaster management, including drought, in graduate and post-graduate agriculture and veterinary courses offered by state institutions.	SDMA, Edu. Dept.	Regular

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Research, forecasting, early warning Information system, zoning, mapping	✓ Support national risk reduction efforts related to GACC ✓ Coordination with central agencies ✓ Sponsor and promote state-specific efforts and local efforts for GACC mitigation and adaptation ✓ Document state-specific GACC impacts and coping mechanisms ✓ Take initiatives to promote drought-resistant crops ✓ Promote local weather-based insurance mechanisms and agricultural practices. ✓ Promote state-specific studies on enhanced risks (economic, social, etc.) under different GACC impact scenarios. ✓ Promote research studies with State-specific contexts on GACC and consequent changes in hazards	SDMA/RD, WRD, DDMA, PRIs,	Jan - Dec (Regular)
Hazard risk vulnerability and Capacity assessment (HRVCA)	✓ Undertake HRVCA as part of preparing and periodic revision of DM plans ✓ Impact assessment, economic and social risks under GACC, and reporting ✓ Assess GACC risks of vulnerable and marginalized sections ✓ Creation of databank and hazard, risk & vulnerability mapping locally.	SDMA/RD,	Jul - Dec
Climate change adaptation (CCA)	✓ Sensitisation and Public Awareness ✓ Capacity building and utilizing traditional knowledge to build eco-system. ✓ Develop local adaptation strategies. ✓ Implement various water and soil conservation programs consistent with anticipated GACC impacts ✓ Adaptation and mitigation strategies under the DM plan to ensure food security. ✓ Sponsor state-specific efforts support local efforts ✓ Develop climate-resilient infrastructure. ✓ Implement efficient water management and monitoring systems as part of CCA in drought-prone areas. ✓ Promote appropriate combinations of green and blue infrastructure approach ✓ Integrate adaptive measures in social protection programs for vulnerable groups	SDMA/RD, FD, DDMA, PRIs, DoUD	Feb- Oct

Table 20: Heat and Cold Waves Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMEN T	TIMELINE
Observation networks, information systems, monitoring, research, forecasting & early warning and zoning/ mapping	✓ Maintaining preventive measures as per norms ✓ Vulnerability Assessment and Establishing Heat-Health Threshold Temperatures ✓ Strengthening and maintaining monitoring and data logging systems for temperature, humidity, etc., required for the threshold for heatwave alerts. ✓ Establish and maintain community-based network for sharing alerts ✓ Modify or customize warnings according to thresholds suitable for the State/UT	NDMA, SDMA, RD, DDMA, IMD, CWC, IIRS	Jan - Dec (Regular)
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Updating HRVCA ✓ Identification and listing of Identifying the vulnerable population/ communities/ settlements ✓ Identification of groups requiring special attention ✓ Constitute/ strengthen the mechanisms for consultation with experts and stakeholders ✓ Conduct an audit of equipment and human resource requirements	SDMA, RD, DDMA,	Jul - Dec
Dissemination of warnings, data, and information	✓ Create awareness of preventive measures ✓ Extensive IEC campaigns to create awareness through print, electronic and social media ✓ Specific messages for highly vulnerable groups such as the elderly, young children, outdoor workers, and slum residents	SDMA, RD DDMA, IMD, CWC, GSI, DGRE, FSI	Mar - Oct
Disaster data collection and management	✓ Systematic data management of data on disaster damage and loss assessments ✓ Disaster Damage and Losses 2005-2015 baseline	SDMA/RD, All Depts.	Jan - Dec (Regular)
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Ensure the local administration (city/district) can understand and meaningfully use all the heatwave-related information from various agencies and health authorities – central and state ✓ Team preparation and coordination – officials and agencies are well prepared for the heatwave season ✓ Coordinate with IMD regarding forecasts, early warnings, and alert system based on drought severity & Appointing a State Nodal Agency and Officer ✓ Preparing/Adapting Heat Wave Action Plan ✓ Implementation as per specific conditions in the state & Develop a clearly defined interagency emergency response plan with roles and information flows marked out, Ensuring coherence and mutual reinforcement of DRR, CCA, and development & Partnering local institutions with national institutions/experts ✓ Adapting HAPs developed in other countries /cities, monitoring and evaluating implementation and impact on mortality and morbidity	NDMA, SDMA, RD, PRIs, DDMA	Jan - Dec (Regular)

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Warnings, information, data	✓ Coordinating the dissemination of warnings to all, down to the last mile – remote, rural, or urban Regular updates to people in areas at risk ✓ Follow the alerts/warning ✓ Do's-and-Don'ts" during a heat wave should be available in local languages and disseminated through media ✓ Collecting Data/Information necessary for review/update of the plan	IMD, CWC, FSI, SDMA, RD, PRIs, DDMA	Feb - Oct
Preparation and response	✓ Organizing and coordinating the immediate response ✓ Coordinate with central agencies ✓ Implementing the heat action plan ✓ Establishing First Aid/ Medical Aid facilities in key locations ✓ Identify vulnerable places and provide drinking water points at those places and worksites also, ORS ✓ Avoiding outdoor games/sports activities ✓ Livestock preparedness during hot weather - ensuring that the livestock has sufficient shade and water on hot days ✓ Heat treatment wings in hospitals ✓ Establishing medical assistance facilities at places of mass gathering ✓ Implement a system of heat alerts to trigger early morning shifts for schools and offices/Rescheduling school and office timings during heat-wave season ✓ To construct cool shelters, bus stands, etc., that offer shelter from heat wave	NDMA, SDMA, RD, PRIs, DDMA	Mar- Sep
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Social housing schemes	✓ Ensure incorporation of protection from heat waves in multi-hazard resistant features in the planning and execution of social housing schemes in heat wave-prone areas	NDMA, UHUDA, SDMA/RD, DDMA	Feb- Nov
Heatwave shelters and other measures	✓ Strengthening/mainstreaming the network of medical assistance facilities ✓ Temperature forecasts and heat alerts will be sent in bulk messages on mobile phones, local electronic media ✓ Electronic screens at busy traffic intersections and marketplaces ✓ Effective transportation ✓ Promote cool roofs and heat-reducing integrated development	IMD, NCDC, SDMA, RD, Forest Dept., PRIs, DDMA	Apr- Sep
Hazard resistant construction, Strengthening, retrofitting of all lifeline structures and critical infrastructure	✓ Collaboration with technical agencies and implementation	PWD, RWD, Irrigation, UJN, UDD, SDMA/RD, PRIs, DDMA	Mar - Dec

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMEN T	TIMELINE
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Risk transfer	✓ Implementation of Risk Transfer Arrangements, including multi-hazard insurance for life and property ✓ Policy Framework	SDMA/RD	May - Dec
Techno-legal regimes	✓ Laws and Regulations ✓ Institutional arrangements ✓ Improving the forest coverage and green areas ✓ Promote the use of building materials that protect from heat ✓ Promote designs to reduce heat island effects in urban areas ✓ Facilitate integrated development plans that can cope better with heatwave conditions	UHUDA, UDD, FD, PRIs, DDMA,	Jan – Dec (Regular)
THEME: CAPACITY DEVELOPMENT			
Training	✓ Train key officials regarding pre-, during, and post-heat-wave season activities ✓ Training for CDEF, community, and volunteers ✓ Training for deployment of Rapid Medical Response Teams ✓ Training on heat-wave-specific health care for vulnerable groups	SDMA/RD, SDRF, RD, PRI, DDMA	Feb - Sep
Curriculum development	✓ Inclusion of heat wave and similar issues in various curriculum	SDMA/RD, DDMA	Jan- Dec (Regular)
Awareness generation	✓ Promoting awareness, alertness, and preparedness ✓ Training programs for the public, PRIs/DoUD ✓ Carry out mass media campaigns in heat-wave-prone areas ✓ Create awareness of coping with heat waves and HAP	IMD, GSI, CWC, SDMA, RD, DDMA	Mar - Oct
Mock drills/exercises	✓ Identify and resolve communication gaps between participating departments, partners, and the public ✓ Joint execution of emergency drills with local bodies to address heatwave emergencies in relevant areas	SDMA/RD, SDRF, SDRF/Police, DDMA	Apr – Sep
vocational training/skill development	✓ Incorporating gender-sensitive and equitable approaches in capacity development for coping with heat wave emergencies	SDMA/RD, DDMA	Feb - Oct
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Research, forecasting, data management, zoning, mapping	✓ Support and coordination ✓ Research on local threshold and climate change adaptation ✓ Improving the dissemination of information on GACC and adaptation	IIRS, WIHG, FSI, NIH, SDMA, RD, IMD, PRIs, DoUD	Jan- Dec (Regular)

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Incorporate updated info on GACC in HRVCA while preparing or periodic revision of DM plans ✓ Assess heat wave risk and vulnerability due to GACC ✓ Update heat-wave vulnerability maps based on projected GACC impacts ✓ Assess GACC risks of vulnerable and marginalized sections.	SDMA, IMD	Jul - Dec
Climate change adaptation (CCA)	✓ Sensitization and awareness creation ✓ Support national CCA efforts ✓ Coordination with central agencies ✓ Sponsor and promote state-specific efforts and local efforts for GACC mitigation and adaptation ✓ Develop local adaptation strategies and pilot projects ✓ Sponsor and promote state-specific efforts and local efforts ✓ Implementation of GACC adaptation programs ✓ Promote appropriate combinations of green and blue infrastructure approach ✓ Integrate adaptive measures in social protection	SDMA, DDMA, PRIs,	Feb- Oct

Table 21: Chemical (Industrial) Disaster Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Zoning/ mapping	✓ Industrial zones based on hazard potential and effective disaster management for worst-case scenarios ✓ Carry out the mapping and related studies in collaboration with Districts	SDMA, Industries Dept., DDMA, Panchayats, ULBs, Industries, Industrial Associations	Jul- Aug
Hazard risk vulnerability assessment	✓ Undertake HRVA as part of preparing and periodic revision of DM plans ✓ Studies on vulnerability covering social, economic, ecological, gender, and equity aspects ✓ Change in vulnerability and risk due to climate change scenarios	SDMA, DDMA, Forest/Environment, Industries Dept., other relevant departments, Panchayats, ULBs, Industries, Associations	Sep-Oct
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks	SDMA, DDMA, Industries, Associations	Regular

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Response	✓ Organizing the IRS and seeking assistance from central agencies	SDMA, DDMA, Industries, Associations	November
Warnings, information, data	✓ Quick, clear, effective dissemination among state, District, and PRI agencies	SDMA, Industries Dept., DDMA, Panchayats, ULBs	Dec- Mar
Non-structural measures	✓ Adapting the norms/ codes as per the district's requirement, enforcement, monitoring	SDMA, Industries Dept., DDMA, Panchayats, ULBs	Regular
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Shelters, evacuation, and support facilities multiple routes for reliable access and escape	✓ Identification of shelters with basic facilities like drinking water and first aid for chemical exposure ✓ Ensuring water storage facilities and sources of water for accident containment and firefighting operations ✓ Providing wide roads and multiple routes in the industrial area to allow quick access by first responders and to ensure escape	SDMA, DDMA, Forest/ Environment Dept., Industries Dept., other relevant departments, Panchayats, ULBs, Industries, Associations	Feb
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Public private partnerships	✓ Promote private participation in off-site disaster management facilities ✓ Provide legal support for Mutual Assistance Groups among industries within clusters ✓ Encourage private participation in enhancing off-site disaster response and mitigation	SDMA, Industries Dept., DDMA, Panchayats, ULBs	Regular
Compliance and monitoring institutional arrangements	✓ Formulate rules, norms, and laws, such as factory rules, to ensure excellent safety in hazardous industries and reduce the likelihood of disasters. ✓ Review rules to grant compensation to chemical accident victims to improve them in Favor of victims ✓ Amend land use norms to ensure excellent safety and buffer zones without human settlements near hazardous industries. ✓ Strengthen the conduct of safety audits and enforcement of disaster prevention norms.	SDMA, DDMA, Forest/ Environment Dept., Industries Dept., other relevant departments, Panchayats, ULBs, Industries, Associations	Regular
THEME: CAPACITY DEVELOPMENT			
Empowering women, marginalized, & persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development, covering all aspects of disaster management at the state, district, and local levels	SDMA, Industries Dept., DDMA, Panchayats, ULBs	Regular

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Training	✓ Training and orientation programs for govt. Staff, professionals for veterinary care and support to disaster-affected animals ✓ Incorporating disaster response, search, and rescue in the training programs of youth, such as village volunteers, and for the protection of disaster-affected animals	SDMA, Industries Dept., DDMA, Panchayats, ULBs	Nov- Feb
Community-based disaster management	✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach. ✓ Strengthen the ability of communities to manage and cope with disasters based on a multi-hazard approach. ✓ Training for panchayat, SHG, NCC, NSS, Youth, and local community organizations	SDMA, Industries Dept., DDMA, Panchayats, ULBs	Feb-Mar
Curriculum development	✓ Implement the recommendations of reviews in all educational institutions	Professional bodies	Regular
awareness generation & mock drills	✓ Carry out mass media campaigns. ✓ Promote a disaster risk prevention, mitigation, and better risk management culture. ✓ Promote attitude and behaviour change in the awareness campaigns/IEC ✓ Promote the use of insurance/ risk transfer ✓ Promote Community Radio, Strengthening the network of civil society organizations for awareness generation about DRR and DM ✓ Information on the care and protection of disaster-affected animals ✓ Joint planning and execution of emergency drills	SDMA, Industries Dept., DDMA, Panchayats, ULBs	Feb-Mar

Table 22: Nuclear and Radiological Emergencies Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Monitoring and warning network Strengthening radiation monitoring	✓ Strengthen radiation monitoring at critical locations, including nuclear facilities and high-risk zones. Ensure compliance with national and international nuclear safety standards	Atomic Energy Regulatory Body, Dept. Of Atomic Energy, BARC, DRDO, SDMA/RD, DDMA	Jan-Dec (Regular)
Setting up reliable and dedicated Communication network	✓ Set up a dedicated communication network for nuclear and radiological emergencies. Enhance coordination between emergency response agencies for real-time information sharing.	SDMA, RD, DDMA, State IT Department	Feb- Oct

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Establish monitoring mechanisms to prevent illicit movement of radioisotopes	✓ Coordinate with central agencies to prevent unauthorized movement of radioactive materials. Strengthen security at transport hubs and nuclear facilities.	SDMA/RD	Mar-Dec
Disaster data collection and management	✓ Develop a systematic data management system for tracking nuclear and radiological emergencies. Maintain a database on past incidents and response effectiveness.	SDMA, RD, All Departments	Jan- Dec (Regular)
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Preparation and implementation of DM plans and ensuring the functioning of agencies with DM tasks ✓ All aspects of disaster risk management and mainstreaming DRR	SDMA/RD, DDMA, PRIs,	Jan-Dec (Regular)
Response	✓ Organizing an immediate response and seeking assistance from the central agencies	SDMA/RD, DDMA, PRIs,	Feb- Oct
Warnings, information, data dissemination	✓ Coordinating the dissemination of warnings to all, down to the last mile – remote, rural, or urban Regular updates to people in areas at Risk	SDMA/RD, DDMA, PRIs,	Apr- Oct
Non-structural measures	✓ Adapting the norms/ codes as per the State's requirement, enforcement, monitoring	SDMA/RD, DDMA, PRIs,	Mar- Sep
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Shelters	✓ Identification of safe buildings and sites to serve as temporary shelters near nuclear installations ✓ Construction of multi-purpose shelters near nuclear installations ✓ Ensure compliance with relevant building codes	SDMA/RD, DDMA, PRIs,	Mar- Oct
Decontamination centres strengthen protection systems of nuclear facilities	✓ Coordination with and support to central agencies	SDMA/RD, DDMA, PRIs,	Apr- Nov
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Regulatory and safety standards compliance	✓ Ensure enforcement of nuclear safety guidelines. Implement strict monitoring of radiation levels in high-risk zones.	SDMA, DDMA,	Jan-Dec (Regular)
Public private partnerships	✓ Promote private participation in disaster management facilities	SDMA, RD, DDMA, Private Sector	May-Dec

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Risk transfer mechanisms	✓ Implementation of Risk Transfer ✓ Arrangements including multi-hazard insurance for life and property ✓ Policy Framework	SDMA/RD	Jul - Dec
THEME: CAPACITY DEVELOPMENT			
Training and capacity building	✓ Conduct training programs for emergency responders, police, and medical personnel on nuclear disaster response. Educate volunteers and local communities on nuclear safety protocols.	SDMA, RD, SDRF, DDMA, Police, PRIs,	Feb- Aug
Mock drills and simulation exercises	✓ Organize full-scale nuclear emergency response drills at nuclear facility sites. Test evacuation procedures and radiation exposure mitigation strategies.	SDMA, RD, SDRF, DDMA, Police, PRIs,	Apr- Sep
Incorporation of nuclear safety education	✓ Introduce nuclear safety awareness in school and university curricula. Develop training materials for first responders and healthcare workers.	SDMA, RD, Education Department, PRIs,	Jan- Dec (Regular)
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Research on climate change impacts on nuclear safety	✓ Assess potential climate change risks to nuclear facilities, including extreme weather events. Develop resilience strategies for nuclear infrastructure.	SDMA, RD, BARC, PRIs,	Jan- Dec (Regular)
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Integrate climate change-related nuclear hazard risks into HRVCA planning. Assess vulnerability of nuclear infrastructure to changing climate conditions.	SDMA, RD, PRIs, DDMA	Jul- Dec
Climate change adaptation strategies	✓ Develop adaptive strategies to enhance nuclear disaster resilience. Implement infrastructure upgrades to mitigate climate-induced risks.	SDMA, RD, PRIs, DDMA	Feb- Oct

Table 23: Biological and Public Health Emergencies (BPHE) Risk Mitigation

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Observation networks, information systems, monitoring, research, forecasting & early warning & zoning/ mapping	✓ Maintaining preventive measures as per norms. Strengthening integrated health surveillance systems. Establishing and maintaining a community-based network for sharing alerts. ✓ Strengthening IDSP. The state should modify or adapt IMD's warning system according to the thresholds applicable to the state.	NCDC, Integrate Disease Surveillance Program, SDMA/RD, PRI/, DDMA	Jan- Dec (Regular)

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Dissemination of warnings, data, and information	✓ Create awareness of preventive measures ✓ Extensive IEC campaigns to create awareness through print, electronic and social media ✓ Specific messages for highly vulnerable groups such as the elderly, young children, outdoor workers, and slum residents	SDMA/RD, PRI, DDMA	Apr - Sep
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Updating HRVCA ✓ Identification and listing of the vulnerable population/ communities/ settlements ✓ Identification of groups requiring special attention ✓ Conduct an audit of equipment and human resource requirements ✓ Constitute/ strengthen the mechanisms for consultation with experts and stakeholders	SDMA/RD, PRI/ DOUD, DDMA,	Mar- Oct
Disaster data collection and management	✓ Systematic data management of data on disaster damage and loss assessments ✓ Disaster Damage and Losses 2005-2015 baseline	SDMA/RD, SDMA, all depts.	Jan – Dec (Regular)
Preparation and response	✓ Rapid health assessment and provision of laboratory support ✓ Institution of public health measures to deal with secondary emergencies as an outcome of biological emergencies	SDMA/RD, PRI, DDMA	Mar- Nov
Warnings, information, data	✓ Follow the alerts/warning ✓ “Do's-and-Don'ts” should be available in local languages and widely disseminated ✓ Dissemination of warnings to all, down to the last mile – remote, rural or urban ✓ Regular updates to people in areas at risk ✓ Collecting Data/ Information necessary for review/ update of the plan	SDMA/RD, PRI, DDMA	Feb- Oct
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Implementation as per specific conditions in the State ✓ Team mobilization and coordination - officials and agencies ✓ Involving local administration ✓ Coordinate with the state MOES (IMD) office regarding forecasts, early warning and alert system based on colour codes corresponding to different thresholds ✓ Develop a clearly defined interagency emergency response plan with roles and information flows marked out. Partnering local institutions with national institutions/experts ✓ Adapting HAPs developed in other countries/cities, monitoring and evaluating implementation and impact on mortality and morbidity	SDMA/RD, PRI, DDMA	Jan – Dec (Regular)

