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OPINION

Aapda Mitra: Scientific Temper in Action on Kartavya Path

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ABSTRACT

The National Disaster Management Authority (NDMA) tableau showcased during the 77th Republic Day Parade at Kartavya Path provided a compelling public demonstration of India's advancing disaster risk management architecture. Commemorating twenty-five years since the 2001 Bhuj earthquake, the tableau illustrated the entire disaster management continuum-early warning, response, recovery, preparedness, mitigation, and the principle of *Build Back Better*-while placing trained community volunteers, the Aapda Mitra, at its center. This article interprets the tableau as both a symbolic and substantive manifestation of scientific temper, where technological capability, institutional readiness, and citizen engagement converge. By highlighting collective memory, evidence-based preparedness, and community-led response during the critical initial hours of disasters, the tableau emphasised the pivotal role of trained citizens in translating scientific knowledge into effective action. The Aapda Mitra programme exemplifies scientific temper in practice-calm, informed, cooperative, and service-oriented-demonstrating that disaster resilience relies not only on infrastructure and institutions but also on empowered, scientifically literate communities.

KEYWORDS: Disaster Management; Risk Reduction; Scientific Temper; Science Communication

1. Introduction

India's vulnerability to natural and human-induced disasters has intensified in recent decades due to climate variability, rapid urbanisation, environmental degradation, and the growing interdependence of critical infrastructure systems. Addressing these risks effectively requires not only technological capability

and institutional preparedness but also the cultivation of scientific temper within society—an approach that emphasises evidence-based reasoning, proactive planning, collective action, and learning from past events. In this context, public communication of science-informed governance plays a vital role in shaping risk perception, influencing behavioural responses, and strengthening societal resilience.

The tableau presented by the National Disaster Management Authority (NDMA) at the 77th Republic Day Parade on Kartavya Path, New Delhi, offered a rare instance of disaster risk management being conveyed to the public as a coherent, science-driven system rather than as an episodic emergency function. Marking twenty-five years since the 2001 Bhuj earthquake, the tableau traced India's evolution across the full disaster management continuum—early warning, response, recovery, preparedness, mitigation, and the principle of Build Back Better—placing trained community volunteers, the Aapda Mitra, at its centre. These volunteers symbolise citizens as active participants in disaster risk reduction rather than passive recipients of aid.

Figure 1 illustrates the integrated disaster risk management framework depicted in the NDMA tableau. The visual composition highlights the operational coordination between institutional response forces, such as the National Disaster Response Force (NDRF), and trained community responders across multiple hazard scenarios, including earthquakes, floods, urban collapses, and industrial accidents. Emphasis on human-centric rescue, protection of vulnerable populations, and the cyclical representation of Prevention–Preparedness–Response–Recovery underscores India's shift from reactive relief to proactive risk reduction and resilience building.

This article interprets the NDMA tableau as more than a ceremonial display, presenting it as a public articulation of scientific temper in action. By examining the tableau through the lenses of collective memory, evidence-based preparedness, and community-level response capacity, the study demonstrates how disaster resilience in India is increasingly framed as a socio-technical endeavour, where scientific knowledge is translated into tangible action through trained institutions and empowered citizens.

Fig. 1 National Disaster Management Authority (NDMA) Tableau at the Republic Day Parade, Kartavya Path, New Delhi.

The tableau illustrates India's integrated disaster risk management framework under the NDMA and NDRF. Central visuals show trained responders conducting rescue operations amid simulated debris, symbolising preparedness for earthquakes (commemorating 25 years since the Bhuj earthquake), urban collapse, floods, industrial accidents, and other hazards. A prominent sculpture of a woman rescuer carrying a child highlights the human-centric approach, with emphasis on protecting vulnerable populations. Structural elements such as collapsed buildings, fire symbols, and flood imagery represent the diversity of disaster typologies. The emblematic Prevention–Preparedness–Response–Recovery cycle conveys the comprehensive disaster management continuum adopted in India. Marching responders alongside the moving platform reinforce operational readiness, professionalism, and the nationwide reach of India's disaster response ecosystem, reflecting the ongoing shift from reactive relief to proactive resilience building.

