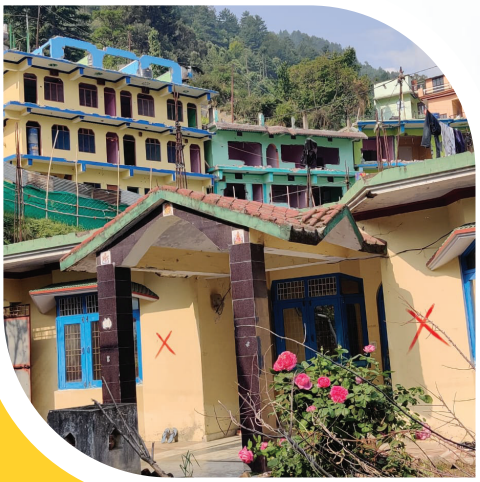
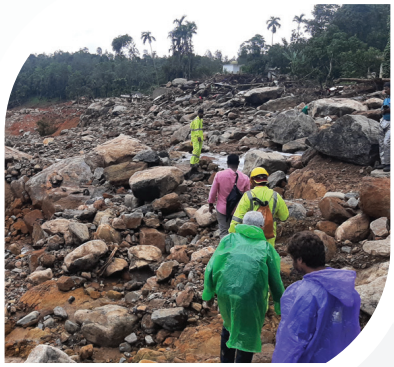
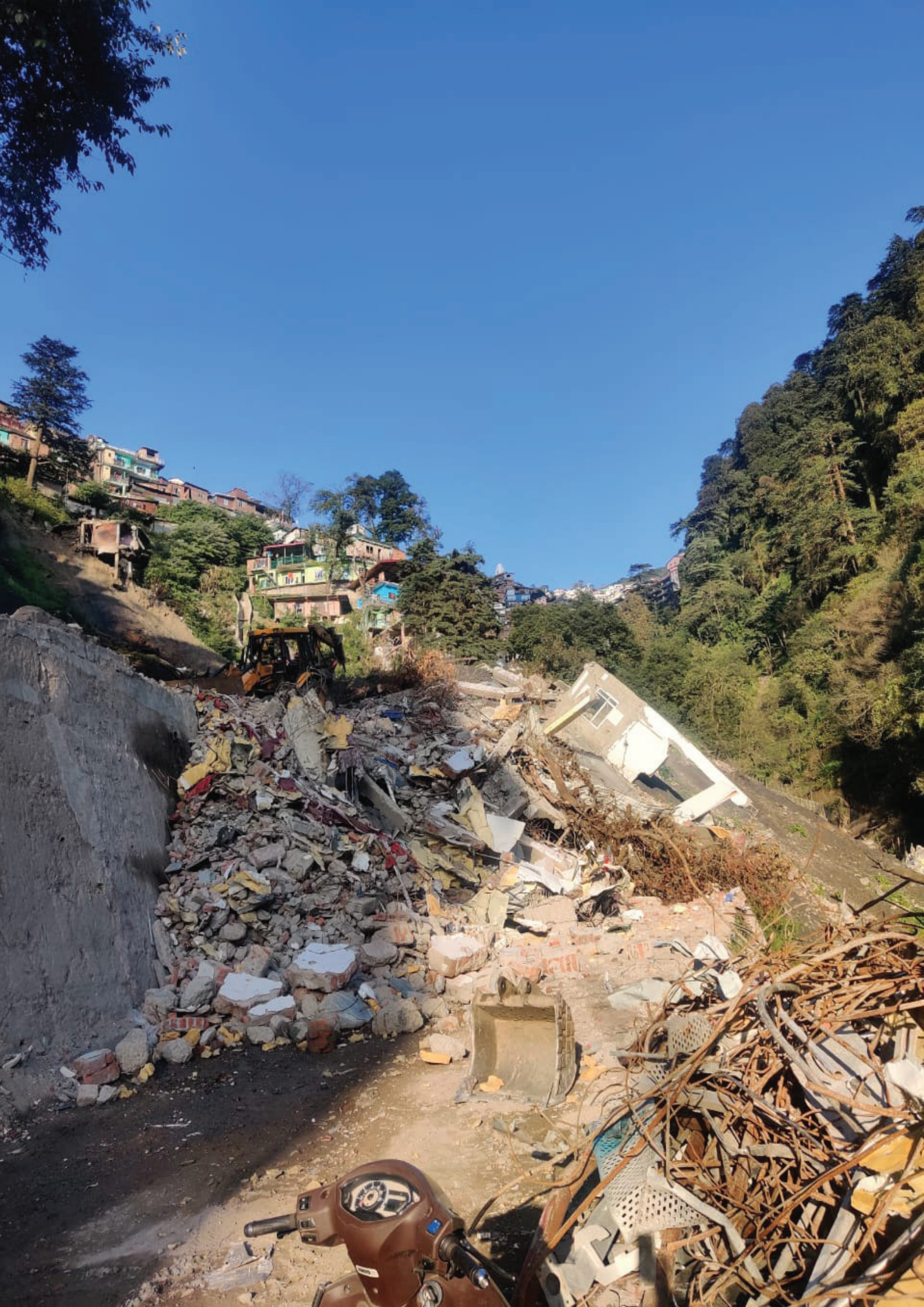
PDNA EVOLUTION IN INDIA