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY /DEPART MENT	TIMELINE
Upgrading medical facilities	✓ Specialized health care and laboratory facilities to address biological emergencies/ incidents ✓ Establishing and strengthening quarantine facilities ✓ Creating at least one public health laboratory in each district	SDMA/RD, DDMA, PRIs,	Mar- Nov
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Techno-legal regimes	✓ Strengthen institutional arrangements ✓ Enact/ amend any Act, Rule, or Regulation, if necessary, for better implementation of BPHE programs	SDMA/RD, DDMA	Jan- Dec (Regular)
Biosafety, biosecurity measures and environmental management	✓ Strict compliance with biosafety and biosecurity provisions ✓ Environmental monitoring to prevent outbreaks	SDMA/RD, DDMA	Mar - Oct
Risk transfer	✓ Implementation of Risk Transfer Arrangements, including multi-hazard insurance for life and property Policy Framework	SDMA/RD	Jul- Dec
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Strengthening response	✓ Establishing adequate decontamination systems, critical care ✓ Intensive Care Units (ICUs) and isolation wards with pressure control and lamellar flow systems ✓ Adequate Personal Protective Equipment (PPE) for all the health workers associated with responding to biological emergencies ✓ Strengthening/mainstreaming the network of medical assistance facilities ✓ Equipping Medical First Responders (MFRs)/Quick Reaction Medical Teams (QRMTs) with all material logistics and backup support ✓ Upgradation of earmarked hospitals to cope with Chemical, Biological, Radiological and Nuclear (CBRN) emergencies ✓ Communication and networking system with appropriate intrahospital and inter-linkages with state ambulance/transport services, state police departments and other emergency services ✓ Mobile telehealth services and Mobile Hospitals	SDMA/RD, DDMA, PRIs,	Apr - Dec
THEME: CAPACITY DEVELOPMENT			
Mock drills/exercises/ CBDM	✓ Defining the role of the community as a part of disaster management ✓ Testing of various elements of the hospital emergency preparedness through tabletop exercises and mock drills ✓ Identify and resolve communication gaps between participating departments, partners, and the public ✓ Joint execution of emergency drills with local bodies	SDMA/RD, DDMA, SDRF, Police, PRI,	

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY /DEPART MENT	TIMELINE
Knowledge management & curriculum development	✓ Incorporating basic knowledge of BPHE management through the educational curricula ✓ Proper education and training of personnel ✓ Conduct continuing medical education programs and workshops at regular intervals. ✓ Defining the role of public, private, and corporate sectors for their active participation and their sensitization	SDMA/RD, PRI, DDMA	Jan- Dec (Regular)
Human resource development & training	✓ Training support for CDEF, community, and volunteers ✓ Training for surveillance ✓ Training for deployment of Rapid Medical Response Teams ✓ Training for All Health and allied healthcare professions, AYUSH doctors and practitioners, community health workers, ASHA, MPWS, ANM and Anganwadi workers. ✓ Organizing community awareness programs for first aid and general triage	SDMA/RD, SDRF, RD, PRI, DDMA	Feb - Oct
Applied research	✓ Strengthening of scientific and technical institutions for knowledge management and applied research and training in the management of CBRN emergencies	SDMA/RD PRI/	Jan- Dec (Regular)
Awareness generation	✓ Promoting awareness, alertness, and preparedness ✓ Training programs for the public, PRIs/ DoUD ✓ Community awareness program for first aid ✓ Dos and Don'ts to mitigate the effects of medical emergencies caused by biological agents ✓ Awareness about the importance of personal hygiene ✓ With due consideration to the social, ethnic, and religious issues involved, utmost care will be exercised in the disposal of dead bodies.	SDMA/RD, PRI/DDMA	Mar - Oct
Empowering women, marginalised communities, SC/ST & persons with disabilities	✓ Incorporating gender-sensitive and equitable approaches in capacity development for coping with BPHE	SDMA/RD, PRI, DDMA	Feb - Dec
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Research, forecasting, early warning, data management, zoning, mapping	✓ Support and cooperate with central agencies ✓ Sponsor and support state-specific and local efforts	SDMA/RD	Jan- Dec (Regular)
Hazard risk vulnerability and capacity assessment	✓ Undertake HRVCA as part of preparing and periodic revision of plans ✓ Assess GACC risks of vulnerable and marginalized sections	SDMA/RD, SDMA,	Jul - Dec

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Climate change adaptation (CCA)	✓ Sensitization and awareness creation ✓ Support national CCA efforts ✓ Coordination with central agencies ✓ Sponsor and promote state-specific efforts and local efforts for GACC mitigation and adaptation ✓ Develop local adaptation strategies and pilot projects	SDMA/RD, DDMA, PRIs,	Feb- Oct

Table 24:Fire Hazard Risk Mitigation

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Fire hazard identification and mapping	✓ Conduct hazard risk assessment and develop fire hazard maps for urban and rural areas. Identify high-risk zones for preventive	SDMA, DDMA, Fire Department, ULBs, PRIs, Revenue Dept.	Jan- Dec (Regular)
Establishing fire safety regulations	✓ Develop and enforce fire safety codes and regulations for residential, commercial, and industrial buildings. Ensure compliance with national fire safety standards.	SDMA, DDMA, Fire Department, ULBs, PRIs, Revenue Dept.	Mar- Nov
Strengthening firefighting infrastructure	✓ Establish new fire stations in high-risk areas. Upgrade existing fire services with modern firefighting equipment and personnel training.	SDMA, DDMA, Fire Department, ULBs, PRIs	Apr - Dec
Enhancing fire early warning systems	✓ Deploy advanced fire detection and early warning systems in vulnerable areas. Strengthen communication networks for real-	SDMA, DDMA, Fire Department, IT Dept., ULBs, PRIs	May - Oct
Dissemination of fire safety information	✓ Conduct public awareness campaigns on fire prevention, preparedness, and response. Ensure dissemination of fire safety guidelines through mass media and local outreach programs.	SDMA, DDMA, Fire Department, ULBs, PRIs	Feb- Sep
Fire hazard response planning	✓ Develop and regularly update fire emergency response plans at state, district, and local levels. Conduct inter-agency coordination drills for effective response.	SDMA, DDMA, Fire Department, ULBs, PRIs, Revenue Dept.	Jan – Dec (Regular)
Enforcement of building codes and fire safety audits	✓ Ensure strict compliance with fire safety building codes. Conduct periodic fire safety audits for commercial and residential buildings.	SDMA, DDMA, Fire Department, ULBs, PRIs, Revenue Dept., PWD, Town and Country Planning	Mar- Oct
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Strengthen governance mechanisms for fire disaster management. Enhance coordination between fire departments, local authorities, and emergency response teams.	SDMA, DDMA, Fire Department, ULBs, PRIs, Revenue Dept.	Jan- Dec (Regular)
Emergency response activation	✓ Establish rapid response teams for fire incidents. Strengthen coordination between fire services, medical units, and disaster management authorities.	SDMA, DDMA, Fire Department, Health Dept., Police, ULBs, PRIs	Mar - Oct

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
Public fire safety awareness and training	✓ Organize community training programs on fire prevention, evacuation procedures, and emergency response. Conduct school-based fire safety education initiatives.	SDMA, DDMA, Fire Department, Education Dept., ULBs, PRIs	Apr- Sep
Fire risk data collection and analysis	✓ Develop a centralized fire risk database to track fire incidents, response efficiency, and mitigation efforts.	SDMA, DDMA, Fire Department, IT Dept., ULBs, PRIs	Jan- Dec (Regular)
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Development of fire -resistant infrastructure	✓ Promote the construction of fire-resistant buildings. Implement fire safety retrofitting for critical infrastructure.	SDMA, DDMA, Fire Department, PWD, ULBs, PRIs Town and Country Planning	Feb- Nov
Establishment of water supply systems for firefighting	✓ Ensure adequate water availability for firefighting through dedicated reservoirs, hydrants, and water sources in urban and rural areas.	SDMA, DDMA, Fire Department, Water Supply Dept., ULBs, PRIs, Jal Sansthan	Mar - Dec
Fire-resistant zoning and planning	✓ Implement zoning regulations to separate high-risk industrial areas from residential zones. Develop fire buffer zones in urban planning.	SDMA, DDMA, Fire Department, Urban Planning Dept., ULBs, PRIs,	Jan- Dec (Regular)
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Legislation and policy development for fire safety	✓ Develop and implement legal frameworks to enforce fire safety measures. Strengthen penalties for non-compliance.	SDMA, DDMA, Fire Department, Legal Dept., ULBs, PRIs	Jan- Dec (Regular)
Insurance and risk transfer mechanisms	✓ Promote fire insurance policies for residential and commercial properties. Develop financial risk transfer strategies for fire disaster recovery.	SDMA, DDMA, Finance Dept., Insurance Agencies	Jun- Dec
Community-based fire prevention programs	✓ Encourage community participation in fire risk reduction efforts. Establish volunteer fire brigades at the local level.	SDMA, DDMA, Fire Department, ULBs, PRIs	Apr- Oct
THEME: CAPACITY DEVELOPMENT			
Firefighter training and skill enhancement	✓ Conduct specialized training programs for firefighters on advanced firefighting techniques, rescue operations, and hazardous material handling.	SDMA, DDMA, Fire Department, SDRF, Police	Feb- Nov
Mock drills and simulation exercises	✓ Organize regular fire drills in public spaces, schools, hospitals, and workplaces. Conduct large-scale simulation exercises for industrial fire scenarios.	SDMA, DDMA, Fire Department, SDRF, Police, ULBs, PRIs	Mar- Oct
Public fire safety awareness campaigns	✓ Develop and distribute fire safety educational materials. Promote fire safety through social media, radio, and television campaigns.	SDMA, DDMA, Fire Department, IPRD, ULBs, PRIs	Jan- Dec (Regular)

THEME: UNDERSTANDING RISK			
Task	RESPONSIBILITY	AGENCY /DEPARTMENT	TIMELINE
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Research on climate change impact on fire risks	✓ Assess the effects of rising temperatures and extreme weather events on fire hazards. Develop adaptive fire risk reduction strategies.	SDMA, DDMA, Fire Department, Climate Research Institutes	Jan- Dec (Regular)
Wildfire prevention and management	✓ Strengthen fire prevention measures in forested and rural areas. Implement controlled burning and vegetation management strategies.	SDMA, DDMA, Forest Dept., Fire Department	Feb- Oct
Urban heat island effect and fire risk reduction	✓ Develop strategies to mitigate the impact of urban heat islands on fire risks. Promote green infrastructure and heat-resistant urban planning.	SDMA, DDMA, Urban Planning Dept., ULBs, PRIs	Mar- Dec

Table 25: Illegal Mining Risk Mitigation

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
ZONING/ MAPPING	✓ Map the areas vulnerable to illegal mining using GIS and satellite imagery ✓ Identify critical zones with environmental and human safety risks ✓ Tag Forest, riverbed, and hill zones for enhanced monitoring ✓ Satellite-based detection of illegal mining, GIS mapping, drone surveillance, alert generation	Indian Bureau of Mines (IBM), State Directorates of Geology & Mining, Ministry of Mines, ISRO	Regular
HAZARD RISK VULNERABILITY ASSESSMENT (HRVA)	✓ Conduct HRVA to assess ecological, economic, and social vulnerabilities due to illegal mining ✓ Include risks to water bodies, forests, and human settlements ✓ Assess risk escalation (landslides, flooding) due to illegal mining	District Administration, Revenue Department, Forest Dept., State Directorates of Geology & Mining, MoEF&CC, State Environment Impact Assessment Authorities (SEIAA)	Regular
THEME: INTERAGENCY COORDINATION			
RESPONSE	✓ Deploy rapid response units in high-risk zones ✓ Seek assistance from State/Central enforcement agencies for crackdown operations	District Administration, State Mining Dept., Forest Department, State Police	When required
OVERALL DISASTER GOVERNANCE	✓ promote conservation, scientific development of mineral resources, and environmental protection ✓ Ensure inclusion of illegal mining risk in DM plans. ✓ Develop Standard Operating Procedures (SOPs) for quick response and prevention	Indian Bureau of Mines, District Administration, Directorates of Geology & Mining, Revenue Dept, Forest Department	Regular

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
NON-STRUCTURAL MEASURES	✓ Enforce mining and forest protection regulations strictly ✓ Use technology to track illegal movements of minerals	Mining Dept., Forest Dept., Police	Regular
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
CONTROL INFRASTRUCTURE AND MONITORING CHECK POSTS	✓ Develop and reinforce physical barriers and check posts in vulnerable areas ✓ Install CCTVs and surveillance in high-risk mining zones	SDMA, DDMA, Mining Dept., Forest Dept., Revenue Dept., PRIs	When required
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
COMPLIANCE AND MONITORING INSTITUTIONAL ARRANGEMENTS	✓ Strengthen mining policy enforcement at district level ✓ Regular safety audits in licensed mining areas ✓ Create buffer zones around sensitive ecosystems	Mining Dept., Forest Dept., Revenue Dept.	Regular
THEME: CAPACITY DEVELOPMENT			
TRAINING	✓ Train officials, police, and forest guards on identifying and managing illegal mining operations	Mining Dept., Forest Dept., Police, IBM, State Mining Departments, MoEF & CC, Academic Institutions	Nov–Feb
AWARENESS GENERATION & MOCK DRILLS	✓ Conduct mass awareness campaigns about the ecological and legal impacts of illegal mining.	SDMA, DDMA, Mining Dept., Forest Dept., Revenue Dept., PRIs,	Feb–Mar
EMPOWERING WOMEN, MARGINALIZED AND VULNERABLE GROUPS	✓ Ensure participation in village surveillance groups ✓ Livelihood support to those vulnerable to participating in illegal mining due to economic need	SDMA, PRIs, Rural Development Dept.	Regular
COMMUNITY-BASED DISASTER MANAGEMENT (CBDM)	✓ Train local communities, SHGs, and youth to monitor and report illegal mining ✓ Use community radio and local champions for awareness	SDMA, DDMA, Mining Dept., PRIs, ULBs	Feb–Mar
THEME: CLIMATE CHANGE RISK MANAGEMENT			
RESEARCH ON CLIMATE CHANGE IMPACTS ON MINING AREAS	✓ Conduct studies to assess the cumulative impact of climate change and illegal mining on soil erosion, hydrology, slope instability, and biodiversity. ✓ Analyse the linkage between increased flash floods, landslides, and mining-induced environmental degradation.	SDMA, SDMC, Forest Department, Geology & Mining Department, Irrigation Department, Disaster Mitigation and Management Centre (DMMC), Remote Sensing Centre, Academic Institutions	Apr–Sep

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
CLIMATE CHANGE ADAPTATION STRATEGIES	✓ Framing of sustainable mining policies, best practice guidelines ✓ Develop site-specific adaptation strategies in mining-affected areas (e.g., reforestation, water catchment treatment, slope stabilization). ✓ Encourage adoption of eco-restoration models for mined areas to build long-term climate resilience. ✓ Promote community-based climate adaptation initiatives linked to sustainable livelihoods.	Ministry of Mines, IBM, NITI Aayog Environment Dept., Forest Dept., State Mining Dept., Panchayats, NGOs	Oct–Mar
THEME: INTERAGENCY COORDINATION			
Overall disaster governance	✓ Ensure inclusion of illegal mining risk in DM plans. ✓ Develop Standard Operating Procedures (SOPs) for quick response and prevention	SDMA, DDMA, Mining Dept., Police, Revenue Dept.	Regular
Response	✓ Deploy rapid response units in high-risk zones ✓ Seek assistance from State/Central enforcement agencies for crackdown operations	SDMA, DDMA, Mining Dept., Police	Nov
Warnings, information, data	✓ Set up local-level mining alert systems through community participation. ✓ Use drone and satellite surveillance data for quick alerts	SDMA, Mining Dept., Forest Dept., PRIs	Dec–Mar
Non-structural measures	✓ Enforce mining and forest protection regulations strictly ✓ Use technology to track illegal movements of minerals	SDMA, Mining Dept., Forest Dept., Police	Regular
THEME: INVESTING IN DRR-STRUCTURAL MEASURES			
Control infrastructure and monitoring check posts	✓ Develop and reinforce physical barriers and check posts in vulnerable areas ✓ Install CCTVs and surveillance in high-risk mining zones	SDMA, DDMA, Mining Dept., Forest Dept., Revenue Dept., PRIs	Feb
THEME: INVESTING IN DRR-NON-STRUCTURAL MEASURE			
Compliance & monitoring institutional arrangements	✓ Strengthen mining policy enforcement at district level ✓ Regular safety audits in licensed mining areas ✓ Create buffer zones around sensitive ecosystems	SDMA, DDMA, Mining Dept., Forest Dept., Revenue Dept., PRIs	Regular
Public-Private Partnerships (PPP)	✓ Encourage CSR investment in local ecosystem restoration ✓ Promote responsible mining certification schemes	SDMA, Mining Dept., Industry Associations, PRIs	Regular
THEME: CAPACITY DEVELOPMENT			
Training	✓ Train officials, police, and forest guards on identifying and managing illegal mining operations ✓ Conduct training for community volunteers	SDMA, DDMA, Mining Dept., Forest Dept., Police, PRIs	Nov–Feb

THEME: UNDERSTANDING RISK			
TASK	RESPONSIBILITY	AGENCY/ DEPARTMENT	TIMELINE
Curriculum development	✓ Include sustainable mining and environmental conservation in school curricula	Education Dept., Mining Dept., SDMA	Regular
Awareness generation & mock drills	✓ Conduct mass awareness campaigns about the ecological and legal impacts of illegal mining. ✓ Mock drills for response to landslides, floods caused by illegal mining	SDMA, DDMA, Mining Dept., Forest Dept., PRIs	Feb–Mar
Empowering women, marginalized & vulnerable groups	✓ Ensure participation in village surveillance groups ✓ Livelihood support to those vulnerable to participating in illegal mining due to economic need	SDMA, PRIs, Rural Development Dept.	Regular
Community-based disaster management	✓ Train local communities, SHGs, and youth to monitor and report illegal mining ✓ Use community radio and local champions for awareness	SDMA, DDMA, Mining Dept., PRIs, ULBs	Feb–Mar
THEME: CLIMATE CHANGE RISK MANAGEMENT			
Research on climate change impacts on mining areas	✓ Conduct studies to assess the cumulative impact of climate change and illegal mining on soil erosion, hydrology, slope instability, and biodiversity. ✓ Analyse the linkage between increased flash floods, landslides, and mining-induced environmental degradation.	SDMA, SDMC, Forest, Geology & Mining, Irrigation Dept., DMMC, Remote Sensing Centre, Academic Institutions	Apr–Sep
Hazard risk vulnerability and capacity assessment (HRVCA)	✓ Include illegal mining–related hazards in state and district HRVCA frameworks. ✓ Map critical eco-sensitive and mining-prone zones vulnerable to extreme weather and anthropogenic exploitation. ✓ Assess capacity of local institutions to monitor and respond to illegal mining.	SDMA, DDMA, Forest Dept., Mining Dept., Panchayats, ULBs, DMMC	Aug–Nov
Climate change adaptation strategies	✓ Develop site-specific adaptation strategies in mining-affected areas (e.g., reforestation, water catchment treatment, slope stabilization). ✓ Encourage adoption of eco-restoration models for mined areas to build long-term climate resilience. ✓ Promote community-based climate adaptation initiatives linked to sustainable livelihoods.	SDMA, Environment Dept., Forest Dept., Mining Dept., DMMC, Panchayats, NGOs	Oct–Mar

Chapter 9

"By failing to prepare, you are preparing to fail."

“Benjamin Franklin”

9. Disaster Preparedness

9.1. Preparedness Measures and Strategies

Disaster preparedness is a crucial risk management aspect involving proactive planning, capacity building, and efficient resource allocation. The effectiveness of disaster response depends on how well preparedness measures are implemented at various levels—state, district, and community. The primary goal of preparedness is to equip decision-makers with essential tools, personnel, and equipment to respond effectively to emergencies. Establishing a State Disaster Resource Network (SDRN) is vital to systematically collect, compile, and update resource information. This network should integrate Geographic Information System (GIS)-based tools to ensure quick access and deployment.

Key Responsibilities:

- Identifying agencies responsible for resource collection, compilation, and maintenance.
- Developing a GIS-based system to map and track resources across regions.
- Regularly updating the database to ensure reliability during emergencies.
- Establishing an emergency procurement framework for rapid resource allocation.
- Encouraging public-private partnerships for resource sharing.

9.1.1. Resource Management Strategies for Disaster Preparedness and Response

Table 26: Resource Management Strategies for Disaster Preparedness and Response

Strategies	Task	Responsibility
Resource mapping	Identifying available human, financial, and equipment resources at all administrative levels	Revenue Department, Fire and Emergency Services, SDRF, Police, Civil Defence, Health, Agriculture, NGOs, District Administration, Others
Gap analysis	Assessing deficiencies in resource availability and procuring necessary items	Municipal Corporation, Relief Commissioner, District Administration
Procurement process	Developing streamlined procurement strategies for emergency situations	State, District, Tehsil, and Village-level authorities
Infrastructure development	Strengthening supply chains, storage, and distribution networks	Public Works Department, Transport Department, Health Department

9.1.2. Community-based Disaster Management (CBDRM)

Disasters often strike without warning the affected communities are the first and most immediate responders. Community-Based Disaster Risk Management (CBDRM) is a proactive approach that empowers local populations to effectively prepare for, respond to, and recover from disasters. Given their first-hand knowledge of the local terrain, hazards, and vulnerabilities, communities play a pivotal role in reducing disaster risks and mitigating impacts.

To ensure a well-coordinated and efficient response, every village should develop a Village Contingency Plan (VCP) tailored to its specific risks and available resources. A VCP serves as a structured framework for disaster preparedness, outlining key actions for early warning, emergency response, evacuation, and recovery. This plan must be community-driven and

participatory, involving all stakeholders—village leaders, women, youth groups, and professionals such as doctors, engineers, and teachers. By leveraging local knowledge and resources, a VCP enhances the ability of the community to act swiftly and effectively when a disaster strikes.