2. The Bhuj Earthquake as a Scientific and Institutional Turning Point

The 26 January 2001 Bhuj earthquake represents a defining moment in India's contemporary disaster management history. With widespread structural collapse, large-scale loss of life, and

severe disruption of lifelines and livelihoods, the event exposed systemic vulnerabilities in seismic risk awareness, construction practices, emergency response capacity, and institutional coordination. Importantly, the scale of devastation revealed that disasters are not solely the result of extreme natural events but are significantly shaped by the interaction between hazards, built environments, and societal preparedness.

Post-disaster assessments of the Bhuj earthquake highlighted critical deficiencies in hazard mapping, enforcement of building codes, emergency medical response, and community-level preparedness. The absence of trained local responders during the critical early hours amplified casualties and delayed organised rescue operations. These findings reinforced a key scientific insight in disaster studies: while advanced response forces play an essential role, the majority of life-saving actions in the immediate aftermath of disasters are undertaken by those already present at the site. Consequently, preparedness at the community level emerged as a decisive factor in reducing disaster impacts.

The Bhuj experience also marked a shift in how disaster risk was understood within policy and scientific discourse in India. Rather than treating disasters as isolated emergencies requiring ad hoc relief, the event catalysed a systems-based perspective that recognised disaster risk as a function of exposure, vulnerability, and response capacity. This reframing led to the establishment of institutional mechanisms such as the National Disaster Management Authority and the strengthening of dedicated response forces, alongside the formulation of national and state disaster management plans grounded in risk reduction and preparedness.

Equally significant was the role of memory and learning in shaping this transition. Scientific progress depends on the systematic analysis of past failures and the incorporation of lessons into improved practices. The continued reference to Bhuj in policy discourse and public communication, including its explicit commemoration in the NDMA Republic Day tableau, reflects an understanding of disasters as cumulative learning events. By institutionalising memory, disaster management evolves from reactive response to anticipatory governance.

Thus, the Bhuj earthquake served not only as a trigger for organisational reform, but also as a catalyst for embedding scientific temper into disaster governance. It reinforced the need for evidence-based planning, risk-informed development, and the empowerment of trained citizens as an integral component of national resilience. These principles form the foundation upon which subsequent initiatives, including the Aapda Mitra programme, have been conceptualised and implemented.

3. Disaster Risk Management Continuum: From Early Warning to Build Back Better

Contemporary disaster risk management is increasingly conceptualised as a continuous and integrated process rather than a sequence of isolated interventions. This approach recognises that effective risk reduction depends on the coordinated functioning of multiple phases—early warning, response, recovery, preparedness, mitigation, and adaptive reconstruction—each informed by scientific evidence and operational learning. In India, this systems-based perspective gained prominence following the Bhuj earthquake and has since been institutionalised through national policies and operational frameworks.

Advances in hazard monitoring and early warning systems constitute the first layer of this continuum. India has developed multi-hazard early warning capabilities using satellite observations, meteorological and hydrological monitoring networks, seismic instrumentation, and heatwave forecasting systems. These technologies have significantly improved lead times for cyclones, floods, heatwaves, and other environmental hazards. However, scientific evidence consistently demonstrates that early warnings translate into risk reduction only when they are effectively communicated and when communities possess the knowledge and capacity to respond appropriately.

The response phase is characterised by the critical importance of the initial hours following a disaster. Empirical studies indicate that a substantial proportion of rescues occur before the arrival of specialised forces, underscoring the central role of local actors. Scientific understanding of structural behaviour, fire dynamics, flood hydraulics, and human physiology informs effective rescue, first aid, and evacuation during this period.

Trained responders operating at the community level therefore represent a vital interface between hazard occurrence and formal emergency response systems.