The development of a VCP should follow a systematic approach to ensure comprehensive risk management. This includes:

Table 27: Steps for Developing a Village Contingency Plan

Steps in developing a village contingency plan	Description
Review past hazard events	Analysing past disasters to understand risks
Situational analysis	Identifying vulnerabilities and resource gaps
Hazard, risk & vulnerability mapping	Mapping risk-prone areas and planning mitigation strategies
Opportunity mapping	Identifying community resources and strengths
Capacity building & training	Training community members in disaster response
Implementation & regular updates	Conducting periodic revisions and practice drills

Each **village should establish task force groups** (5-10 trained volunteers), including youth, women, and professionals such as doctors and engineers. These groups should be equipped with emergency supplies, radios, and early warning tools.

9.1.3. Training, Awareness, and Capacity Building

(a) Training Programs

Effective disaster preparedness and response require well-structured training programs that equip community members with the necessary knowledge and skills to act swiftly and efficiently during emergencies. Since different stakeholders play distinct roles in disaster response, training programs must be customized to address their specific responsibilities and capacities. A multi-tiered approach ensures that training is inclusive, practical, and aligned with the local context.

Table 28: Capacity Building and Training Components

Training component	Stakeholders to be trained	Trainers/resource personnel
First aid & medical response	Health workers, NGOs, community volunteers	Red Cross, Health Department
Evacuation drills	Schools, offices, local communities	Civil Defence, Fire Brigade
Emergency coordination	District officials, law enforcement, disaster response	District Administration, Home Department

(b) Public Awareness Campaigns

Public awareness is a crucial component of disaster risk reduction (DRR), as it ensures that individuals, families, and communities are well-informed about potential hazards and know how to respond effectively. By promoting disaster readiness at all levels, awareness campaigns help build a culture of preparedness, resilience, and proactive risk management. These campaigns must be multi-faceted, inclusive, and continuous, engaging diverse populations through accessible and impactful communication strategies.

Table 29:Public Awareness and Community Preparedness Strategies

Strategy	Task	Responsibility
Information dissemination	Spreading disaster preparedness messages via TV, radio, newspapers, and social media	Information Department, Media, PR Agencies
Community engagement	Conducting workshops, street plays, exhibitions, and mock drills	NGOs, Schools, Disaster Management Committees
Public education	Educating citizens on emergency response, evacuation routes, and relief measures	Education Department, Local Bodies

Capacity Enhancement Initiatives

Capacity enhancement is a cornerstone of institutional disaster preparedness, aimed at improving the efficiency and responsiveness of all stakeholders involved in disaster risk management. Strengthening capacities through training, drills, and community engagement ensures that response mechanisms are tested, refined, and effectively implemented during emergencies. This includes regular mock exercises to evaluate coordination among response agencies, structured training programs to develop essential skills such as first aid, search and rescue, and risk assessment, and active involvement of local communities to foster a culture of preparedness and resilience. These initiatives, when executed collaboratively by relevant government departments, local bodies, and civil society, significantly contribute to reducing disaster risk and enhancing adaptive capabilities at all levels.

Table 30:Capacity Building and Community Participation Strategies

Strategy	Task	Responsibility
Mock drills & exercises	Conducting periodic drills to test response mechanisms	Civil Defence, Police, Fire Brigade
Training programs	Enhancing skills in first aid, search & rescue, and risk assessment	Health Department, NGOs, Disaster Management Authorities
Community involvement	Encouraging citizen participation in disaster risk reduction	Local Governments, PRIs, Volunteer Groups

9.2. Techno-legal Regime

A Techno-Legal Regime refers to the integration of technical regulations, risk-informed policies, and legal frameworks to mitigate disaster risks. It ensures that preparedness efforts are systematic, enforceable, and legally binding rather than being voluntary or ad-hoc. To strengthen preparedness, a robust legal framework should be in place.

Table 31:Institutional and Financial Strategies for Disaster Management

Strategy	Task	Responsibility
Legislation & policy development	Operationalizing the State Disaster Management Authority	Revenue & DM Dept., Relief Commissioner
Regulatory compliance	Enforcing building codes, land-use regulations, and fire safety norms	Municipal Bodies, Urban Development Authority
Disaster risk financing	Establishing emergency funds for rapid response and recovery	Finance Department, State Treasury

9.3. Medical Preparedness

Disasters often lead to mass casualties, overwhelming healthcare infrastructure, and medical response systems. A robust medical preparedness strategy ensures timely, efficient, and coordinated healthcare services during and after disasters. Medical preparedness involves pre-planning, capacity building, resource mobilization, and training to reduce disaster-related mortality and morbidity. Under the State Disaster Management Plan (SDMP), medical preparedness is a key pillar of disaster risk reduction (DRR) and response planning, ensuring that healthcare services remain accessible, functional, and effective during emergencies.

9.4. Knowledge Management and Information Sharing

Effective knowledge management and information sharing are critical components of disaster risk reduction, enabling timely decision-making, coordinated response efforts, and capacity building at all levels. A well-structured strategy ensures that disaster-related information is collected, analyzed, stored, and disseminated efficiently to all stakeholders, including government agencies, emergency responders, researchers, and local communities. The State Disaster Management Plan (SDMP) emphasizes the need for a robust information management system to enhance disaster preparedness and response capabilities.

Table 32: Disaster Information and Data Management Strategies

Strategy	Task	Responsibility
Data collection & risk assessment	Documenting disaster histories and vulnerabilities	SDMA, District Administration, ULMMC
Capacity building	Training officials in emergency communication & information management	ICT Departments, NGOs, Universities
Data security	Establishing cloud-based storage for critical disaster records	IT Department, State Archives

9.5. Data Security and Disaster Information Systems

A secure and well-maintained disaster information system is crucial for efficient response and recovery efforts. Data security measures ensure that disaster-related information remains protected, accessible, and up to date

Key Components:

- **Cloud-Based Storage:** Secure online repositories for disaster data.
- **Cybersecurity Measures:** Protecting sensitive disaster response information from cyber threats.
- **Inter-Agency Data Sharing:** Ensuring seamless access to critical data among disaster management agencies.
- **Public Access Protocols:** Providing communities with timely and accurate disaster-related information.

9.6. Emergency Communication Systems

Effective communication is a cornerstone of disaster response. A well-integrated emergency

communication system ensures timely stakeholder coordination and swift dissemination of critical alerts. **Key Elements:**

- **Early Warning Systems:** SMS alerts, sirens, and community radio networks.
- **Multi-Channel Communication:** Integration of television, social media, and wireless networks.
- **Backup Communication Plans:** Satellite phones and ham radio networks for redundancy.
- **Real-Time Reporting Mechanisms:** Mobile applications for instant data collection and reporting.

9.7. Shelter Management and Evacuation Planning

Effective shelter management and evacuation planning are critical components of disaster preparedness under the State Disaster Management Plan (SDMP). In Uttarakhand, where the terrain and climate pose unique challenges, pre-identified evacuation routes, temporary shelters, and relief centers must be strategically located to ensure accessibility and safety. In coordination with district and local authorities, the Uttarakhand State Disaster Management Authority (USDMA) must develop comprehensive evacuation plans, incorporating hazard mapping, early warning systems, and community-based response mechanisms. Shelters should be equipped with adequate resources, including food, water, medical aid, sanitation, and provisions for vulnerable groups such as children, the elderly, and persons with disabilities. Periodic mock drills, capacity-building programs, and awareness campaigns must be conducted to familiarize communities with evacuation protocols and shelter management procedures. A well-coordinated approach, leveraging technology, local knowledge, and inter-agency collaboration, is essential for ensuring an efficient and safe evacuation process during disasters.

Table 33:Relief Shelter Management Strategies

Strategy	Task	Responsibility
Identification & maintenance	Setting up shelters in safe locations	District Administration, Revenue Department, U-Prepare, Rural
Provisioning of essentials	Ensuring food, water, medical aid in shelters	Food & Civil Supplies, Health Department, U-Prepare, Rural
Personnel deployment	Assigning trained staff for shelter management	PRIs, NGOs, Block Dev

9.8. School Safety and Education Continuity Planning

Ensuring school safety and education continuity is a crucial aspect of disaster preparedness under the State Disaster Management Plan (SDMP). Given Uttarakhand’s vulnerability to earthquakes, landslides, and floods, schools must have well-defined disaster preparedness and response plans to protect students, teachers, and staff. In collaboration with the education department, the Uttarakhand State Disaster Management Authority (USDMA) should implement structural and non-structural mitigation measures, including retrofitting school buildings, securing furniture, and establishing emergency evacuation routes. Schools must conduct regular disaster drills, first aid training, and capacity-building programs to enhance preparedness among students and staff. Additionally, education continuity planning should ensure minimal disruption to learning through measures such as temporary learning spaces, digital education alternatives, and psychosocial support for affected children. Integrating disaster risk reduction (DRR) education into school curricula will further strengthen resilience, fostering a culture of preparedness and safety among

students and communities.

Table 34: School Disaster Preparedness Strategies

Strategy	Task	Responsibility
Mock drills & training	Conducting bi-annual disaster drills	Education Board, School Authorities
Disaster preparedness plan	Forming School Disaster Management Committees (SDMCs)	School Principals, Teachers
Emergency evacuation plans	Ensuring safe exits and assembly areas	Local Administration, Education Department

9.9. Food Security and Nutritional Support

Ensuring food security and nutritional support is vital to disaster preparedness under the State Disaster Management Plan (SDMP). In Uttarakhand, disasters such as landslides, floods, and extreme weather events can disrupt food supply chains, leading to shortages and malnutrition, particularly among vulnerable populations. The Uttarakhand State Disaster Management Authority (USDMA), in coordination with the Food and Civil Supplies Department, must establish contingency plans to maintain food availability, accessibility, and affordability during emergencies. This includes pre-positioning buffer stocks of essential commodities, developing alternative supply routes, and strengthening Public Distribution System (PDS) resilience. Nutritional support programs should prioritize at-risk groups, including children, pregnant and lactating women, and the elderly, through fortified foods, supplementary nutrition, and community kitchens. Emergency response mechanisms must integrate food safety standards, local procurement strategies, and coordination with NGOs to ensure timely and adequate distribution. Promoting climate-resilient agriculture and local food production will also enhance long-term food security, reduce dependency on external supplies, and strengthen community resilience to disasters.

Table 35: Food Security and Nutrition Strategies

Strategy	Task	Responsibility
Stockpiling & distribution	Maintaining buffer stocks of essential commodities	Food & Civil Supplies, Agriculture Department
Infant & maternal nutrition	Ensuring food security for vulnerable groups	Social Welfare, Health Department

9.10. Livestock and Animal Welfare in Disaster Contexts

Livestock and animal welfare are critical considerations in disaster preparedness under the State Disaster Management Plan (SDMP), particularly in Uttarakhand, where a significant portion of the population depends on agriculture and animal husbandry for livelihood. Disasters such as floods, landslides, and extreme weather events can lead to displacement, injury, or loss of livestock, severely impacting rural economies. The Uttarakhand State Disaster Management Authority (USDMA), in collaboration with the Animal Husbandry Department, must develop livestock evacuation plans, emergency shelters, and fodder banks to ensure the safety and well-being of animals during disasters. Veterinary care facilities should be strengthened to provide emergency treatment, vaccination, and disease control measures to prevent outbreaks in the aftermath of disasters. Additionally, community awareness programs, training for farmers on animal emergency preparedness, and the integration of livestock management into district disaster response plans will enhance resilience. Promoting disaster-resilient animal shelters, insurance

coverage for livestock, and sustainable pasture management are essential strategies to protect livelihoods and ensure the welfare of animals in disaster-prone regions.

Table 36: Livestock and Animal Care Strategies

Strategy	Task	Responsibility
Livestock shelters	Establishing emergency cattle camps	Animal Husbandry, PRIs
Medical support	Providing veterinary care for disaster-affected animals	Veterinary Hospitals, NGOs
Carcass disposal	Mobilizing trained teams for safe disposal	District Administration, Municipal Bodies

9.11. Emergency Operations Centre (EOC) Preparedness

The Emergency Operations Center (EOC) plays a pivotal role in disaster preparedness, response, and coordination under the State Disaster Management Plan (SDMP). In Uttarakhand, where disasters such as earthquakes, landslides, and flash floods pose significant risks, a well-equipped and efficiently functioning EOC is essential for effective decision-making and resource mobilization. The Uttarakhand State Disaster Management Authority (USDMA) must ensure that state and district EOCs are operational 24/7 and equipped with modern communication systems, GIS-based decision support tools, and real-time data monitoring for early warning dissemination and emergency coordination. Standard Operating Procedures (SOPs) should be in place to guide the functioning of EOCs, ensuring seamless inter-agency coordination among government departments, emergency responders, and humanitarian agencies. Regular capacity-building programs, simulation exercises, and technological upgrades are necessary to enhance the efficiency of EOCs. Additionally, establishing backup EOCs and alternative communication networks will ensure operational continuity in case of infrastructure damage during disasters. Strengthening EOC preparedness will significantly improve disaster response capabilities, minimizing loss of life and property in Uttarakhand.

Table 37: Emergency Operations and Coordination Strategies

Strategy	Task	Responsibility
Coordination & communication	Maintaining inter-agency collaboration for emergency response	Home Dept., Police, Fire Services
Infrastructure & logistics	Setting up control rooms and command centres	SDMA, Public Works Department
Technology integration	Implementing GIS-based risk analysis & early warning systems	IT Department, Meteorological Department

9.12. Roles and Responsibilities of Key Stakeholders

A well-defined framework for the roles and responsibilities of key stakeholders is essential for effective disaster preparedness, response, and recovery under the State Disaster Management Plan (SDMP). Explicit coordination among government departments, local authorities, civil society organizations, and communities is crucial in Uttarakhand, where diverse hazards necessitate a multi-agency approach. The Uttarakhand State Disaster Management Authority (USDMA) is the nodal agency responsible for overall planning, policy formulation, and capacity building. District Disaster Management Authorities (DDMAs) oversee local-level preparedness, response, and relief efforts. Line departments, such as health, public works, and rural development, must integrate

disaster risk reduction (DRR) measures into their sectoral plans. Emergency responders, including the State Disaster Response Force (SDRF), National Disaster Response Force (NDRF), police, and fire services, play a crucial role in search, rescue, and evacuation operations. Non-Governmental Organizations (NGOs), community-based organizations (CBOs), and private sector partners contribute through resource mobilization, awareness campaigns, and logistical support. Additionally, local communities and Panchayati Raj Institutions (PRIs) are at the frontline of disaster response, requiring continuous training and engagement in preparedness activities. A well-synchronized mechanism, supported by inter-agency coordination, capacity building, and real-time information sharing, is essential for an effective disaster management system in Uttarakhand.

Key Stakeholders & Responsibilities:

- **Government Bodies:** Policy formulation, resource allocation, and emergency coordination.
- **Local Authorities:** Implementing response strategies at the grassroots level.
- **NGOs & Civil Society Organizations:** Community engagement, relief distribution, and capacity building.
- **Private Sector:** Providing logistics, financial support, and expertise in risk management.
- **International Agencies:** Technical and financial assistance for disaster resilience.

Chapter 10

"Preparedness, when properly pursued, is a way of life, not a sudden, spectacular program."

“Spencer W. Kimball”

10. Disaster Response Mechanism

Disaster response focuses on minimizing the impact of hazards on human life, property, and the environment. It involves rapid decision-making under stressful conditions, activating emergency support systems, and coordinating various agencies for an effective response.

10.1. Institutional Arrangements

The institutional framework for disaster response includes various entities responsible for coordination and execution at state, district, and local levels.

Table 38: Roles and Responsibilities of Disaster Management Institutions

Institution	Roles and Responsibilities
State Disaster Management Authority (SDMA)	Conducts situation analysis, preliminary impact assessment, and estimates external assistance needs.
State Executive Committee (SEC)	Allocates responsibilities, reviews coordination, mobilizes resources, and requests external aid, including National Disaster Response Force (NDRF) and Armed Forces.
State Emergency Operations Centre (EOC)	Monitors disaster response, ensures inter-agency coordination, and manages resource mobilization.
District Disaster Management Authority (DDMA)	Plans and coordinates disaster response at the district level.
District Emergency Operations Centre (EOC)	Implements response measures, liaises with State EOC, and directs local emergency response teams.
Tehsil/Block Disaster Management Committee	Facilitates disaster response at the block level under district-level guidance.
Village/Gram Panchayat Disaster Management Committee	Ensures local response efforts are aligned with district and block-level directives.

10.2. Incident Response System (IRS)

In line with Section 6 of the Disaster Management Act, 2005 and the guidelines of the National Disaster Management Authority, Uttarakhand has adopted the Incident Response System (IRS) to strengthen and streamline disaster response across the state. The goal is to minimize loss of life and property through a standardized, efficient, and coordinated approach

Table 39: State-Level Incident Response System

S.No.	IRS position	Designation of Officers	Roles / Responsibilities
Command Staff			
1.	Responsible Officer (RO)	Chief Secretary/ ACS Government of Uttarakhand	1. Overall, In charge 2. Issue Standing Orders in advance to different departments and agencies for mobilization of resources in times of emergency 3. Activate Incident Response Team (IRT) at State Headquarters when the need arises 4. Coordinate with the Central Government for mobilization of Armed Forces, Air Support, etc., as and when required
2.	Incident Commander (IC)	Principal Secretary/ Secretary Disaster Management	1. Establish immediate priorities, including search & rescue and relief distribution strategies 2. Brief higher authorities and request for additional resources, if required 3. Establish appropriate Incident Response System (IRS) organizations based on the span of control and scale of the incident 4. Establish an Incident Command Post (ICP) at a suitable place and designate concerned officers 5. Ensure that the Incident Action Plan (IAP) is prepared 6. Approve and authorize the implementation of IAP 7. Ensure that planning meetings with section heads are held at regular intervals 8. Authorise release of information to the media 9. I recommend demobilizing the Incident Response Team (IRT) when appropriate.
3.	Deputy Incident Commander (DIC)	ACEO (Operations), USDMA & USDMA Experts	1. Will carry out any assignment given by the Incident Commander 2. Shall officiate as the Incident Commander in the absence of the permanent incumbent
4.	Information & Media officer (IMO)	Secretary Information supported by IEC Expert, USDMA	1. Prepare and release information about the incident to the media agencies and others with the approval of the Incident Commander (IC) 2. Jot down decisions taken and directions issued in case of sudden disasters when the IRT has not been fully activated and hand it over to the Planning Section (PS) on its activation for incorporation in the IAP 3. Monitor and review various media reports regarding the incident that may be useful for Incident Planning 4. Disseminate necessary information to all concerned
5.	Safety Officer (SO)	IG (Fire)	1. Recommend measures for assuring the safety of responders and hazardous, unsafe situations and review regularly. 2. Review the IAP for safety implications. 3. Review and approve the Site Safety Plan, as and when required. 4. Conduct Hazard Specific Mock drills regularly for capacity building
6.	Liaison Officer (LO)	JCEO, USDMA supported by IRS Expert, USDMA	1. Maintain a list of concerned line department agencies (NGOs, etc.) and their representatives at various locations. 2. Carry out liaison with all concerned agencies, including NDRF and Armed Forces and line department of State Government. 3. Keep the IC informed about the arrivals of all the Government and Non-Government agencies and their resources. 4. Help in organizing briefing sessions of all Government and Non-Government agencies with the Incident Commander. 5. Maintain record of various activities performed by each authority/agency

S.No.	IRS position	Designation of Officers	Roles / Responsibilities
7	Nodal Officer, Air Operation (NO)	Additional CEO, Uttarakhand Civil Authority Development (UCADA) and Chief Engineer, Civil Aviation	1. Coordinate with concerned authorities for air operations. 2. Project the type of Air support required to the appropriate authorities based on the IAP and place the demand at least 24 hours in advance or as early as possible. 3. Inform the IC and OSC about the Air movements and landing schedules in their respective areas. 4. Ensure that relevant Maps of the incident locations are available with all agencies involved in the Air Operations to give the correct coordinates, etc., of the locations where Air support is required. 5. Determine the suitability of Helipads or Helicases in coordination with the Air Force authorities and the State authorities. 6. Maintain communication with Air Traffic Control and the ground support staff regarding Air movements and other related activities. 7. Assist the IC and the LSC in the procurement of required ATF, etc. 8. Report on Air Operations activities to the RO. 9. Perform any other duties assigned by the RO and IC.
General staff			
8.	Operation Section Chief (OSC)	Principal Secretary/ Secretary. Home	1. Manage all field operations for the accomplishment of the incident objectives. Deploy, activate, expand, and supervise organizational elements. Maintenance of On Duty Officers list. 2. Brief the personnel in the Operation Section (OS) at the beginning of each operational period 3. Prepare Section Operational Plan by the IAP, if required 4. Consult the IC from time to time and keep him fully briefed 5. Determine the need for additional resources and place demands accordingly with the planning section chief and ensure their arrival 6. Ensure record of various activities performed by concerned authorities, units, and groups and maintain it.
	a. Staging Area Manager (SAM)	Secretary Home/ representatives of Chief Engineer PWD or Officer in the rank of superintending Engineer and Secretary, Food and Civil supplies or Senior Officer designated by Commissioner Food & Supplies	1. Establish the Staging Area (SA) with proper layout 2. Organize storage and despatch of resources received and dispatch them as per IAP 3. Report all receipts and despatches to the Operations Sections Chief and maintain their records 4. Establish check-in function as appropriate 5. Ensure that communications are established with the ICP and other required locations, e.g., different SAs, Incident Base, Camps, Relief Camps, etc. 6. Maintain and provide resource status to PS and LS 7. Demobilise Staging Area in consultation with IC
	b. Rescue & Response Branch Director (RRBD)	IG/ Commandant, SDRF	1. Work under the supervision of the OSC and is responsible for the implementation of IAP as per the assigned role 2. Attend planning meetings as required by the OSC. 3. Review Assignment Lists for Divisions or Groups under his Branch 4. Assign specific tasks to Division and Groups-in-Charge 5. Supervise Branch functions 6. Resolve conflicts reported by subordinates 7. Report to OSC regarding modifications required in the IAP, need for additional resources, availability of surplus resources when hazardous situations or significant events occur, etc. 8. Provide Single Resource, Strike Team, and Task Force support to various operational areas 9. Ensure that all team leaders maintain records of various activities relating to their field Operations and send them to OSC 10. Perform any other duties assigned by the OSC

S.No.	IRS position	Designation of Officers	Roles / Responsibilities
	c. Transport Branch (Road, Rail, Water & Air Unit) Director (TBD)	Secretary, Transport supported by Transport Commissioner and MD UKTC, Director, Airport Dehradun	1. Activate and manage different Operation Groups like Road, Rail, Water and Air 2. Coordinate with the Logistic Section (LS) for required resources and activate Groups of his Branch 3. On placement of resources/requisition, Coordinate with railways, road transport, waterways, and airport authorities for support as required 4. Ensure that the Organisational Assignment List is circulated among the Group-in-charge (s) and other responders of his branch 5. Provide ground support to the air operations and ensure appropriate security arrangements 6. Report to the Operation Section Chief and Incident Commander about the progress of the Transportation Branch 7. Prepare transportation plan as per the IAP, if required 8. Ensure the maintenance of the Status of hired resources, their full utilization, and timely release 9. Ensure that the record of various activities performed by different operational groups (Road, Rail, Water, and Air) are collected and sent to the Section concerned
9.	Planning Section Chief (PSC)	Additional Secretary, Disaster Management supported by Geologist USDMA	1. Coordinate with the activated Section Chiefs for planning and preparation of IAP in consultation with Incident Commander 2. Ensure that decisions taken and directions issued in case of sudden disasters when the PS has not been activated are obtained from the Information and Media Officer (Command Staff) and incorporated in the IAP 3. Ensure collection, evaluation, and dissemination of information about the incidents, including weather, environmental toxicity, availability of resources, etc., from concerned departments and other sources. The Joint Secretary (Home) must have a databank of available resources with their locations from where they can be mobilized 4. Ensure that the Incident Status Summary is filled and incorporated into the IAP 5. Ensure that the Organisational Assignment list (Divisional / Group) is circulated among the unit leaders and other responders of his Section 6. Plan to activate and deactivate IRS organizational positions as appropriate, in consultation with the Incident Commander and Operation Section Chief 7. Determine the need for any specialized resources for the incident management 8. Provide periodic projections on incident potential 9. Report to the Incident Commander any significant changes that take place in the incident status 10. Compile and display incident status summary at the Incident Command Post 11. Oversee preparation and implementation of Incident Mobilisation Plan 12. Maintain Duty Officers List for the day 13. Ensure that records of various activities performed by members of Units are collected and maintained in the Unit Log

S.No.	IRS position	Designation of Officers	Roles / Responsibilities
	a. Situation Unit Leader (SUL)	Additional Secretary, Disaster Management GoUK supported by Meteorologist USDMA	1. Collect, process, and organize all incident information. 2. Prepare periodic future projections of the development of the incident (along with maps if required) and keep the PSC and Incident Commander informed 3. Prepare situation and resource status reports and disseminate them as required 4. Provide authorized maps photographic services to responders, if required 5. Attend IAP Meeting with required information, data, documents Survey of India maps, etc. 6. record of various activities performed and send to the Section concerned
	b. Resource Unit Leader (RUL)	Joint/Deputy Secretary, Disaster Management, GoUK	1. Maintain and display the status of all assigned resources (Primary and Support) at the incident 2. Compile a complete inventory of all resources available 3. Ensure and establish a Check-in function at various incident locations 4. Update the Planning Section Chief (PSC) and Incident Commander about the status of resources received and dispatched from time to time 5. Coordinate with the various activated Branches, Divisions, and Groups of OS to check the status and utilization of allotted resources 6. Maintain a record of various activities performed and send it to the Section concerned
	c. Documentation Unit Leader (DUL)	Director Planning GoUK Supported by all subject Expert of USDMA	1. Ensure that all the required forms and stationery are procured and issued to all the activated sections, branches, divisions, groups and units 2. Compile all information and reports related to the incident 3. Review and scrutinize records and various IRS forms for accuracy and completeness 4. Inform appropriate units of errors or omissions in their documentation, if any, and ensure that errors and omissions are rectified 5. Store files properly for post-incident analysis 6. Maintain records of various activities performed and send them to the sections concerned
	d. Demobilization Unit Leader (DeUL)	Additional Secretary, Revenue, GoUK	1. Prepare Incident Demobilisation Plan 2. Identify surplus resources and prepare a tentative IDP in consultation with the PSC and give priority to the demobilization of surplus resources 3. Develop incident check-out functions for Sections, Branches, Divisions, and units in consultation with all Sections and send to the PS 4. Plan for logistics and transportation support for Incident Demobilisation in consultation with LS 5. Disseminate Incident Demobilisation Plan-IDP at an appropriate time to various stakeholders involved 6. Brief the PSC on the progress of Demobilisation 7. Maintain record of various activities performed and send to Sections concerned
10.	Logistic Section Chief (LSC)	Secretary / Additional Secretary, PWD supported by Civil and Construction Expert, USDMA.	1. Provide logistic support to all Incident Response efforts, including establishing a Staging Area. Incident Base, Camp, Relief Camp, Helipad, etc. 2. Participate in the development and implementation of the IAP 3. Keep RO and IC informed on related financial issues 4. Ensure that the Organisational Assignment List (Divisional/Group) is circulated among the Branch Directors and other responders of his Section 5. Request for sanction of Imprest fund, if required 6. Brief Branch Director and Unit Leaders

S.No.	IRS position	Designation of Officers	Roles / Responsibilities
			7. Constantly review the Communication Plan, Medical Plan, and Traffic Plan to meet the changing requirements of the situation 8. Assess the requirement for additional resources and take steps for their procurement in consultation with the RO and IC 9. Maintain on Duty Officers List for the day 10. Ensure that records of various activities performed by members of branches and units are collected and maintained in the Unit Log
	a. Service Branch Director (SBD)	Secretary, Civil Food & Supplies	1. Work under the supervision of LSC and manage all required service support for incident management 2. Manage and supervise various Units of the Branch like Communication Unit, Medical Unit, Food Unit, and any other activated Unit 3. Discuss with activated Unit leaders for the materials and resources required and procure the same through LS 4. Ensure proper dispatch of personnel, teams, resources, etc., as per the IAP 5. Keep the LSC informed about the progress of the Service Branch from time to time 6. Maintain record of various activities performed and send to sections concerned
	i. Communication Unit Leader (CUL)	Director ITDA/ State Radio Officer, PHQ, System Expert, USDMA	1. Work under the direction of the SBD 2. Provide Communications facility as and when required 3. Ensure that all communications equipment available are in working condition and that the network is functional 4. Maintain the records of all communications equipment deployed in the field 5. Ensure the setting up of a message centre to receive and transmit radio, telephone, and other messages from various activated Sections, Branches, Units, and higher authorities and maintain their records 6. Prepare an alternative communication plan for execution in case of possible failure of the normal communications network 7. Prepare a plan for integration of the communications set up of the central teams 8. Maintain a record of various activities performed
	ii. Medical Unit Leader (MUL)	DG, Health and Director Animal Husbandry	1. Work under the direction of the SBD Prepare the medical plan and procure the required resources as per IAP. 2. Respond to requests of the OS for medical aid, transportation medical supplies, etc., under intimation to the SBD and LSC 3. Maintain the list of medical personnel who could be mobilized in times of need 4. Prepare and circulate a list of referral service centres to all the medical team leaders 5. Maintain a record of various activities performed and send to SBD.
	iii. Food Unit Leader (FUL)	Commissioner, Food & Civil Supplies	1. Work under the direction of the SBD 2. Supply food to personnel of IRT(s) at ICP, Camps, Incident Base, SA, etc. and Victims at the temporary shelters, relief camps, etc. 3. Determine food and drinking water requirements and their transportation, and brief the SBD and LSC 4. Maintain an inventory of receipt and dispatch of resources 5. Maintain record of various activities performed and send to SBD
	b. Support Branch Director (SuBD)	Additional Secretary Rajya Sampatti/RSA	1. Work under the supervision of LSC and supervise the function of the Resource Provisioning Unit, Facility Unit, and Ground Support Unit 2. Procure and dispatch required tactical materials and resources for operations with the concurrence of the Section Chief 3. Participate in the planning meeting of the LS

S.No.	IRS position	Designation of Officers	Roles / Responsibilities
			4. Ensure that the organization assignment list concerning the Branch is circulated to all Units under him 5. Keep the LSC informed about the progress of the work 6. Maintain a record of various activities performed and send it to the section concerned
	Resource Provisioning Unit Leader (RPUL)	Senior Management Officer, Rajya Sampatti Vibhag	1. Work under the supervision of Support BD 2. Organise movement of personnel, equipment, and supplies 3. Receive and store safely all supplies required for the incident response 4. Maintain the inventory of supplies and equipment 5. Maintain the records of receipt and dispatch of supplies, including equipment and personnel 6. organize repair and servicing of non-expandable supplies and equipment 7. Participate in the planning meeting of LS 8. Monitor the 'Kind,' 'type' and 'quantity' of supplies available and dispatched 9. Requisition additional human resource assistance, if needed 10. Maintain record of various activities performed and sent to Support BD
	Facilities Unit Leader (FaUL)	Engineer in Chief, PWD/GIS Expert USDMA	1. Prepare the layout and activation of incident facilities, e.g., Incident Base, Camp(s), Relief Camp(s), ICP, etc., and provide basic amenities to the responders 2. Report to the Sup. BD 3. Locate the different facilities as per the IAP 4. Participate in the planning meeting of the Section, prepare a list for each facility and its requirements in coordination with the LSC 5. Maintain a record of various activities performed as per IRS and send it to Sup. BD
	Ground Support Unit Leader (GSUL)	Additional Transport Commissioner /RTO & Additional Commissioner Food and Civil supplies	1. Work under the supervision of the Sup. BD 2. Provide transportation services for field operations to TBD 3. In case Air operations are activated, organize and provide required ground support through TBD 4. Provide maintenance and repair services for all the vehicles and related equipment used for incident management 5. Develop and implement the Incident Traffic Plan 6. Inform the Resource Unit about the availability and serviceability of all vehicles and equipment 7. Arrange for and activate fuelling requirements for all transport, including aircraft, in consultation with the Sup. BD 8. Maintain inventory of assigned, available, and off-road or out-of-service resources 9. Ensure safety measures within his jurisdiction 10. Maintain a record of various activities performed as per IRS and send it to Sup. BD

S.No.	IRS position	Designation of Officers	Roles / Responsibilities
	Finance Branch Director (FBD)	Additional Secretary, Finance Services	1. Work under the LSC 2. Attend planning meetings 3. Prepare a list of resources to be mobilized, procured, or hired by the IAP 4. Obtain orders of the competent Authority as per financial rules and take steps for their procurement without delay 5. Ensure that time records of hired equipment, personnel, and their services are accurately maintained as per Government norms for payment 6. Examine and scrutinize the cost involved in the entire response activity, including the demobilization, analyse the cost-effectiveness and keep the LSC informed 7. Ensure that all obligation documents initiated at the incident are adequately prepared, completed, verified, and signed by the appropriate Section Chief and BD 8. Brief the LSC or IC on all incident-related financial issues needing attention or follow-up 9. Maintain record of various activities performed as per IRS and send to Sections concerned
	i. Time, Procurement & Cost Unit Leader (TPCUL)	Director of Treasury & Finance Services	1. Maintain time recording of hired equipment and personnel and ensure that it is maintained daily and according to Government norms 2. Examine logs of all hired equipment and personnel concerning their optimal utilization 3. Attend to all financial matters about vendors and contracts 4. Review procurement needs in consultation with the FBD 5. Prepare a list of vendors from whom procurement can be done and follow proper procedures 6. Complete final processing of all bills arising out of the response management and send document for payment with the approval of the FBD, LSC, IC 7. Brief FBD on current problems with recommendations on outstanding issues and follow-up requirements 8. Develop incident cost summaries in consultation with the FBD based on the Cost Analysis Report 9. Make cost-saving recommendations to the FBD
	ii. Compensation/Claim Unit Leader (CCUL)	Secretary, Disaster Management & Rehabilitation	1. Collect all cost data and provide cost estimates 2. Prepare and maintain a list of requisitioned premises, services, resources, vehicles, etc., with the correct date and time of such requisition 3. Follow appropriate procedures for the preparation of claims and compensation 4. Maintain record of various activities performed as per IRS and send to FBD

10.3. State Emergency Operations Centre (SEOC) Management

The State Emergency Operations Centre (SEOC) serves as the central command and control facility responsible for managing and coordinating multi-agency response efforts during emergencies and disasters. It plays a pivotal role in facilitating communication, resource allocation, and decision-making across all relevant government departments, emergency services, and support agencies. The SEOC ensures a unified and effective response by integrating information from various sources, monitoring ongoing incidents, and issuing directives based on real-time assessments. Additionally, it oversees the implementation of contingency plans, supports logistics and resource mobilization, and maintains continuous liaison with District EOCs, national agencies, and other stakeholders. In both pre-disaster preparedness and post-disaster recovery phases, the SEOC functions as a strategic hub for operational coordination and leadership.

Objectives of SEOC

- Serve as the central hub for disaster response.
- Oversee large-scale emergencies requiring inter-agency coordination.
- Issue warnings, manage evacuations, and coordinate relief operations.
- Ensure transparent information dissemination.
- Maintain law and order.

Table 40: Functions of EOC

Function	Task
Coordination	Centralizes disaster response coordination across agencies.
Policy making	Establishes emergency policies, activation protocols and resource allocation frameworks.
Operations	Manages search & rescue, medical response, logistics, and relief distribution.
Information gathering	Collects real-time data on disaster impacts and response activities.
Public information	Disseminates official updates, warnings, and emergency guidance.
Visitor hosting	Manages visits from officials and media to prevent disruptions.

Table 41: EOC Activation Levels

LEVEL	NATURE OF OPERATION
L1	Routine monitoring by EOC staff.
L2	Increased vigilance and resource mobilization for potential threats.
L3	Partial activation with limited emergency staff deployment.
L4	Full-scale activation, involving all emergency services and agencies.

10.4. Alert Mechanisms- Early Warning

Upon receiving a warning or alert from a recognized authority or based on reports from the District Collector regarding the occurrence of a disaster, the State Government's response structure will be promptly activated. The Secretary (Revenue) will assume the role of Chief of Operations during the emergency. The competent agencies responsible for issuing warnings or alerts for various types of disasters include the Meteorological Department for extreme weather events such as cyclones and heavy rainfall, Seismic and Geological Agencies for earthquakes and landslides, Fire and Emergency Services for fire-related incidents, the National Disaster Management Authority (NDMA) for national-level alerts, and local authorities, including District Collectors, for localized hazards such as floods or chemical incidents. Once the alert is received, the Emergency Operations Centre (EOC) will coordinate the disaster response efforts, mobilize necessary resources and implement response strategies to mitigate the disaster's impact.

Table 42: Agencies involved in issuing the first alert

Disaster	NODAL AGENCIES
Earthquakes	IMD, GSI, IIT Roorkee
Floods	IMD, Irrigation Department
Landslide	ULMMC
Windstorms/ rains/cloudburst/ heat waves/cold waves	IMD
Avalanche	IMD, SASE
Drought	Agriculture Department
Epidemics	Health & Family Welfare Department
Industry, labour & employment department	Industrial & Chemical Accidents
Fire	Fire & Emergency Services

When a disaster occurs, the situation will be immediately communicated to key stakeholders, including the Governor, Chief Minister, Home Minister, State Cabinet, Guardian Minister of the affected district, and relevant MPs and MLAs from the affected area. The Prime Minister's Office (PMO), Cabinet Secretary, Secretary of Home and Defense, NDMA, Ministry of Home Affairs (MHA), and Command Officers will also be informed of the disaster.

In response, the EOCs (Emergency Operations Centers) and ERCs (Emergency Response Centers) will be placed on full alert and expanded to include specialized branches, each responsible for specific tasks, depending on the nature and scale of the disaster. The Chief of Operations, typically the Financial Commissioner (Revenue) and Relief Commissioner at the state level, along with the District Collectors or Deputy Commissioners at the district level, will determine the number and scope of branches to activate.

All relevant departments and nodal officers will operate under the overall supervision and administrative control of the Chief of Operations. Decisions made in the EOC will require approval from the Chief of Operations. To ensure effective coordination and quick action, immediate access to the disaster site will be established through various communication methods such as mobile phones, VSAT, wireless communication, and hotline contact.

The EOCs and ERCs will continue to operate as long as necessary to manage immediate relief efforts. Once short-term emergency operations are completed, the focus will shift to long-term rehabilitation, including housing, infrastructure, and social services reconstruction. The responsibility for these rehabilitation efforts will lie with the respective line departments, guided by a structured Rehabilitation and Reconstruction (R&R) Program.

10.4.1. Standard Operating Procedures (SOPs)

Standard Operating Procedures (SOPs) are predefined, actionable protocols designed to ensure a coordinated, timely, and effective response during emergencies. These procedures outline the specific roles, responsibilities, and actions to be undertaken by each department, agency, and stakeholder involved in disaster response. SOPs are activated immediately upon the occurrence or imminent threat of a disaster, enabling swift mobilization of resources, communication channels, and decision-making mechanisms. They serve as a crucial link between contingency planning and ground-level execution, ensuring that response efforts are consistent, efficient, and aligned with the Incident Response System (IRS) and the principles of the State Disaster Response Plan.

10.5. Search and Rescue (SAR) Operations

The District Administration primarily leads search and Rescue (SAR) operations in Uttarakhand to ensure prompt and coordinated response during disasters. These operations involve close collaboration with specialized response forces such as the State Disaster Response Force (SDRF) and the National Disaster Response Force (NDRF), along with support from the police, fire services, paramilitary forces, and trained community volunteers. Each agency contributes expertise, human resources, and equipment to locate, assist, and evacuate affected individuals from disaster-impacted areas. The collective effort ensures timely rescue, reduces casualties, and facilitates the safe transportation of victims to medical facilities or relief camps. SAR operations are guided by pre-established protocols under the Incident Response System to ensure efficiency, coordination, and accountability at every level.

Table 43: Disaster Response Components and Responsibilities

Component	Task	Responsibility
Rescue services	Extricate trapped victims, provide first aid, and recover the deceased.	SDRF, NDRF, Fire Brigade, Civil Defence
Evacuation	Move affected populations to safe locations.	District Administration, Police, NGOs
Emergency response	Fire control, hazardous materials management, and infrastructure protection.	Fire Services, SDRF, Police
Relief & aid	Provide medical aid, temporary shelters, and food supplies.	DDMA, Health Dept., Civil Society

10.6. Coordination with Armed Forces & Critical Infrastructure Restoration

In the aftermath of large-scale disasters that overwhelm the response capacity of civil administration, coordinated engagement with the Armed Forces becomes crucial. Their specialized capabilities, logistical strength, and rapid deployment make them vital partners in search and rescue, relief distribution, and evacuation operations. Simultaneously, the swift restoration of critical infrastructure—such as roads, electricity, telecommunications, and water supply—remains a top priority to resume essential services and enable effective response and recovery. Close coordination between the civil administration, armed forces, and infrastructure departments ensures timely interventions and minimizes disruptions to public life during emergencies.

- **Armed Forces Assistance:** Mobilized for large-scale disasters exceeding state capacity.
- **Essential Services Restoration:** Immediate focus on roads, electricity, communication, and water supply.

Table 44: Essential Service Restoration and Responsibilities

Service	Task	Responsibility
Road network	Restore road connectivity, clear debris.	PWD, Police, Fire Services
Electricity	Repair damaged power lines, establish temporary power supply.	Power Development Dept.
Water &	Supply drinking water, restore sanitation facilities.	Public Health Engineer Dept.