Recovery extends beyond physical reconstruction to include the restoration of livelihoods, social services, and public confidence. Evidence from post-disaster contexts shows that recovery outcomes are strongly influenced by community participation, trust in institutions, and the availability of accurate information. Recovery planning that integrates technical assessments with social and economic considerations contributes to more resilient systems and reduces the likelihood of recurrent losses.

Preparedness and mitigation constitute the preventive core of the disaster management continuum. Preparedness involves systematic training, mock drills, awareness programmes, and contingency planning, while mitigation focuses on risk-informed land-use planning, structural safety, and adherence to building codes. These measures reduce vulnerability before hazards materialise, often without immediate visibility. Their effectiveness, however, reflects the application of scientific knowledge to policy, planning, and behavioural practice.

The principle of *Build Back Better* represents the adaptive dimension of disaster risk management. It emphasises learning from each disaster to improve design standards, institutional arrangements, and governance mechanisms. Rather than restoring pre-disaster conditions, this approach seeks to reduce future risk through incremental improvement. Fig. 1 illustrates this integrated disaster risk management continuum as represented in the NDMA Republic Day tableau, highlighting the interconnection between prevention, preparedness, response, and recovery, as well as the operational integration of institutional response forces and trained community volunteers across diverse hazard scenarios.

Together, these phases constitute a dynamic socio-technical system in which scientific knowledge, institutional capacity, and community participation interact to shape disaster outcomes. Understanding this continuum is essential for appreciating the role of programmes such as Aapda Mitra, which operationalise scientific principles at the community level and strengthen the early and intermediate layers of disaster response.

4. Aapda Mitra Programme: Community Volunteers as a Scientific Interface

The effectiveness of disaster response during the early and intermediate phases depends critically on the availability of trained personnel at or near the site of impact. Recognising this, India's disaster management framework has increasingly emphasised the role of community-based responders as a complement to specialised institutional forces. The Aapda Mitra programme represents a structured attempt to translate scientific principles of disaster response into community-level capacity, thereby strengthening the functional continuity of the disaster risk management system.

Aapda Mitra volunteers are trained in essential response functions, including search and rescue, first aid, evacuation, and basic incident management. While these activities may appear operational in nature, they are grounded in well-established scientific knowledge. Training modules incorporate principles of structural stability and collapse behaviour, human physiology under stress and injury, fire dynamics, flood and water-flow behaviour, and risk-based decision-making under uncertainty. By embedding such knowledge into practical skills, the programme enables community responders to act effectively during the critical early hours following a disaster.

From a systems perspective, Aapda Mitra functions as an intermediate response layer between affected populations and formal response agencies such as the National Disaster Response Force. This layer addresses a recurring vulnerability identified in disaster science: the temporal and spatial gap between hazard occurrence and the arrival of specialised response forces. By reducing this gap, trained volunteers contribute to improved survival outcomes, better coordination, and reduced secondary impacts during emergencies.

Beyond immediate response, Aapda Mitra volunteers play a role across multiple phases of the disaster management continuum. During preparedness, they participate in mock drills, awareness campaigns, and local risk mapping, reinforcing hazard literacy within communities. In the recovery phase, they support relief distribution, shelter management, and communication

between authorities and affected populations. These activities contribute to social cohesion and trust, factors that empirical studies have shown to be critical for effective recovery and long-term resilience.

Importantly, the Aapda Mitra programme exemplifies scientific temper as a social practice rather than as an abstract ideal. Scientific temper, in this context, is reflected in calm and disciplined behaviour, adherence to evidence-based procedures, willingness to learn from training and experience, and collective action in the public interest. By institutionalising these attributes through systematic training and integration with formal response systems, the programme transforms scientific knowledge into routine civic capability.