10.7. Public Health & Epidemic Control

Public Health and Epidemic Control efforts focus on preventing the outbreak and spread of diseases during and after disasters. The Health Department, in coordination with district authorities and support agencies, ensures the availability of medical services, sanitation, clean drinking water, and public awareness. Rapid response teams are deployed for disease surveillance, outbreak investigation, vaccination drives, and treatment of affected individuals. Special attention is given to vulnerable populations, including children, older people, and those with pre-existing conditions. Coordination with local hospitals, mobile medical units, and public health workers ensures timely and effective medical intervention to minimize health risks and contain the spread of epidemics.

Table 45: Medical and Public Health Response Components

Component	Task	Responsibility
First aid	Medical treatment, vaccination, disease surveillance.	Health Dept., NGOs
Ambulance services	Transport injured to hospitals.	Health Dept., Red Cross
Epidemic management	Monitor disease outbreaks, ensure hygiene measures.	Public Health Dept., NGOs

10.8. Food Supply & Nutrition

Food Supply and Nutrition services aim to ensure uninterrupted access to safe and adequate food during disasters. The District Administration, the Food and Civil Supplies Department, and supporting agencies coordinate the procurement, storage, and distribution of food grains and essential commodities. Special care is taken to meet the nutritional needs of vulnerable groups such as children, pregnant and lactating women, the elderly, and the sick. Relief camps are provided with balanced meals, and efforts are made to prevent food shortages, malnutrition, and related health issues through timely delivery and proper monitoring of food supplies.

Table 46: Relief Supply and Essential Services

Component	Task	Responsibility
Food security	Ensure stockpiling and equitable distribution of food.	Food & Civil Supplies Dept.
Water supply	Provide clean drinking water.	Revenue Dept., PRIs

10.9. Disaster-Specific Response Plans

Disaster-Specific Response Plans are tailored strategies developed to address the unique challenges posed by disasters such as floods, landslides, earthquakes, forest fires, and cloudbursts. These plans outline clear roles, responsibilities, and standard operating procedures for all stakeholders involved in response efforts. Developed at the state, district, and local levels, they ensure swift, coordinated, and practical action based on the nature and scale of the disaster. Regular updates, drills, and capacity-building programs are conducted to keep these plans practical, relevant, and ready for immediate implementation.

Table 47: Nodal Agencies for Disaster Management

Disaster type	Nodal agency	State department
Flood	Ministry of Water Resources	Irrigation Dept.
Earthquake	Ministry of Earth Sciences	Revenue Dept.
Industrial disasters	Ministry of Environment	Pollution Control Board
Epidemics	Ministry of Health	Health & Family Welfare

Chapter 11

" Recovery must not merely restore what was destroyed-it must build back better."
"Ban Ki-moon"

11. Recovery and Building Back Better

11.1. Scope and Vision for Recovery

Disaster recovery is a complex process that focuses on restoring and enhancing communities' livelihoods, health, infrastructure, economy, and environment while integrating disaster risk reduction (DRR) measures. The Build Back Better (BBB) approach ensures that recovery efforts do not merely restore pre-disaster conditions but also improve resilience against future hazards.

Recovery is guided by sustainable development principles and must align with national, regional, and local development plans. The process begins after the emergency phase, transitioning from immediate relief to long-term rehabilitation and reconstruction. Pre-disaster planning plays a crucial role in ensuring that recovery efforts are efficient, well-coordinated, and community driven.

The Sendai Framework for Disaster Risk Reduction (SFDRR) underscores the need for institutional mechanisms that facilitate effective and inclusive recovery, ensuring that disaster-affected communities are better prepared for future shocks.

Key Objectives of Disaster Recovery

- **Rebuilding livelihoods and economic stability** through sustainable employment and income-generating activities.
- **Enhancing community resilience** by incorporating DRR strategies in infrastructure, housing, and essential services.
- **Strengthening institutional frameworks** for recovery management at state, district, and local levels.
- **Ensuring participatory planning** by engaging communities, NGOs, and the private sector.
- **Addressing development deficits** exposed by the disaster to reduce future vulnerabilities.

11.2. Strategic Approach to Recovery and Reconstruction

The National Policy on Disaster Management (NPDM) 2009 provides guidelines for post-disaster reconstruction and recovery. The policy outlines principles to ensure inclusive, timely, and sustainable recovery.

Table 48: Principles of Disaster Recovery and Reconstruction

Principle	Description
Comprehensive & resilient recovery	Reconstruction should incorporate disaster-resilient designs, strengthening infrastructure, housing, and services.
Impact assessments	Recovery plans must consider economic, environmental, and social impacts before implementation.
Participatory planning	Governments, affected communities, NGOs, and private sector stakeholders must collaborate in recovery efforts.
Timely reconstruction	Essential services and temporary shelters should be restored within months, with full reconstruction completed within 2-3 years.
Pre-disaster preparedness	Disaster-prone areas should have pre-prepared recovery and reconstruction plans, including standardized designs for housing and infrastructure.
Livelihood restoration	Special focus should be given to women-headed households, farmers, artisans, and marginalized communities to ensure social stability.

11.3. Phased Recovery Process and Implementation

Post-disaster recovery is a complex and multi-dimensional process that extends beyond immediate relief to long-term reconstruction and resilience-building. A structured and phased approach ensures that recovery efforts are strategic, inclusive, and sustainable. The Post-Disaster Recovery Framework is organized into three key dimensions—**Physical, Economic, and Social Recovery**—each addressing critical aspects of restoration. Physical recovery focuses on rebuilding damaged infrastructure, housing, and public utilities economic recovery emphasizes the revival of livelihoods, local industries, and trade and social recovery prioritizes psychosocial support, education continuity, and the re-establishment of community networks. Together, these dimensions guide the implementation of comprehensive recovery plans that aim to restore normalcy while reducing future vulnerabilities.

Post-disaster recovery is structured into three major dimensions:

Table 49:Dimensions of Disaster Recovery

Dimension	Focus areas
Physical recovery	Rebuilding infrastructure, utilities, housing, and public services.
Economic recovery	Reviving livelihoods, industries, trade, and market services.
Social recovery	Addressing psychological well-being, education, and community cohesion.

Key Recovery Activities:

- Conducting comprehensive Post-Disaster Needs Assessments (PDNA).
- Restoring healthcare, education, transport, and water supply systems.
- Rebuilding and upgrading housing and public buildings.
- Ensuring environmentally safe disposal of debris.
- Implementing economic recovery programs, including financial support for small businesses and employment generation.

11.4. Post-Disaster Needs Assessment (PDNA)

The Post-Disaster Needs Assessment (PDNA) is a systematic and comprehensive methodology used to assess the full impact of a disaster across multiple sectors. It evaluates both the **quantitative damages and economic losses** as well as the qualitative **needs for recovery and reconstruction**, ensuring that post-disaster interventions are well-informed and prioritized. PDNA brings together stakeholders from government agencies, international partners, and local communities to jointly identify sector-wise recovery requirements, align them with development goals, and formulate strategies for resilient and inclusive rebuilding. By offering a unified framework, PDNA supports evidence-based decision-making and promotes efficient resource mobilization for long-term recovery.

Table 50:Post-Disaster Recovery Assessment Framework

Assessment type	Objective
Damage & loss assessment (DALA)	Quantifies physical destruction and economic loss.
Human recovery needs assessment (HRNA)	Evaluates social impacts, psychological recovery, and welfare needs.
Recovery framework	Develops financing strategies and outlines phased recovery activities.

The **PDNA** findings help decision-makers allocate resources efficiently, ensuring that recovery efforts align with community needs and long-term resilience goals.

11.5. Stages of Recovery: Early, Mid, and Long-Term

Recovery after a disaster is not a one-time intervention but a phased process that evolves over time to address the changing needs of affected communities. It unfolds in three distinct yet interconnected stages—**Early Recovery**, **Mid-Term Recovery**, and **Long-Term Recovery**—each with a specific focus and timeline. Early recovery, typically spanning the first six months, concentrates on restoring basic services, clearing debris, and providing emergency relief. Mid-term recovery, covering six months to two years, emphasizes the rebuilding of critical infrastructure, revival of livelihoods, and restoration of health and education services. Long-term recovery, extending over two to five years, focuses on sustainable development, disaster risk reduction, and strengthening institutional capacities. This phased approach ensures a smooth transition from relief to resilience, promoting comprehensive and inclusive recovery. Recovery progresses in **three phases**, each addressing specific needs:

Table 51: Stages of Post-Disaster Recovery

Stage	Focus areas
Early recovery (0-6 months)	Immediate restoration of basic services, debris clearance, and emergency relief.
Mid-term recovery (6 months - 2 years)	Rebuilding essential infrastructure, reviving livelihoods, and restoring education and healthcare.
Long-term recovery (2-5 years)	Sustainable redevelopment, risk reduction, and institutional strengthening.

Table 52: Institutional Arrangements for Recovery

Key component	DESCRIPTION
Governance & leadership	Establish structured recovery teams at state, district, and local levels.
Inter-agency coordination	Facilitate collaboration between government, NGOs, and international organizations.
Public-private partnerships (PPP)	Engage corporate sectors in financing and technical support.
Monitoring & evaluation (M&E)	Implement transparent tracking systems for fund utilization and impact assessment.

11.6. Reconstruction Planning and Implementation

Reconstruction Planning and Implementation focuses on restoring infrastructure, housing, and public services in disaster-affected areas while building back safer and more resilient communities. The State and District Administration coordinates this process with relevant departments, agencies, and stakeholders. Emphasis is placed on incorporating disaster-resilient designs, sustainable development practices, and community participation. The reconstruction phase also includes damage assessments, resource mobilization, and long-term planning to ensure that rebuilt structures are better equipped to withstand future disasters. Reconstruction aims to restore essential infrastructure and improve resilience against future disasters.

Table 53:Key Focus Areas in Reconstruction

COMPONENT	OBJECTIVE
Infrastructure	Rebuilding roads, power grids, communication, and water systems.
Housing	Providing disaster-resistant shelters for affected communities.
Economic rehabilitation	Supporting employment, trade, and financial stability.
Cultural heritage preservation	Restoring historical sites and community landmarks.

Table 54: Reconstruction Methods and Approaches

Method	Description
Owner-driven reconstruction (ODR)	Empower communities to rebuild homes with financial and technical assistance.
Public infrastructure restoration	Government-led rebuilding of essential public services and facilities.
Eco-friendly designs	Use of sustainable materials and energy-efficient technology.

Reconstruction involves approaches like Owner-Driven Reconstruction (ODR), where affected families rebuild with support Public Infrastructure Restoration led by government agencies and the use of Eco-Friendly Designs to ensure sustainability and resilience.

11.7. Coordinating Reconstruction Efforts

Coordinating Reconstruction Efforts involves collaborating with government departments, local authorities, technical experts, and community stakeholders to ensure efficient and timely recovery in disaster-affected areas. The aim is to align reconstruction activities with long-term development goals while prioritizing safety, sustainability, and resilience. Clear communication, proper resource allocation, and regular monitoring are key to avoiding duplication, addressing gaps, and ensuring that all efforts contribute to building back better. Effective coordination ensures timely and well-managed recovery efforts.

Table 55:Stakeholders in Disaster Reconstruction

Stakeholder	Role in reconstruction
State government	Leads damage assessments, mobilizes resources, and formulates policy.
Private sector	Provides financial and technical support for infrastructure rebuilding.
NGOs & international agencies	Conduct capacity-building programs and provide humanitarian aid.

11.8. Rehabilitation Strategies for Affected Communities

Rehabilitation Strategies for Affected Communities focus on restoring livelihoods, housing, and essential services while addressing disaster-impacted populations' social, emotional, and economic needs. These strategies are designed to support long-term recovery through skill development, employment generation, access to healthcare, education, and psychosocial support. Special attention is given to vulnerable groups, including women, children, the elderly, and

persons with disabilities. Community participation is central to the rehabilitation process, ensuring that recovery efforts are inclusive, need-based, and sustainable. Rehabilitation focuses on restoring long-term community well-being.

Table 56:Key Rehabilitation Sectors

Sector	Rehabilitation focus
Physical infrastructure	Restoring roads, utilities, and community centres.
Social welfare	Providing psychological support and education continuity.
Economic stability	Creating livelihood opportunities and vocational training.

11.9. Fund Mobilization

Fund Mobilization involves securing financial resources from various sources to support disaster response, recovery and reconstruction efforts. This includes allocations from state and central government funds, contributions from international agencies, corporate social responsibility (CSR) initiatives, and public donations. Efficient fund management ensures timely disbursement and optimal utilization for relief, rehabilitation, and rebuilding activities.

Table 57:Sources of Funding for Disaster Recovery

Funding source	Description
Government budget	National and state-level funding allocations.
Private investment	Corporate partnerships and insurance funds.
International aid	Loans, grants, and donor assistance.

Financial Oversight Measures:

- Conducting transparent damage and loss assessments.
- Implementing strict financial tracking systems.
- Encouraging corporate social responsibility (CSR) investments.

Chapter 12

"Disasters can wipe out years of development gains in an instant. That is why financial preparedness is as essential as physical preparedness."

“Jim Yong Kim”

12. Financial Arrangements

12.1. Background

XV Finance Commission has recommended the creation of funds for disaster mitigation along with disaster response, which will now together be called National Disaster Risk Management Fund (NDRMF) and State Disaster Risk Management Funds (SDRMF).

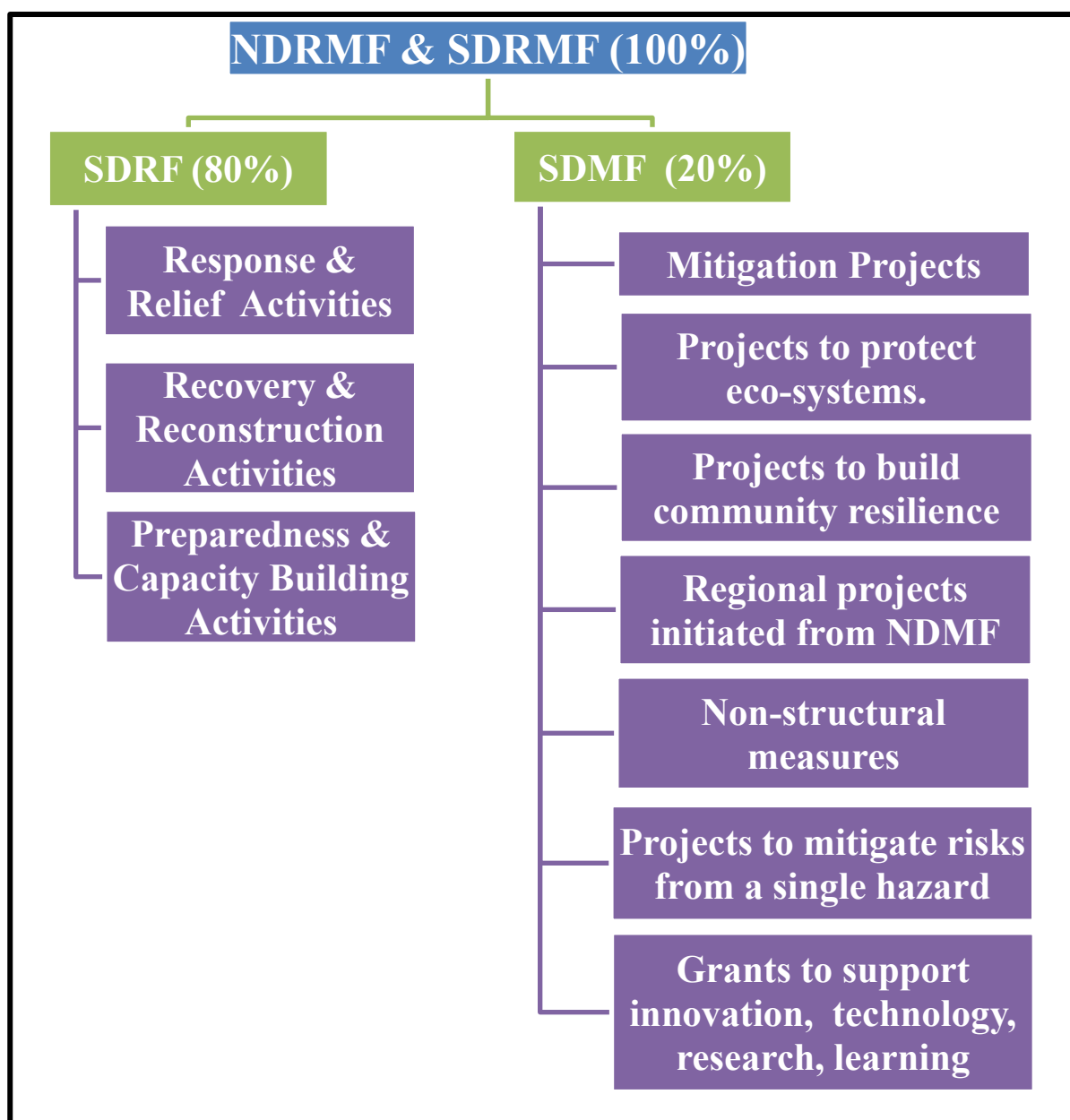


Figure 11: Broad Allocation of NDRMF and SDRMF Funds

To set up recovery, reconstruction, preparedness and capacity building facilities to address activities of immediate nature within SDRF/ NDRF have been subdivided into funding window by the 15th Finance Commission.

The Central Government contributes 75% of SDRF allocation for general category States. For Uttarakhand, which is a hill state, the Central Govt. contributes in the ratio of 90:10 (90% Centre's share and 10% State share) out of which

- The **SDRF** would receive **80 per cent** & **SDMF** would get **20 percent** of the allocation.

Within the SDRF allocation, there would be three sub-allocations. While the funding windows of SDRF and SDMF are not interchangeable, there could be flexibility for re-allocation within the three sub-windows of SDRF for that financial year. Distribution of total SDRF allocation among sub-window is given as under:

- Forty percent (40%)** of the annual allocation of **SDRMF** i.e. equal to **50% of SDRF** allocation for the year is kept for **Response and Relief** activities. These activities would be administered as per GOI approved items & norms.
- Thirty percent (30%)** of the annual allocation of **SDRMF** i.e. equal to **37.50% of SDRF** allocation for the year is kept for **Recovery and Reconstruction** activities. These activities would be administered as per GOI approved items & norms.
- Ten per cent (10%)** of the annual allocation of **SDRMF** i.e. equal to **12.50% of SDRF** allocation for the year is kept for **Preparedness and Capacity-building** activities. These activities would be administered as per GOI approved items & norms.

12.2. State Disaster Response Fund

- The State Disaster Response Fund (SDRF), constituted under Section 48 (1) (a) of the Disaster Management Act, 2005, is the primary fund available with State Governments for responses to notified disasters.
- The annual Central contribution is released in two equal instalments, as per the recommendation of the Finance Commission.
- SDRF shall only be used for meeting the expenditure of providing immediate relief to the victims.
- Disaster (s) covered under SDRF: Cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloudburst, pest attack, frost and cold waves.
- Local / State Specific Disaster: A State Government may use up to 10 percent of the funds available under the SDRF for providing immediate relief to the victims of natural disasters that they consider to be 'disasters' within the local context in the State, and which are not included in the notified list of disasters of the Ministry of Home Affairs, subject to the condition that the State Government has listed the State specific natural hazards, and notified clear and transparent norms and guidelines for such disasters with the approval of the State Authority, i.e., the State Executive Authority (SEC).
- There are certain state specific / local disasters which are notified by the Disaster Dept. of Uttarakhand.
- Man – animal conflict & Thunderstorms and Lightning

The State Disaster Response Fund shall only be used for meeting the expenditure of providing immediate relief to the victims of drought, earthquake, fire, flood, hailstorm, landslide, avalanche, cloud burst, pest attack, frost and cold wave. While the State can draw from the State Disaster Response Fund for emergency response and relief, there are provisions to adjust a portion of the expense against funds released from the National Disaster Response Fund, between the fiscal year in which National Disaster Response Fund is released and the expenses incurred by State in the previous fiscal year under State Disaster Response Fund. In case the same State faces another severe disaster during the same year, no reduction will be made while releasing assistance from the National Disaster Response Fund.

The State-specific disasters within the local context of the State, that are not included in the notified list of disasters, and are eligible for assistance from the State Disaster Response Fund, and National Disaster Response Fund, can be met from the State Disaster Response Fund within the 10 per cent limit of the annual fund's allocation of the State Disaster Response Fund. The two funds have provisions for the following:

- Gratuitous Relief
- Search and Rescue operations, as per actual cost incurred
- Relief measures
- Air dropping of essential supplies
- Emergency supply of drinking water
- Clearance of affected area, including management of debris
- Agriculture, Animal husbandry, fishery, Handicraft, artisans
- Repair/ Restoration (of immediate nature) of damaged Infrastructure
- Capacity development

The default period of assistance is as per norms prescribed. However, based on assessment of the ground situation, the SEC may extend it beyond the prescribed time limit, subject to the condition that expenditure on this account should not exceed 25 percent of the State Disaster Response Fund allocation for the year. The SEC will organize contributions from the relevant State Government, administer the State Disaster Response Fund and invest the accretions to the State Disaster Response Fund in accordance with the norms approved by the GOI from time to time. The State must meet the capacity development expenses from the State Disaster Response Fund and not the National Disaster Response Fund, subject to a limit of 10 percent of the State Disaster Response Fund.

Capacity Development

- Capacity development covers the following:
- Setting up / strengthening of Emergency Operation Centres (EOCs) in the State
- Training / Capacity Building of stakeholders and functionaries in the State
- Supporting disaster management centres in the State
- Preparation of Disaster Management Plans based on Hazards, Risks, and Vulnerability Analysis
- Strengthening of SDMA and DDMA

In most cases, the SEC and, if necessary, a central team will carry out need assessment. The State Government shall take utmost care and ensure that all individual beneficiary-oriented assistance is disbursed through the beneficiary's bank account. The scale of relief assistance for each item for all disasters, including 'local disaster', should not exceed the norms of the State Disaster Response Fund / National Disaster Response Fund.

- Any amount spent by the State for such disasters over and above the ceiling would be borne out of the resources of the State Government and not from the State Disaster Response Fund.
- For disasters needing central support, over and above the State Disaster Response Fund, the MHA processes the State Government's request for support from the Government of India. The Ministry of Finance will make the budgetary provisions for the relief funds required for strengthening response mechanisms, disaster management institutions, capacity development of stakeholders, and DRR.
- The effective implementation of these statutory provisions would place Uttarakhand on a firm footing for effectively managing disasters and minimizing their negative socio-economic consequences. Another important aspect of disaster management is financial resilience. This requires a systematic approach, combining an optimum mix of ex ante and ex post financing mechanisms based inter alia on the country's current economic status.

12.3. State Disaster Mitigation Fund

In view of the provision of the Disaster Management Act, 2005, and the recommendations of XV Finance Commission, Government of India framed Guidelines for the administration of the State Disaster Mitigation Fund-SDMF at the State level and issued the same on 14th January 2022.

In the light of the said guidelines, the Government of Uttarakhand took the necessary steps to set up the Appraisal committee under the chairmanship of the Secretary, Disaster Management for the approval of projects under the SDMF fund (06-04-2022). In order to implement the measures aimed at reducing the risk, impact or ill effects of a disaster or threatening disaster situation, the State Government shall utilize the State Disaster Mitigation Fund- SDMF established as per the Section 48 (1) of the Disaster Management Act, 2005. It will help the State in carrying out mitigation activities for reducing the impact of disasters.

12.3.1. Scope of State Disaster Mitigation Fund (SDMF)

SDMF will fund mitigation projects at the State level. It will support and fund the following types of Projects:

- All projects relating to mitigation measures:
 - a. For the notified disasters by the Government of India namely cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloud burst, pest attack and frost & cold wave; and
 - b. For the 'disasters' notified by the State Government within the local context in the State, which are to be completed within the geographical jurisdiction of the State, will be funded from the SDMF.
- The State Government may use up to 10% funds of the annual allocation of the SDMF for the purpose of mitigation projects with respect to disasters that they consider to be 'disasters' within the local context of the State, as notified under SDRF guidelines.
- Projects which are of State-level significance, protecting assets, eco-systems and settlements within the State.
- Projects that promote practices to reduce disaster risks and its impacts.
- Projects that build community resilience through information and knowledge.
- Projects that focus on creating safe living conditions for people from weaker socio-economic categories, people with disabilities, and women.
- Regional projects which are initiated from the National Disaster Mitigation Fund (NDMF).
- Research and studies related to disaster mitigation through the small grants window.
- In case of flood mitigation projects, States should undertake the following non-structural measures:
 - a. Adopting Integrated Flood Management approach by considering river basin as a hydrological unit.
 - b. Real Time Hydro-meteorological Data Acquisition Network coupled with Decision Support System for integrated or standalone operation of reservoir(s), as the case may be.
 - c. Delineation and demarcation of flood plain zones on certain notified stretch(es) of river(s) within the State and regulation of various activities permissible therein.

12.3.2. Limitation of State Disaster Mitigation Fund (SDMF)

- Each year, at least 10% of the SDMF should be earmarked for non-structural measures (Components of non-structural measures in projects consisting of both kinds of measures may be counted towards this limit).
- In a year, not more than 50% of SDMF may be utilized for measures / projects to mitigate risks from a single hazard. However, this stipulation may be relaxed by the Ministry of Home Affairs on the recommendations of the Sub Committee of the National Executive Committee (SC-NEC), based on the written request of the State with proper justification.
- In a year up to 5% of the SDMF, funds may be earmarked for small grants window to support small proposals related to innovation, technology, community leadership, research, studies and learning. The NDMA and the SDMA will devise a mechanism to fund projects from this window.
- Funds available under SDMF shall not be used for general environmental improvement or landscape beautification and for funding the existing Government programs /ongoing schemes etc.
- Mitigation Fund should generally not be used for maintenance and upkeep of any structure or engineering measure aimed at mitigation. This fund should be used for developing and implementing new projects. The mitigation measures that have been implemented, should be maintained through other sources of funding.
- Resources under Mitigation Fund cannot be used towards the establishment expenditure such as salaries, office expenditure etc. to be incurred by the Disaster Management Authorities or other entities, except for payment of remuneration to technical staff included in the project's costs. Such payments will be as per the GFR-2017 and extant Government of India guidelines.

12.4. Administrative Mechanism for processing SDMF proposal

- The SDMA consists of an Appraisal Committee headed by a Member of the SDMA, with members from the line Departments of the State Government and State entities for appraisal of the proposals/ projects under SDMF (State Disaster Mitigation Fund).
- The Departments / Agencies of the State Government/ DDMA, who wish to take up projects from SDMF, will submit the project proposals to the State Government Department dealing with the Disaster Management, which in turn will refer the project proposal to the Committee headed by the Member, SDMA for appraisal.
- The recommendations of the Appraisal Committee of SDMA shall be placed before the SEC for consideration / sanction.

12.5. State Executive Committee (SEC)

- SEC, constituted by the State Government as per provision of section 20 of the DM Act, 2005, will decide on matters connected with the administration of SDMF including obtaining contributions from the Central Government, investing the accretions to the SDMF in accordance with the prescribed norms and approving the mitigation project from SDMF.
- SEC shall ensure that the money drawn from SDMF is actually utilized for the purpose for which the SDMF has been set up.

12.6. The Uttarakhand State Disaster Financial Management Rules 2007

Provision of Disaster Management Fund in the Annual State Budget: Constitution of Fund

The State contributes such some of money as it thinks fit for the purpose of carrying out the activities and programs set in the Disaster Management Plan by the various Authorities under the Act. The Government, shall after due appropriation made by the Legislature of the State, by law in this behalf, make in its annual budget a provision relating to funds, under heads, such as:

- The State Disaster Response Fund
- The State Disaster Mitigation Fund
- The District Disaster Response Fund
- The District Disaster Mitigation Fund.

The State Executive Committee, the State Authority and District Authority may spend such as they think fit for performing their functions under the Act and all such sums shall be treated as expenditure payable out of respective fund Head. The authority thereof shall maintain all the expenditure in form as specified by the Government.

12.7. Form of Annual Report.

The State Authority shall during each financial year prepare an annual report with respect to the year last ended, giving a true and full account of its activities during the previous financial year, furnishing particulars as specified in “Form A” (Annexure-V), appended to the rules. The annual report shall be forwarded to the Government within three months from the end of the previous financial year and the Government shall cause every such report to be laid before the State Legislature.

12.8. Financing Prevention, Mitigation, and Preparedness

The provisions relating to funding of prevention, mitigation, and preparedness, as per DM Act 2005 are listed below:

- Section 18 (2) (f) provides that **SDMAs** may recommend provision of funds for mitigation and preparedness measures
- Section 38 (2) (d) provides that **the State Government** may allocate funds for measures, for prevention of disaster, mitigation, capacity -building and preparedness by the departments of the **Government** of the State in accordance with the provisions of the State Plan and the District Plans
- Section 39 (c) provides that the departments of the **State Government** shall allocate funds for prevention of disaster, mitigation, capacity- building and preparedness.

12.8.1. Allocation by Ministries & Departments

Section 49 (1) states that: every Ministry or Department of the Government of India shall make provisions, in its annual budget, for funds for the purpose of carrying out activities and programs set out in its disaster management plan.

The provisions of sub-section (1) shall, mutatis mutandis, apply to departments of the Government of the State.

12.8.2. Provisions in the Act for Disaster Risk Reduction

Some of the statutory provisions incorporated in the Disaster Management Act, 2005 for mainstreaming DRR and financing thereof are reproduced below.

- **Section 18(2g)** provides that the SDMA may review the development plans of the different departments of the State and ensure that prevention and mitigation measures are integrated therein
- **Section 22(2b)** provides that the SEC may examine the vulnerability of different parts of the State to different forms of disasters and specify measures to be taken for their prevention or mitigation
- **Section 23(4b)** provides that the State Plan shall include measures to be adopted for prevention and mitigation of disasters
- **Section 23(4c)** provides that the State Plan shall include the way the mitigation measures shall be integrated with the development plans and projects
- **Section 23(4d)** provides that the State Plan shall include capacity-building and preparedness measures to be taken
- **Section 30(2-iv)** provides that the guidelines for prevention of disasters, mitigation of its effects, preparedness and response measures, as laid down by the National Authority and the State Authority are followed by all departments of the Government, at the district level and by the local authorities in the district
- **Section 30(2-xiii)** provides that the District Authority may facilitate community training and awareness programs for prevention of disaster or mitigation with the support of local authorities, governmental and non-governmental organizations
- **Section 30(2-xiv)** provides that the District Authority may set up, maintain, review and upgrade the mechanism for early warnings and dissemination of proper information to public
- **Section 31(3b)** provides that the District Plan shall include the measures to be taken, for prevention and mitigation of disaster, by the Departments of the Government at the district level and the local authorities in the district
- **Section 32(a)** provides that every office at the district level shall prepare a Plan setting out:
 - ✓ provisions for prevention and mitigation measures as provided for in the District Plan and as is assigned to the department or relevant agency
 - ✓ provisions for taking measures relating to capacity-building and preparedness as laid down in the District Plan
 - ✓ the response plans and procedures, in the event of, any threatening disaster situation or disaster
- **Section 38(2e)** provides that the State Government may ensure integration of measures for prevention of disaster or mitigation by the departments of the Government of the State in their development plans and projects
- **Section 38(2f)** provides that the State Government may integrate in the State development plan, measures to reduce or mitigate the vulnerability of different parts of the State to different disasters
- **Section 39(b)** provides that the departments of the State Government may integrate into their development plans and projects, the measures for prevention of disaster and mitigation
- **Section 40(1a-ii)** mandates all department of the State to prepare a disaster management plan that shall integrate strategies for the prevention of disaster or the mitigation of its effects or both with the development plans and programs by the department.

12.9. Implementation of DRR – Financial Aspects

The primary mechanism for funding DRR related schemes and projects in India is through Public Funded Schemes at Central and State level. Various nodal Ministries play a key role in disaster management as far as specific disasters are concerned. These nodal Ministries as well as other

Ministries and Departments have dedicated schemes, aimed at disaster prevention, mitigation, capacity building, etc. within their particular domain. Existing examples include the scheme of MHA for Strengthening of Fire and Emergency Services, Financial assistance to ATIs and other Training institutions for disaster management, Forest Fire, flash floods. Over time further assistance from Public funded schemes needs to be pursued.

Apart from this, many of the schemes, which are implemented by various ministries / departments, have embedded DRR components, for example, those implemented by the MOEFCC. There are many other programs that improve societal resilience, which is a critical component of DRR, such as the National Rural Health Mission, Mahatma Gandhi Employment Guarantee Scheme, and the Urban Development's Urban Renewal Mission.

Outlay for reconstruction activities is normally embedded in the schemes of the Union Government to ensure that "Building Back Better" is in consonance with the approved programs. Post disaster reconstruction work is funded by the Union Government through increased outlay for the on-going infrastructure projects in the region and providing more untied grant to the affected State. The Centre / State may also utilize funds from international agencies for specific intervention in a particular region in the form of an externally aided project.

12.9.1. Public Funded Schemes

As per the Department of Expenditure, Ministry of Finance, the NITI Aayog has issued instructions for rationalization of Centrally Sponsored Schemes (CSS), vide OM No. O—11013/02/2015-CSS & CMC dated August 17, 2016. As per para 6 of the said OM, flexi-funds available in each CSS has been revised to 25% for States, and 30% for UTs, of the overall annual allocation under each scheme. The flexi – fund component within the CSS can be used to achieve the following objectives:

- To provide flexibility to States to meet local needs and requirements within the overall objective of any given Scheme at the sub-head level
- To pilot innovation to improve efficiency within the overall objective of any given Scheme at the sub- head level
- To undertake mitigation / restoration activities in case of natural calamities, or to satisfy local requirements in areas affected by internal security disturbances. The utilization of flexi-funds for mitigation /restoration activities in the event of natural calamity must be in accordance with the broad objectives of the CSS. It is possible to combine the flexi-fund component across schemes within the same sector however, the flexi-funds of a CSS in a particular sector, shall not be diverted to fund activities/schemes in another sector. The flexi-funds constitute a source of funding for mitigation activities within overall objectives of the CSS(s) under which they are allocated, and this would still leave a gap in terms of funding purely mitigation related projects, especially those addressing crosscutting themes that cover multiple sectors. The latter would be covered by setting up of National Disaster Mitigation Fund and State Disaster Mitigation Funds.

Investment of funds in the centrally sponsored schemes (SDMRF).

On the receipt of amounts of contribution from the Government of India, the SEC would act for investment of the funds in one or more of the following instruments:

- Central Government dated securities

- Auctioned Treasury Bills and
- Interest earning deposits and certificates of deposits with Scheduled Commercial Banks.
- The investment of the funds is to be carried out by the branch of the Reserve Bank of India at the headquarters of the State, or a bank designated by the RBI.

12.9.2. Flexi Funds as a Part of Centrally Sponsored Schemes

Besides the funds which are available through public funded schemes, efforts have also been made by the center to mobilize the resources from external funding agencies for vulnerabilities assessment, capacity development, institutional strengthening of response mechanism and mitigation measures, etc. For reconstruction and rehabilitation measures in the aftermath of major disasters, the State Government would seek continuous support from the Central Government.

12.9.3. Externally Aided Projects

Besides the funds which are available through public funded schemes, efforts have also been made by the center to mobilize the resources from external funding agencies for vulnerabilities assessment, capacity development, institutional strengthening of response mechanism and mitigation measures, etc. For reconstruction and rehabilitation measures in the aftermath of major disasters, the State Government would seek continuous support from the Central Government.

12.10. Risk Transfer and Insurance

As of now the Government of India is acting as a self-insurer for the purpose of maintaining relief funds (National Disaster Response Fund and State Disaster Response Fund). The funds are monitored by MHA in consultation with Ministry of Finance. The amount committed for State Disaster Response Fund is invested by the Union in government securities. MHA has issued guidelines in consultation with Ministry of Finance for the maintenance and encashment of the securities as and when required. However, need for projects or risk transfer instruments by private agencies, is also acknowledged by the Government. The corresponding policy changes and fund requirement is to be deliberated in detail in consultation with the IRDA, insurance sector and other stakeholders.

12.11. Uttarakhand Disaster Management Fund Scheme

Minimum Standards of Relief-Ex Gratia assistance - The Ex-Gratia Assistance on account of loss of or damage to houses and restoration of means of livelihood to the disaster victims shall be provided as per the Items and Norms of Assistance from SDRF/NDRF issued by Ministry of Home Affairs, Government of India and Uttarakhand Disaster Management Fund Scheme (GDMFS) spearheaded by Revenue Department Government of Uttarakhand. Also, whichever is higher among the two, shall be considered as Minimum Standards of Relief as applicable. Furthermore, whenever the Items and Norms of Assistance from SDRF/NDRF and GDMFS are revised, the Ex-gratia Assistance shall be provided as per the revised notification.

In the case of any disaster in Uttarakhand, the PM Relief fund gives Rs. 2 lakhs to the deceased / injured person's kin while the State provides Rs. 4 Lakhs. Funds received from the PM Relief fund, by Uttarakhand State during the Kedarnath disaster and COVID pandemic are examples of relief from the center.

Chapter 13

"Bad situations only get worse without good disaster risk governance."

“António Guterres”

13. Strengthening Disaster Risk Governance

13.1. Background

Strengthening disaster risk governance is considered a cornerstone of efforts to understand, reduce and manage risks in global practices (UNDP 2015). Governance encompasses the exercise of political, economic and administrative authority in the management of a country's affairs at various levels. It comprises mechanisms, processes and institutions through which groups articulate their interest, exercise their legal rights, meet their obligations and mediate their differences. Governance transcends government. It goes beyond governmental systems and powers by encouraging pro-active citizen engagement. Risks include health and medical, safety and security, and environmental risks, such as hazards and disasters.

The concept of governance has its origins partly in the recognition that many functions carried out by public entities are now provided by several governmental as well as private-sector or civil society entities. Such systems rely on the development and diffusion of various types of norms such as state regulation, self-regulation and market mechanisms (Tierney 2012). It may also rely on other processes such as negotiation, participation, and engagement, which facilitate collective decision making and action. Disaster governance is nested within and influenced by overarching societal governance systems and various aspects such as state-civil society relationships, economic organization, and societal transitions having implications for disaster governance. Governance arrangements and stakeholder participation could vary across different disaster phases, adding to the complexity of governance challenges. Insurance and reinsurance are an integral part of disaster governance.

UNDP describes disaster risk governance as:

"The way in which public authorities, civil servants, media, private sector, and civil society at community, national and regional levels cooperate in order to manage and reduce disaster and climate related risks." This means ensuring that sufficient levels of capacity and resources are made available to prevent, prepare for, manage and recover from disasters. It also entails mechanisms, institutions and processes for citizens to articulate their interests, exercise their legal rights and obligations, and mediate their differences." (UNDP 2013)

UNISDR defines it as:

"The system of institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction and related areas of policy." (UNISDR 2016)

The concept has evolved considerably, and the current thinking acknowledges that one cannot separate governance of disaster risk from the governance of other types of risks, including those associated with global climate change, environmental degradation, financial crises, and conflict situations (UNDP 2015). From the mid-2000's onwards, governance was commonly accepted as the crux of DRR, with comprehensive efforts underway to increase the DRR capacity of national and local institutions to strengthen policy, legal and planning frameworks to develop human and financial capacities and to promote multi-stakeholder and multi-disciplinary approaches. Effectiveness of disaster governance can be judged from stakeholder participation, collaboration, accountability and transparency. There is now greater emphasis on accountability, transparency, responsiveness to the needs of those most at risk, and ensuring the rule of law/compliance with adequate legal provisions. These are of crucial importance in fostering development and

promoting risk reduction.

The capacity of relevant individual actors and organizations comes into play when DRR policies – at various levels from the top to bottom – are implemented. Participation, rule of law, transparency, responsiveness, consensus orientation, equity, effectiveness, efficiency, accountability and strategic vision are key factors when implementing a governance structure aimed at sustainable development and disaster risk reduction (UNDP 2004).

13.2. Sendai Framework and Strengthening Disaster Risk Governance

The Sendai Framework emphasizes the importance of governance at different levels for effective and efficient management of disaster risk. Effective risk governance requires clear vision, plans, competence, guidance, and coordination within and across sectors, as well as participation of relevant stakeholders, as discussed earlier. Strengthening disaster risk governance is necessary to foster collaboration and partnerships for the implementation of disaster risk reduction and sustainable development. The Sendai Framework lays emphasis on the following to strengthen disaster risk governance:

- Mainstream and integrate disaster risk reduction within and across all sectors and promote the coherence and development of relevant laws, regulations, and public policies. It must guide both the public and private sectors through the legal framework that clearly spells out the roles and responsibilities. It must address disaster risk in publicly owned, managed, or regulated services and infrastructures. It must encourage actions by persons, households, communities, and businesses. It must enhance relevant mechanisms and initiatives for disaster risk transparency. It must put in place coordination and organizational structures.
- Adopt and implement disaster risk reduction strategies and plans, across different levels (local to national) and timescales, aimed at preventing the creation of risk, the reduction of existing risk and strengthening resilience – economic, social, health and environmental.
- Carry out assessment of the technical, financial and administrative disaster risk management capacity to deal with the identified risks at different levels Promote necessary mechanisms and incentives to ensure high levels of compliance with the safety-enhancing provisions of sectoral laws and regulations, including those addressing land use, urban planning, building codes, environment, resource management, health and safety standards, and update them, where needed, for better disaster risk management Develop and strengthen mechanisms to periodically review and assess the progress on various DM plans as well as encourage institutional debates, including by parliamentarians and relevant officials, on DRR plans.
- Assign clear roles and tasks to community representatives within disaster risk management institutions and processes and decision-making through relevant legal frameworks and undertake comprehensive public and community consultations during the development of such laws and regulations to support their implementation.
- Establish and strengthen government coordination forums composed of relevant stakeholders at the national and local levels, such as national and local platforms for disaster risk reduction.
- Empower local authorities, as appropriate, through regulatory and financial mechanism to work and coordinate with civil society, communities and indigenous people and migrants in disaster risk management at the local level.
- Work with parliamentarians for disaster risk reduction by developing or amending relevant legislation and setting budget allocations.