The prominence of Aapda Mitra in the NDMA Republic Day tableau underscores the recognition of trained citizens as an indispensable component of India's disaster governance architecture. It signals a shift from viewing communities as passive recipients of aid to recognising them as active agents in risk reduction. In doing so, the programme strengthens the socio-technical foundations of disaster resilience and reinforces the role of science as a lived, practice-oriented element of public life.

5. Scientific Temper Beyond Technology

Scientific temper is often narrowly associated with technological advancement or scientific infrastructure. However, in the context of disaster risk management, it encompasses a broader set of cognitive, behavioural, and social attributes, including rational decision-making, respect for evidence, preparedness through training, and collective responsibility. Disasters test not only technological systems but also the capacity of societies to apply scientific knowledge under conditions of uncertainty and stress.

In disaster contexts, scientific temper manifests through disciplined response rather than improvisation, trust in verified information rather than rumours, and coordinated action rather than individualistic behaviour. These attributes are particularly critical during the early stages of emergencies, when incomplete information and time constraints heighten the risk of error. Training and repeated practice play a central role in embedding

such behaviour, converting abstract scientific principles into habitual responses.

Community-based disaster preparedness initiatives provide an effective pathway for operationalising scientific temper at the societal level. By equipping citizens with a basic understanding of hazard behaviour, human response limits, and risk mitigation strategies, such programmes enable individuals to interpret warnings, assess situations, and act proportionately. This distributed capacity enhances the overall robustness of the disaster management system, especially in geographically diverse and densely populated settings.

The NDMA Republic Day tableau can be interpreted as a public representation of this expanded notion of scientific temper. Rather than foregrounding technology alone, it highlighted trained human agency operating in conjunction with institutional systems. The visual emphasis on preparedness, protection of vulnerable populations, and continuity across disaster phases conveyed that scientific knowledge becomes effective only when it is socially embedded and widely practised.

By framing disaster resilience as a shared societal endeavour grounded in scientific reasoning, the tableau reinforced the idea that scientific temper is not confined to laboratories or expert communities. Instead, it is expressed through everyday civic behaviour—preparedness, cooperation, and service—particularly in moments of crisis. This interpretation aligns with contemporary perspectives in science and technology studies, which emphasise the co-production of scientific knowledge and social order.

Thus, scientific temper in disaster management extends beyond technological capability to include institutional learning, community participation, and behavioural preparedness. Recognising and nurturing this broader conception is essential for sustaining disaster resilience in an era of increasing environmental uncertainty.

6. Public Demonstration of Science-Informed Governance

Science-informed governance relies not only on the formulation of evidence-based policies but also on their effective communication and social legitimisation. In the domain of

disaster risk management, where public behaviour and trust significantly influence outcomes, the visibility of preparedness, coordination, and institutional capability plays an important role. Public demonstrations of governance, when grounded in scientific reasoning, can therefore function as instruments of risk communication and societal learning.

The Republic Day Parade provides a nationally visible platform through which the state communicates priorities, values, and institutional capacity. The NDMA tableau presented disaster management not as an episodic response to emergencies, but as a continuous, integrated system encompassing prevention, preparedness, response, recovery, and adaptive reconstruction. By visually representing this continuum, the tableau translated complex governance frameworks into an accessible narrative for a broad audience.

Importantly, the tableau foregrounded the integration of professional response forces with trained community volunteers, reinforcing the idea that disaster resilience is a shared responsibility. This representation aligns with contemporary governance approaches that emphasise decentralisation, community participation, and multi-level coordination. By highlighting Aapda Mitra alongside institutional responders, the tableau conveyed a model of governance in which scientific knowledge is operationalised through both formal structures and civic engagement.

From a science communication perspective, the tableau functioned as a non-verbal educational tool. The use of recognisable hazard scenarios, human-centric rescue imagery, and cyclical representations of disaster phases enabled intuitive understanding without reliance on technical language. Such visual communication can enhance public comprehension of risk and preparedness, particularly in a country characterised by linguistic, cultural, and educational diversity.