- Promote the development of quality standards, such as certifications and awards for disaster risk management, with the participation of the private sector, civil society, professional associations, scientific organizations and the United Nations.
- Formulate relevant public policies and laws aimed at addressing issues of prevention or relocation, where possible, of human settlements in disaster risk-prone zones.

13.3. Responsibility Framework for Strengthening Disaster Risk Governance

- Based on these considerations, and the increased emphasis globally on strengthening disaster risk governance to reduce disaster risk and to build resilience, the major tasks, agencies of the central and state government are presented in a responsibility framework. India currently has in place many institutions dedicated to disaster reduction, response, and for disaster risk governance at the centre and within the states at various levels from local to the state. However, there is wide variation in the functioning, structure, and capabilities. To strengthen disaster governance, a DM Cell will be established in each Central Ministry and a nodal officer, not below the rank of Joint Secretary will be appointed.
- The NDMP seeks to strengthen the entire system of disaster risk governance in the country using the framework presented here. The NDMP envisages the implementation of various measures across the country over the short (T1), medium (T2), and long-term (T3), ending by 2022, 2027, 2030 respectively. Many of these are highly ambitious given the extremely uneven level of institutional arrangements across various states and districts in the country. Based on the current status of implementation of the DM Plans, each central Ministry, Department, and the State Government will restructure the respective DM Plans into these time frames for implementation while preparing plans or revising existing ones.
- The generalized responsibility framework given in this section summarizes the themes for strengthening DR governance and specifies agencies at the centre and state with their respective roles. The responsibility framework has six thematic areas in which central and state governments must take actions to strengthen disaster risk governance:
 - Mainstream and integrate DRR and Institutional Strengthening
 - Capacity Development, Empower Local Authorities and Strengthen Coordination Mechanism
 - Promote Participatory Approaches, Partnerships and Networks
 - Work with Elected Representatives
 - Grievance Redress Mechanism
 - Promote Quality Standards, Certifications, and Awards

Table 58: Major Themes for Strengthening Disaster Risk Governance

Major theme	Key actions	Responsible agencies
1. Mainstream & integrate disaster risk reduction (DRR)	Short Term (T1): Empower local authorities assess technical, financial, and administrative DRR capacity. Medium Term (T2): Improve work culture harmonize DRR-related laws & policies adopt multi-level DRR strategies/plans ensure transparency & accountability strengthen coordination mechanisms at state, district & local levels. Long Term (T3): Promote mechanisms and incentives for high compliance with safety provisions.	SDMA/RD, DDMA, PRIs, ULBs, all departments involved in disaster management

Major theme	Key actions	Responsible agencies
2. Capacity development	Recurring: Integrate capacity-building across state ministries/departments. Short Term (T1): Build DRR knowledge and skills at state, district, block & local levels develop DM plans ensure compliance with safety standards. Medium Term (T2): Engage communities, PRIs, ULBs, elected reps, civil society, private sector, educational institutions strengthen enforcement of regulatory norms promote social inclusion create awareness of ecosystems & land-use in DRR. Long Term (T3): Assess DRR & climate-change capacities at all levels integrate environmental & land-use management into DRR plans.	SDMA/RD, DDMA, PRIs, ULBs, Dept. of Environment & Climate Change, all DM-related departments
3. Participatory approaches, partnerships & networks	Recurring: Promote participation of communities, individuals, households, and businesses in all aspects of DM. Short Term (T1): Implement multi-hazard participatory approaches based on regional risks. Long Term (T3): Establish and strengthen government coordination forums of key stakeholders.	SDMA/RD, DDMA, PRIs, ULBs, all DM-related departments (esp. DRD & UDD)
4. Engagement with elected representatives	Recurring: Sensitize political leadership involve elected representatives at state, district, block & local levels in DRR planning and decision-making.	SDMA/RD, DDMA, PRIs, ULBs, all DM-related departments (esp. DRD & UDD)
5. Grievance redress mechanism (GRM)	Recurring: Ensure a strong GRM across all disaster-response ministries/agencies. Short Term (T1): Review existing GRM (state & centre) and draft strengthening plans. Medium Term (T2): Implement strengthening measures.	SDMA/RD, DDMA, PRIs, ULBs, all departments involved in disaster response
6. Quality standards, certifications & awards for DRR	Recurring: Ensure implementation and monitor compliance of DRR standards. Short Term (T1): Draft state-level regulations with broad public consultations. Medium Term (T2): Develop urban/rural by-laws create certification & award systems build enforcement mechanisms. Long Term (T3): Implement techno-legal regimes establish institutional arrangements for compliance monitoring.	SDMA/RD, DDMA, PRIs, ULBs

RD-Revenue Department: Since Revenue Department in the State is the nodal department for disaster management, so SDMA/RD can be synchronized accordingly.

Chapter 14

" When disasters strike, our response must be global, because their impact knows no borders."
"Kofi Annan"

14. International Cooperation

14.1. Background

As per the existing legal and policy framework, international and regional cooperation for disaster management is the domain of the Government of India. But as disaster management is a state subject and the State Governments are the end beneficiaries of such cooperation in times of disaster related emergencies, this Chapter presents an overview of the provisions of international cooperation in the context of India and in terms of the implications for the State of Uttarakhand.

India has been at the forefront in supporting and participating in most of the international initiatives that strive towards achieving a safer planet for the future generations. At the international level, India has been working at the bilateral and multilateral level, to promote the agenda of resilience building and sustainable development of nations and communities.

India is one of the participating countries and works closely with the UNISDR. The United Nation Disaster Management Team in India comprises of UN agencies such as Food and Agriculture Organization, International Labor Organization, United Nations Development Program, United Nations Educational, Scientific and Cultural Organization, United Nations Population Fund, United Nations High Commission for Refugees, United Nations Children's Fund, World Food Program and World Health Organization.

India has been an active member at the global level for contributing significantly towards the adoption and implementation of international agreements including SFDRR, COP21 Paris Agreement and SDGs (2015-2030).

With multi-dimensional initiatives and expertise, India remains committed to playing a key role in strengthening regional and international cooperation efforts for mitigating and reducing the impact of disasters.

At the regional level, from organizing South Asian Annual Disaster Management Exercise (SAADMEx, November 2015, New Delhi), to hosting the Asian Ministerial Conference for Disaster Risk Reduction, 2016, India has been making consistent efforts to synchronize and institutionalize the regional cooperation on disaster response among the Asia-Pacific and

SAARC member countries. Further, at the global level India is a participant in the International Solar Alliance (2016) and Coalition for Disaster Resilient Infrastructure (CDRI), aimed at achieving a safer, disaster resilient and sustainable planet. India is participating in the Global Facility for DRR program and is one of the founder members of both Asian Disaster Preparedness Centre (ADPC) and Asian Disaster Reduction Centre (ADRC). India has agreements with several countries for cooperation in the field of disaster management and has been working closely with many countries for the exchange of ideas and expertise in disaster management.

Working in tandem with the nation's policy, practices and international commitments, the Government of Uttarakhand and its agencies have also been working towards developing appropriate plans and programs to achieve the broader objective of achieving resilience and sustainable development for the state of Uttarakhand.

The existing arrangements for international cooperation for disaster management at the national

level constitute the larger backdrop against which appropriate outside help could be sought in times of grave emergencies in the state of Uttarakhand.

14.2. Participation in International Efforts

Uttarakhand is committed to playing a pro-active role in India's International Disaster Risk Reduction Initiatives. Uttarakhand SDMA is in the process of implementing the Sendai Framework for Disaster Risk Reduction Scheme and is committed to achieving priorities and objectives through systematic and institutional efforts. With multi-dimensional initiatives and expertise, Uttarakhand remains committed to playing a leading role in strengthening local and national cooperation efforts in mitigating and reducing the effects from disasters.

Uttarakhand was honored with the WCDM- DRR award for innovations in capacity development for preparedness, response and recovery, by the Government of India in 2024. Uttarakhand has been working closely with many States for the exchange of ideas and expertise in disaster management.

The State successfully hosted the High-level seminar on "Road map to sustainable cities" during the G20 Summit 2023 in Rishikesh in an organized and peaceful manner

14.3. Accepting Foreign Assistance

The State of Uttarakhand adheres to the policy matter on accepting foreign assistance by the Government of India wherein the Central Government does not issue any appeal for foreign assistance in the wake of a disaster. However, if the National Government of another country voluntarily offer assistance as a goodwill gesture in solidarity with the disaster victims, the decision on acceptance of all such offers vests solely with the Central Government. The primary responsibility for reviewing such foreign offers of assistance rests with the Ministry of External Affairs which will consult and coordinate with the Ministry of Home Affairs.

All offers of assistance from foreign governments will be routed through the Ministry of External Affairs. Offers of assistance in-kind, including technical assistance, emergency rescue teams, reconstruction assistance, etc. will be evaluated on a case-by-case basis, in consultation with the Ministry of Home Affairs, which will assess the requirements based on inputs from the concerned State government.

In the case of contributions from NRIs, PIOs and foreign non-governmental bodies, donations may be accepted through the Prime Minister's and Chief Minister's relief funds including the PM CARES Fund (established in the wake of the COVID-19 pandemic in the country). All other donations from foreign non-governmental entities to Indian non-governmental entities must be compliant with extant regulations, including the Foreign Contribution (Regulation) Act, 2010.

14.4. Accepting Multilateral Assistance

In the case of an offer of assistance from UN Agencies, the Government of India evaluates and considers all such offers on its merits and issues directions to the concerned State/s accordingly. The Government of Uttarakhand (GoUK) will follow the directions of GoI, while accepting or coordinating with the concerned UN agency. GoUK will work with UN agencies and international NGOs, those rendering their humanitarian assistance to the people in affected area/s or receiving any technical/financial support in coordination with the relevant Central Ministries/Departments in accordance with the applicable norms, protocols and directions.

UN agencies like UNDP, UNICEF, FAO, WHO may extend assistance in the event of a disaster, if such a proposal has been approved by the Central Government or assistance is being provided under an on-going program, already approved by the Central Government. Such assistance will not be in terms of cash, but it may be in terms of technical and logistic support, including human and material resources. The assistance will be routed through the Central Government or the State Government, if extended under an on-going program in the state. The UN has a central and unique role through the organizations under its aegis, to coordinate international co-operation in the field of disaster management and mitigation. Even though disaster management and mitigation rests on the National Government, the UN agencies are responsible for providing advice and assistance to the Government and are responsible to mobilize and provide technical and material assistance according to their mandate and resources.

UNICEF (UNITED NATIONS INTERNATIONAL CHILDREN'S EMERGENCY FUND)

The SDMA/the Department of Revenue (DM)/State administration may request the UNICEF for following assistance

- Provision of emergency relief to the affected communities
- Immunization
- Restoration of health infrastructures
- Supply of educational and other infrastructures to the affected schools
- Restoration and augmentation of sanitation and drinking water facilities

The key areas of UNICEF's involvement in disaster mitigation will be

- Post disaster situation and needs analysis with the help of NGOs or Govt. machinery.
- Promoting & guiding disease surveillance
- Training support for medical personnel for control of epidemics / pandemics
- Provision of relief support to the affected community as per its mandate.
- Supply of emergent food aid relief, medicine and study materials for children of the affected communities.
- Allocate/generate financial assistance for restoration and rehabilitation activities in the affected areas.
- Restoration of drinking water and sanitation facilities in post disaster period.
- Incorporate disaster preparedness aspects in its ongoing programs.
- Special programs for child and mother health

UNDP (UNITED NATIONS DEVELOPMENT PROGRAM)

UNDP is mandated to promote incorporation of disaster mitigation in development planning and provide financial support and technical assistance for different facets of disaster management. Assistance is also provided in the planning and implementation of post disaster rehabilitation and reconstruction and incorporation of risk reduction techniques in the affected areas. The activities of UNDP in the State could be as follows:

- Supporting the State and district administration in distribution of relief
- Co-ordination of NGO activities in the affected areas
- Promotion of alternative housing techniques in the affected areas

- Strengthening of disease surveillance
- Supporting Disaster Preparedness initiatives in the State through organizing workshops, training programs for various stake holders
- Initiating community-based disaster preparedness program in the State
- Initiation of sustainable livelihood programs
- Provision on agricultural inputs immediately after emergencies
- Provision of tents, family relief kits
- UNDP can play the following roles in a disaster management
- Incorporation of disaster mitigation in development planning.
- Support and get involved in planning and implementation of relief and rehabilitation activities of the State Govt.
- Propagate disaster preparedness in community level through Govt. machinery.
- Support the State Govt. for preparing DM plans at state, district, block and community levels.
- Provide necessary support and guidance for designing early warning systems.

WFP (WORLD FOOD PROGRAM): World Food Program provides targeted food aid to vulnerable communities for humanitarian relief and supports rehabilitation, reconstruction and risk reducing development programs.

FAO (FOOD AND AGRICULTURE ORGANIZATION): FAO provides technical advice in reducing vulnerability and helps in the rehabilitation of agriculture, livestock, fisheries and local food production. It also monitors food production and forecasts any requirements of exceptional food assistance.

WHO (WORLD HEALTH ORGANISATION): WHO provides advice and assistance in various aspects of preventive and curative health care including preparedness of health services for rapid disaster response.

The World Bank: The World Bank is like a cooperative, made up of 189 member countries. These member countries, or shareholders, are represented by a Board of Governors, who are the ultimate policymakers at the World Bank. Generally, the governors are member countries' ministers of finance or ministers of development.

The World Bank Group Boards of Directors refers to four separate Boards of Directors, namely the Board of the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA). Each Board is responsible for the general operations of their respective organization.

The World Bank Group - the world's largest development institution—has worked to help more than 100 developing countries and countries in transition by offering loans and tailored knowledge and advice to help them achieve resiliency to shocks, including against climate and biodiversity crises, pandemics and fragility.

India is a member country of the World Bank Group since 1945. And the Bank assists projects in various States to enable them to achieve their sustainable development goals (SDGs). Any such project is executed through the involvement of the Central Government.

The State of Uttarakhand also engages with the World Bank from time to time on projects aimed at delivering SDGs in various sectors.

The USDMA, which functions as the apex organization in Uttarakhand, serves as the think-tank for the State incorporating aspects of disaster prevention, preparedness, and mitigation into all projects. Following the disaster of 2013, the UDRP project was undertaken with the financial assistance of the World Bank. The project focused on risk and vulnerability reduction with multi sectoral engagement and assistance for reconstructing damaged infrastructure, restoring connectivity, and improving technical support (through various studies to manage future disaster risks).

The UDRP-AF project assisted by the World Bank funds was undertaken with the aim to carry out works for which most of the studies and designs were carried out under UDRP and were related to rural road connectivity, protection works, and bridges, including riverbank protection works. The State Disaster Response Force (SDRF) training facility and construction of USDMA building, incorporating complete logistic support was taken up to build the capacities of SDRF, government functionaries and citizens, thereby improving preparedness and response.

The U-PREPARE project assisted by the World Bank, is currently under execution in the State of Uttarakhand and is scheduled to complete in 2029. The project design has incorporated lessons learned from UDRP, UDRP-AF, and other national and global post-disaster recovery projects.

The project aims to enhance the climate and disaster resilience of critical public infrastructure and strengthen disaster risk management capacity in Uttarakhand through various components such as:

- Enhancement of the resilience of transport connectivity by improving the condition, safety, and resilience of select bridges strengthening the capacity of the PWD in resilient design and construction developing a PWD Climate Adaptation Policy, which will integrate disaster and climate risk management approaches into existing systems and developing a Road Asset Management System with a climate module.
- Provision of pilot multipurpose disaster shelters in selected disaster-prone areas along major routes with resilient, inclusive, and energy-efficient designs establishing procedures for shelter management including the use and maintenance of the shelters during non-emergency situations.
- Strengthening of emergency preparedness by establishment of a State Emergency Operations Centre with a Centralized Incident Command System strengthening of emergency and response frameworks and SOPs improvement of forecasting and early warning systems and information dissemination channels and implementing of community DRM activities.
- Improvement of general fire risk management capacity by strengthening of UFES's capacity for firefighting, application of innovative technologies, enforcement of fire safety acts, rules, and norms, and occupational health and safety management constructing and upgrading of fire stations to meet resilience, environment, health, and safety design considerations and to meet the needs of female employees raising public awareness with respect to fire safety norms and increase in the share of female employees.
- Improvement of forest fire prevention and management capacity by strengthening of the FD's prediction, mapping, and early detection capacity, by focusing on new technologies (mobile applications and artificial intelligence), and considering shifts in fire risks due to climate change strengthening the FD's forest fire suppression capacity by purchasing equipment and providing capacity building for officials and communities establishing an incentive-based

community program for forest fire risk management, restoring degraded lands, and enhancing soil moisture levels and preparing a carbon finance mechanism based on reduced emissions as a sustainable funding mechanism for community forest fire risk management activities.

- The project beneficiaries are the communities of the State and tourists, who use the road infrastructure. U-PREPARE enhances the capacity for evacuation, access to medical facilities, and essential supplies during emergencies. Strengthening the capacities of SDRF, UFES, FD, and establishment of EWS also helps in improving the capacity of the Government functionaries and citizens, thereby improving preparedness and response.

14.5. Bilateral Organizations

Bilateral agencies play a major role in disaster management and work through government as well as NGOs and other partner agencies. They provide resources for preparedness, research, networking and institution development, relief, reconstruction and rehabilitation. They can assist in making suggestions for possible changes in policies by sharing of disaster management applications in other parts of the world. In addition, they can provide technical expertise and give support by mobilizing advanced rescue and evacuation teams from other countries during the time of extreme emergencies. These organizations carry out responsibilities in coordination with the Government of the affected country, other donor Governments, international organizations, UN agencies and NGOs.

14.6. Fostering Partnerships

Uttarakhand is keen to share expertise and work with other countries in the areas of disaster management. Uttarakhand is on the international map and can play a major role for capacity building initiatives of the country in the Asia Pacific region and looks forward to building sustained regional and international partnerships under the Sendai Framework. The State has hosted various prestigious domestic as well as international events like the G20 Summit 2023 and other Business, Tourism, Sports and Entertainment related events. The State Government is committed to fostering partnerships with the domestic as well as international agencies for sharing knowledge and best practices for capacity building in the domain of disaster management. Uttarakhand has the potential to work with countries in the region and to build resilient nations and communities. Uttarakhand acknowledges the benefit of engaging with the international community to provide humanitarian assistance in the State during emergencies.

Since Uttarakhand is a famous tourist destination in the country with the inflow of both Domestic and International tourists, tourist safety is equally important to the State in wake of disaster/crisis situations. The State Disaster Management Authority is committed to extending best possible support to international tourists in the times of disaster emergencies. The SDMA believes in proactive approach to mitigate the negative impacts of an inevitable disaster situation. Uttarakhand SDMA ensured the best possible support to all foreign tourists during unforeseen difficulties in the State, a salient example being during the COVID pandemic.

Chapter 15

" We learn from every natural disaster. Whether it's a fire or a flood, we learn something from it so we can respond to the next one better."

“Malcolm Turnbull”

15. Maintaining, Monitoring and Updating the Plan

15.1. Background

The preparation, maintenance and updating of the Disaster Management Plan is a dynamic process. To ensure the relevance and effectiveness of the DM Plan, it must be revised periodically, by incorporating updated information, changes in Government policies, initiatives, and priorities as well as technological changes and global experiences.

The Evaluation of the effectiveness of DM plans involves a combination of training events, exercises, and real-world incidents to determine whether the goals, objectives, decisions, actions, and timing outlined in the plan led to a successful response. In this way, the emergency preparedness exercises become an integral part of the planning process. The DM planners must be aware of lessons learnt from the recent disaster events and best practices adopted elsewhere.

The trainings, mock drills and exercises are crucial to evaluate the operational aspects of the plan, fill in the gaps and improve the efficiency of the plan. The likelihood of emergencies and actual occurrences are also occasions for evaluating the plan, making innovations, and for updating the plan, SOPs and guidelines.

At times, operations experience setbacks due to outdated information, ineffective procedures, incorrect role assignments, and outdated norms. Further, the priorities for a jurisdiction may change over time, as the makeup of the included communities change, as resources expand or contract, and as capabilities evolve.

15.2. Training and Drills

At different levels, the nodal agency tasked with developing respective DM plans must disseminate it to all other agencies associated with the plan execution having specific responsibilities (State Ministries/ Departments, District Administration, etc.). These key stakeholder agencies are required to train their personnel, so that they have the knowledge, skills and abilities needed to perform the tasks identified in the plan. Each agency shall assign nodal officers for DM and prepare adequate training schedule. Each nodal agency for DM must hold, in accordance with a mandatory timetable, training workshops with regular mock drills, at least twice a year. Such programs are crucial to ensure full preparedness and to maintain operational readiness of the disaster response operation teams, institutional mechanisms, and the equipment.

Mock drills and training must be organized to test their readiness to deploy within the shortest possible time following the activation of a disaster response. They shall be conducted in a manner like that of the drills carried out by fire-fighting departments or army units. These workshops and drills must be held at pre-designated locations or base camps under the guidance of the designated incident commanders and associated departmental heads.

The objective of all these training and drills would be to familiarize the teams with the SDMP and to increase their operational efficiencies. The training courses are crucial because they go beyond concepts and guidelines into inculcating in individuals the critical importance of working as a coherent team for emergency response with a clear chain of command. The workshops and drills will also provide an opportunity to practice SOPs. These workshops would also give the teams an

opportunity to develop all the stakeholders into a cohesive response unit.

For example, the NDMA and USDMA organized a Community Centric Forest Fire drill at the district level in February 2025. The lessons learnt from the exercise formed input into the SDMP and DDMPs.

The Char Dham Yatra is a major yearly event (from around late April to October) in the State of Uttarakhand, wherein lakhs of national and international tourists visit the State. The huge number of visitors, the altitude of the Dham's and associated terrain and weather adversities, altitude related health challenges for visitors, all pose huge risks from disaster perspective. A Char Dham Mock drill exercise was thus conducted by NDMA and USDMA from April 22nd to 24th, 2025 to review Char Dham Yatra preparedness in the State of Uttarakhand. The lessons learnt and observations from the mock exercise were used as inputs in this SDMP and to strengthen the State's disaster preparedness and response capabilities.

After the mock exercise debriefing and evaluation is very important.

- It is of critical importance that these insights are collected from participants (who participated in the exercise) and used to modify the plan.
- Hot debriefing is very effective as it is carried out immediately after the exercise. It also includes documentation in terms of recommendations and improvements of the plan.
- The lessons learned from the mock exercise are likely to be similar to those from real events. The only major difference is that exercises are controlled events, specifically designed to test procedures and they can be repeated and again until sound/workable arrangements are in place.

15.3. Testing the Plan and Learning to improve

Evaluating the effectiveness of a plan involves a combination of training events, exercises and real-time incidents to determine whether the objectives, decisions, actions and timings outlined in the plan led to a successful response. The purpose of exercises and drills is to promote preparedness by testing the plan with equal participation of all relevant stakeholders. The process of evaluation and remedial actions will identify, illuminate, and correct problems with the SDMP. This process must capture information from exercises, post-disaster critiques, self-assessments, audits, administrative reviews, or lessons-learned processes that may indicate that deficiencies exist.

The State Executive Committee (SEC) shall prepare, review and update State Disaster Management Plan as provided for in the DM Act 2005. It shall also ensure that disaster management drills and exercises are carried out periodically. While updating the plan, the following aspects need to be considered by the SEC every year:

- Critical analysis of the outcome of exercises & mock drills as part of plan testing.
- Incorporation of lessons learnt in the updated plan as an outcome of mock exercises through identification of gaps and measures to fill them.

The plan must be thoroughly tested and evaluated on a regular basis once in a year. The plan testing should preferably be organized in the month of March every year.

After plan testing and incorporation of lesson learnt, the SEC should send a copy of the revised and updated plan to the following officials:

- Heads of all line Depts.
- State EOC
- District EOCs
- NDMA
- NIDM
- MHA

The main objectives of plan testing are to:

- Determine the feasibility and compatibility of back up facilities and procedures
- Identity areas in the plan that need modification.
- Identify training needs of key stakeholders.
- Assess the ability of the organization/department to respond to disasters.

All the departments, which have specific roles and responsibilities in State Disaster Management Plan, must have a system to ensure that all Officers of their departments who have a specific role to play are fully conversant with their responsibilities/tasks.

Members of the planning team should reconvene to discuss the problem and to consider and assign responsibility for generating remedies across all mission areas.

Remedial actions may involve revising planning assumptions and operational concepts, changing organizational tasks, or modifying organizational implementing instructions (i.e. the SOPs/SOGs). Remedial actions may also involve reassessment of capabilities, revisiting assumptions made in the SDMP, and finding solutions to overcome the deficiencies.

The final component of a remedial action process is a mechanism for tracking and following up on the assigned actions. As appropriate, significant issues and problems identified through a remedial action process and/or the annual review should provide the information needed to allow the planning team to make the necessary revision(s) to the plan.

15.4. Monitoring by State Ministries /Departments and District Administration

All the departments of the State Government and District Administration should prepare a checklist with verifiable indicators to regularly monitor the progress of the implementation of respective DM plans.

The monitoring system must be aligned with the Sendai framework monitoring checklist (Annexure -III). Keeping the Sendai framework as a reference, they must develop specific checklists relevant to various hazards.

The monitoring must include periodic reviews synchronized with the quasi-cyclic or recurring nature of hazards such as cyclones, or flood. They must also regularly review preparedness for disasters that tend to occur without warnings or are extremely rare.

For recurring or frequent hazards, they should employ check lists to assess preparedness before the onset of the season. For other hazards, this can be undertaken as an annual exercise.

Ministries / Departments of Government of Uttarakhand should also conduct periodic review on the extent of financial provisions required for implementing their Plan.

15.5. Revise/Update

This step closes the loop in the planning process. It focuses on adding the information gained by exercising the plan to the lessons learnt while executing and start the planning cycle all over again. All the relevant stakeholders should establish a process for reviewing and revising the plan.

Each DM plan must be reviewed periodically and updated as indicated below:

- Lessons learnt from major review and revisions after each major incident
- After significant change in operational resources (e.g., policy, personnel, organizational structures, management processes, facilities, equipment)
- Following Recommendations from associated Depts.
- After any notification or formal update of planning guidance or standards
- After every case of plan activation in anticipation of an emergency
- After the completion of major exercises (Drills and exercises)
- A change in the district's demographics or hazard or threat profile
- Enactment of new or amended laws or ordinances
- Directions from Ministry of Home Affairs, National Disaster Management Authority, Government of India, etc.

Salient examples of incorporation of review and revisions after major incidents / change in district's threat profile include the Mana Snow avalanche in March 2025, Silkyara Tunnel Collapse in 2023, Jyotirmath and Sonprayag landslide crisis in 2023 and 2024 respectively. USDMA and all other concerned Depts. should encourage formal and informal interaction with various stakeholders at different levels to learn and document their experiences, so that such experiences can contribute constructively towards updating of State Disaster Management Plan for further improving the capability to deal with future disasters. In exceptional circumstances where the magnitude of the incidence or the situation demands/ needs extra measures to be taken, appropriate authority will make necessary amendments. Various Ministries, Districts, and Talukas will cooperate in the exercise of revising the plan as needed. (AS PER SECTION 23(5) OF THE DM ACT, SDMP IS TO BE REVIEWED AND UPDATED ANNUALLY)

CONCLUSION

The Uttarakhand State Disaster Management Plan (SDMP) 2026 represents a vital strategic framework to guide the state toward a safer, more resilient, and disaster-prepared future. In light of the increasing frequency, scale, and complexity of both natural and human-induced disasters, and given Uttarakhand's fragile mountainous terrain, ecological sensitivity, and socio-economic vulnerabilities, the SDMP assumes critical importance in safeguarding lives, livelihoods, infrastructure, cultural heritage, and ecosystems. It is both a statutory obligation and a visionary document that integrates disaster risk reduction principles with the broader goals of sustainable development, environmental stewardship, and social equity.

The SDMP is firmly anchored in the legislative foundation of the Disaster Management Act, 2005, and aligns seamlessly with the National Policy on Disaster Management (2009). It is also harmonized with global frameworks such as the Sendai Framework for Disaster Risk Reduction (2015–2030), the Sustainable Development Goals (SDGs), and the Paris Agreement on Climate Change, thus ensuring that Uttarakhand's disaster management strategy is globally informed and locally contextualized. Moreover, the Plan reflects the strategic priorities of the Prime Minister's Ten-Point Agenda on DRR. It embodies the Chief Minister's Vision for a Resilient Uttarakhand, positioning the state as a frontrunner in institutionalizing risk-informed development planning.

One of the core strengths of the SDMP lies in its comprehensive coverage of the entire disaster management cycle, ranging from prevention, mitigation, preparedness, and early warning to response, recovery, reconstruction, and long-term resilience-building. It incorporates multi-hazard risk assessments, climate change adaptation strategies, and sector-specific preparedness measures while addressing emerging and non-traditional threats such as biological hazards, industrial accidents, and public health emergencies. The Plan outlines the roles and responsibilities of stakeholders across all levels of governance—State, District, Tehsil, and Local Bodies—while emphasizing vertical and horizontal coordination among institutions.

The Plan places particular focus on institutional mechanisms such as the Incident Response System (IRS), the establishment and strengthening of Emergency Operations Centres (EOCs) at various levels, and the operational readiness of dedicated response forces, including SDRF, NDRF, Civil Defence, and local emergency volunteers. The roles of USDMA, DDMA, and line departments are clearly defined in planning, preparedness, resource mobilization, and response coordination. The SDMP also emphasizes the need for robust early warning systems, improved risk communication, and effective last-mile connectivity to ensure that timely and actionable information reaches the most vulnerable sections of society.

Recognizing that communities are the first responders in any disaster, the Plan promotes community-based disaster risk management (CBDRM) approaches and encourages active participation of Panchayati Raj Institutions, Urban Local Bodies, NGOs, SHGs, youth groups, and local champions. It integrates gender-sensitive planning and inclusive strategies to ensure the protection of marginalized groups, including women, children, the elderly, persons with disabilities, and other at-risk populations. Capacity-building, public awareness, school safety programs, regular mock drills, and training at all levels are essential to foster a culture of preparedness and resilience.

From a developmental perspective, the SDMP encourages mainstreaming DRR into sectoral planning, including infrastructure development, housing, education, health, energy, transport, agriculture, and forestry. It also advocates using technological tools, geospatial mapping, data analytics, and decision-support systems to enhance scientific risk assessments and operational coordination. Financial mechanisms such as the State Disaster Response Fund (SDRF), State Disaster Mitigation Fund (SDMF), and Risk transfer instruments, and convergence with schemes like MGNREGS, PMAY, NRLM, and the State Action Plan on Climate Change (SAPCC) are also emphasized to ensure sustainability and resilience financing.

An essential pillar of the Plan is its commitment to adaptive management. It incorporates monitoring, evaluation, periodic review, and updating mechanisms considering changing risk scenarios, scientific advancements, and administrative feedback. This dynamic nature of the SDMP allows it to remain a living document, responsive to both immediate needs and long-term strategic goals.

The successful implementation of the SDMP depends on institutional capacity and the collective commitment of a wide array of stakeholders. Political leadership, administrative will, inter-departmental collaboration, adequate funding, and active citizen participation are critical to translating the Plan into tangible outcomes. The private sector, media, academic and research institutions, and civil society cooperation will be vital in creating a multi-stakeholder ecosystem for disaster resilience.

In essence, the Uttarakhand SDMP 2026 is more than a preparedness manual. It is a vision document, an operational strategy, and a governance tool. It articulates the state's aspiration to transform disaster risks into opportunities for building back better, protecting development gains, empowering communities, and strengthening governance. It reaffirms the commitment of the State Government to place resilience at the core of development planning and to protect the lives and future of the people of Uttarakhand from the adverse impacts of disasters and climate change.

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ABBREVIATIONS

Abbreviation	Full Form
ADPC	Asian Disaster Preparedness Centre
ADRC	Asian Disaster Reduction Centre
AMCDRR	Asian Ministerial Conference on Disaster Risk Reduction
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
ATI	Administrative Training Institute
ATF	Aviation Turbine Fuel
BBB	Build Back Better
BD	Branch Director
BCR	Benefit-Cost Ratio
BIO	Biological Hazards
BIS	Bureau of Indian Standard
BMTPC	Building Materials and Technology Promotion Council
BPHE	Biological and Public Health Emergencies
BRO	Border Roads Organisation
BPL	Below Poverty Line
CA	Climate Adaptation
CBDRR	Community-Based Disaster Risk Reduction
CBO	Community-Based Organization
CBRN	Chemical, Biological, Radiological and Nuclear
CC	Climate Change
CCA	Climate Change Adaptation
CDP	Climate Development Planning
CDEF	Civil Defence Emergency Force
COP21	21st Conference of the Parties (Paris Agreement)
COVID	Coronavirus Disease
CRF	Calamity Relief Fund
CSR	Corporate Social Responsibility
CSS	Centrally Sponsored Schemes
CUL	Communication Unit Leader
CWC	Central Water Commission
DALA	Damage and Loss Assessment
DDMA	District Disaster Management Authority
DEOC	District Emergency Operations Centre
DGM	Directorate of Geology and Mining
DIC	Deputy Incident Commander
DM	Disaster Management / District Magistrate (context-dependent)
DM Act	Disaster Management Act (2005)

Abbreviation	Full Form
DMMC	Disaster Mitigation and Management Centre
DMP	Disaster Management Plan
DoUD	Department of Urban Development
DRD	Department of Rural Development
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DSRP	Disaster-Specific Response Plan
DS	Decision Support System
DUL	Documentation Unit Leader
EFC	Expenditure Finance Committee
EIA	Environmental Impact Assessment
EOC	Emergency Operations Centre
EQ	Earthquake
ERR	Erratic Rainfall Risk
ER	Early Recovery
ERT	Emergency Response Team
EWS	Early Warning System
FAO	Food and Agriculture Organization
FBY	Fasal Bima Yojana
FDRM	Financial Disaster Risk Management
FD	Forest Department
FF	Forest Fire
FES	Fire and Emergency Services
FPO	Farmer Producer Organisation
FSI	Forest Survey of India
FUL	Food Unit Leader
G20	Group of Twenty
GACC	Global Anthropogenic Climate Change
GDMFS	Government Disaster Management Fund Scheme (Uttarakhand)
GHZ	Geological Hazard Zonation
GIS	Geographic Information System
GLOF	Glacial Lake Outburst Flood
GoI	Government of India
GoUK	Government of Uttarakhand
GSI	Geological Survey of India
HAP	Heat Action Plan
HFA	Hyogo Framework for Action (2005–2015)
HEPS	Hydroelectric Projects
HIR	Human-Induced Risk
HRIs	Heat-Related Illnesses

Abbreviation	Full Form
HRNA	Human Recovery Needs Assessment
HRVA / HRVCA	Hazard Risk Vulnerability and Capacity Assessment
HW	Heat Wave
HWMAP	Heat Wave Management Action Plan
IA	Impact Assessment
IAP	Incident Action Plan
IC	Incident Commander
ICC	Incident Command Centre
ICS	Incident Command System
ICT	Information and Communication Technology
ICU	Intensive Care Unit
IEC	Information, Education and Communication
IFRC	International Federation of Red Cross and Red Crescent Societies
IMD	India Meteorological Department
IMO	Information and Media Officer
INCOIS	Indian National Centre for Ocean Information Services
INRM	Integrated Natural Resource Management
IPCC	Intergovernmental Panel on Climate Change
IRC	Incident Response Coordinator
IRDA	Insurance Regulatory and Development Authority
IRS	Incident Response System
ISRO	Indian Space Research Organisation
IT	Information Technology
ITBP	Indo-Tibetan Border Police
ITR	Incident Tracking Report
IIRS	Indian Institute of Remote Sensing
JJM	Jal Jeevan Mission
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
KR	Kedarnath Route
LA	Lightning Arrester
LDS	Lightning Detection System
LHZ	Landslide Hazard Zonation
LHT	Lightning Hazard Threat
LS	Logistic Section
LSC	Logistic Section Chief
LTR	Long-Term Recovery
M&E	Monitoring and Evaluation
MFR	Medical First Responder
MHA	Ministry of Home Affairs
MHUA	Ministry of Housing and Urban Affairs

Abbreviation	Full Form
MIGA	Multilateral Investment Guarantee Agency
MoEFCC	Ministry of Environment, Forest and Climate Change
MoES	Ministry of Earth Sciences
MoF	Ministry of Finance
MoHFW	Ministry of Health and Family Welfare
MPWS	Multi-Purpose Worker Sanitary
MR	Medium-Term Recovery
MRB	Mandakini River Basin
MRP	Mock Response Plan
MW	Megawatt
NABARD	National Bank for Agriculture and Rural Development
NCC	National Cadet Corps
NCS	National Centre for Seismology
NDMA	National Disaster Management Authority
NDMF	National Disaster Mitigation Fund
NDMP	National Disaster Management Plan
NDVI	Normalized Difference Vegetation Index
NDRF	National Disaster Response Force
NDRMF	National Disaster Risk Management Fund
NFS	National Fire Service
NGO	Non-Governmental Organization
NHIDCL	National Highways and Infrastructure Development Corporation Ltd.
NIDM	National Institute of Disaster Management
NITI Aayog	National Institution for Transforming India
NPP	National Fire Prevention Program
NPDM	National Policy on Disaster Management
NRHM	National Rural Health Mission
NRI	Non-Resident Indian
NSS	National Service Scheme
NTPC	National Thermal Power Corporation
O/C	Officer-in-Charge
OCR	Operational Crisis Response
ODR	Owner-Driven Reconstruction
OM	Office Memorandum
OSC	Operation Section Chief
OS	Operation Section
PDS	Public Distribution System
PDNA	Post-Disaster Needs Assessment
PGA	Peak Ground Acceleration
PG	Postgraduate

Abbreviation	Full Form
PIO	Person of Indian Origin
PM	Prime Minister
PM Agenda	Prime Minister's Ten-Point Agenda for DRR
PM CARES	PM's Citizen Assistance and Relief in Emergency Situations Fund
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMJDY	Pradhan Mantri Jan Dhan Yojana
PMJSBY	Pradhan Mantri Jeevan Suraksha Bima Yojana
PMK	Paidal Marg Kedarnath
PPE	Personal Protective Equipment
PRI	Panchayati Raj Institution
PRD	Panchayati Raj Department
PSC	Planning Section Chief
PWD	Public Works Department
QRMT	Quick Reaction Medical Team
R&D	Research and Development
RD	Revenue Department / Rural Development
RoR	Run-of-River
RTO	Regional Transport Officer
RUL	Resource Unit Leader
SA	Staging Area
SAM	Staging Area Manager
SAR	Search and rescue
SB	Service Branch
SBEs	Socioeconomic Baseline Estimates
SC	Scheduled Caste
SC-NEC	Sub-Committee of the National Executive Committee
SDG / SDGs	Sustainable Development Goal(s)
SDMA	State Disaster Management Authority
SDMC	School Disaster Management Committee / State Disaster Management Centre
SDMF	State Disaster Mitigation Fund
SDMP	State Disaster Management Plan
SDRF	State Disaster Response Fund
SDRMF	State Disaster Risk Management Fund
SEOC	State Emergency Operation Centre
SFAC	Standing Fire Advisory Council
SFC	Standing Finance Committee
SFDRR	Sendai Framework for Disaster Risk Reduction
SHG	Self Help Group
SIL	Safety Integration Level
SMART	Specific, Measurable, Achievable, Relevant and Time-Bound (planning criteria)

Abbreviation	Full Form
SMEs	Small and Medium Enterprises
SMS	Short Message Service
SOP	Standard Operating Procedure
SOG	Standard Operating Guideline
SR-2024	Sonprayag Rescue 2024
SRD	Soil Retention Decrease
SRSC	State Remote Sensing Centre
ST	Scheduled Tribe
ST/SC	Scheduled Tribes / Scheduled Castes
SuBD	Support Branch Director
T1 / T2 / T3	Short- / Medium- / Long-Term (Time Horizon)
TA	Thematic Area
TBD	Transport Branch Director
TV	Television
TTE	Table-Top Exercise
UAV	Unmanned Aerial Vehicle
UD	Urban Development
UDD	Urban Development Department
UFDM	Urban Flood Disaster Management
UFES	Uttarakhand Fire and Emergency Services
UG	Undergraduate
UH	Urban Heat
UHI	Urban Heat Island
UK	Uttarakhand
ULMMC	Uttarakhand Landslide Mitigation and Management Centre
ULB / ULBs	Urban Local Body / Urban Local Bodies
UN	United Nations
UNDP	United Nations Development Program
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
UNISDR	United Nations International Strategy for Disaster Reduction (now UNDRR)
USDMA	Uttarakhand State Disaster Management Authority
USDMP	Uttarakhand State Disaster Management Plan
USAC	Uttarakhand Space Application Centre
VSAT	Very Small Aperture Terminal
VCA	Vulnerability and Capacity Assessment
VCP	Village Contingency Plan

Abbreviation	Full Form
VDF	Very Dense Forest
VIIRS	Visible Infrared Imaging Radiometer Suite
VIP	Very Important Person
WASH	Water, Sanitation and Hygiene
WBGT	Wet Bulb Globe Temperature
WCDM	World Congress on Disaster Management
WHO	World Health Organization
WFP	World Food Program
WRD	Water Resources Department
WSD	Watershed Development Department



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