The public articulation of disaster preparedness also contributes to institutional credibility and trust. When citizens perceive that disaster risk management is systematic, rehearsed, and inclusive, compliance with warnings and response directives is more likely. In this sense, the tableau served not merely as a

symbolic display but as an affirmation of the state's commitment to proactive risk reduction and resilience building.

Thus, the NDMA tableau illustrates how science-informed governance can be communicated through public platforms in ways that strengthen science–society linkages. By making preparedness visible and relatable, such demonstrations help embed scientific temper within public consciousness and reinforce disaster resilience as a collective civic value.

7. Discussion

The analysis presented in this article highlights disaster resilience as a socio-technical outcome shaped by the interaction of scientific knowledge, institutional capacity, and community participation. The NDMA Republic Day tableau serves as a focal case illustrating how these elements are increasingly being aligned within India's disaster risk management framework. Rather than treating disasters as exceptional events, the tableau reflects a systems-oriented understanding in which preparedness, response, and recovery are continuous and interdependent processes.

A key insight emerging from this discussion is the central role of trained citizens in bridging the temporal and functional gaps inherent in disaster response systems. While specialised response forces remain indispensable, their effectiveness is enhanced when complemented by community-level capacity during the critical early phases of emergencies. The Aapda Mitra programme exemplifies how scientific principles can be operationalised at the societal level, transforming abstract knowledge into routine preparedness and disciplined action.

The article also highlights the importance of collective memory in sustaining scientific temper within governance systems. The continued reference to the Bhuj earthquake, including its commemoration through public platforms, demonstrates how past disasters function as learning anchors for institutional reform and behavioural change. Such memory-based learning aligns with scientific practice, where iterative improvement is driven by systematic evaluation of past outcomes.

From a governance perspective, the public demonstration of disaster preparedness contributes to institutional legitimacy and trust. Visible integration of technology, institutions, and trained citizens reinforces confidence in early warnings, response protocols, and recovery measures. This trust is particularly significant in disaster contexts, where compliance with advisories and coordinated action can substantially influence outcomes.

At a broader level, the findings suggest that scientific temper in disaster management extends beyond technological sophistication to include behavioural preparedness, social coordination, and evidence-informed decision-making under uncertainty. Embedding these attributes within communities enhances the robustness of the disaster management system, especially in the face of increasingly complex and cascading environmental risks.

Together, these observations point to the value of viewing disaster risk management not merely as an administrative or technical function, but as a dynamic interface between science and society. Strengthening this interface through training, communication, and public engagement remains critical for sustaining disaster resilience in India.

8. Conclusion

Disaster resilience in contemporary societies is not achieved solely through technological advancement or institutional capacity, but through the effective integration of scientific knowledge into social practice. The NDMA Republic Day tableau, examined in this article, offers a compelling illustration of how disaster risk management can be publicly articulated as a coherent, science-informed system encompassing prevention, preparedness, response, recovery, and adaptive reconstruction.

By foregrounding trained community volunteers alongside institutional response mechanisms, the tableau emphasises the indispensable role of citizens in translating scientific principles into timely action. The Aapda Mitra programme emerges as a practical embodiment of scientific temper, demonstrating how evidence-based training, disciplined behaviour, and collective responsibility can be institutionalised at the community level.

The continued invocation of the Bhuj earthquake underscores the importance of memory and learning in disaster governance. Treating disasters as cumulative learning events aligns disaster management with scientific practice, where progress is driven by reflection, correction, and improvement. Public platforms that reinforce this learning contribute to sustaining preparedness and risk awareness over time.

As environmental hazards grow in frequency and complexity, strengthening the science–society interface will remain central to effective disaster risk reduction. Initiatives that embed scientific temper within everyday civic life—through training, communication, and public engagement—offer a durable pathway towards resilience. In this sense, when scientific temper is made visible and actionable, it becomes not only a guiding principle but a lived practice of governance and citizenship.

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