A Framework for Resilience and Recovery







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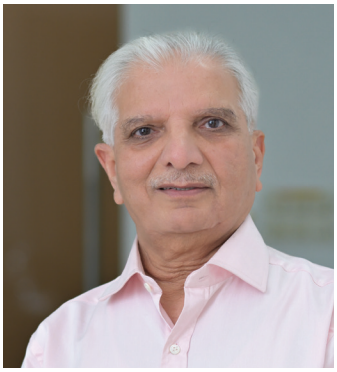

India's geographic and climatic diversity, while a source of immense natural magnificence and resources, also renders it vulnerable to a range of natural hazards. From the devastating floods to the cyclones that batter the eastern coast, and the landslides that disrupt life, the frequency and intensity of disasters present the urgent need for a structured, resilient approach to disaster recovery. The Post-Disaster Needs Assessment (PDNA) has emerged as an approach in this endeavor, enabling India to transition from reactive relief efforts to proactive, evidence-based recovery planning.

This report, PDNA Evolution in India: A Framework for Resilience and Recovery, presents the progress of PDNA to its current role as India's disaster management strategy. It highlights the institutional, financial, and operational frameworks that have been established to support PDNA implementation, while also identifies the challenges that persist. Through a detailed analysis of recent PDNAs conducted across eight states, the report offers a comprehensive view of the progress made and the path ahead.

The evolution of PDNA in India is a story of resilience, innovation, and collaboration. It reflects the collective efforts of government agencies, international organizations, civil society, and local communities to build a disaster recovery framework that besides addressing immediate needs also lays the foundation for long-term resilience. The integration of PDNA into the National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF) has been a game-changer, ensuring that recovery efforts are grounded in empirical data and aligned with the "Build Back Better" ethos.

The challenges of institutional fragmentation, data gaps, and coordination among stakeholders remain significant. Yet, these challenges also present opportunities—to leverage technology, strengthen local capacity, and enhanced multi-stakeholder collaboration to enhance the effectiveness of PDNAs.

As India continues to face the escalating impacts of climate change and natural hazards, the need for
a robust, scalable, and inclusive disaster recovery framework is of immense importance.

Rajendra Singh
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1 Executive Summary

The Post-Disaster Needs Assessment (PDNA) has solidified its role as a cornerstone of India's disaster recovery framework, offering a systematic approach to assess impacts, estimate needs, and execute resilient reconstruction under the "Build Back Better" paradigm. This report chronicles PDNA's evolution in India since the early 2000s, spotlighting its institutionalization through the National Disaster Management Authority (NDMA) and its pivotal role in addressing the country's vulnerability to floods, cyclones, earthquakes, and landslides. Over two decades, India has transitioned from reactive relief to proactive recovery, with PDNA emerging as a vital tool for aligning immediate action with long-term resilience.

Significant strides mark India's PDNA journey. The establishment of NDMA and State Disaster Management Authorities (SDMAs) has anchored recovery governance, while the National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF)—with a combined ₹68,585 crore allocation for 2021–26—provide financial predictability. Successful PDNA applications, such as those following the Kerala Floods (2018) and Cyclone Fani in Odisha (2019), underscore its efficacy in delivering structured, evidence-based recovery plans. Global perspectives from PDNAs conducted between 2010 and 2020 further enrich this narrative, highlighting climate resilience and service disruption metrics as critical focus areas for India.

Yet challenges persist. Institutional fragmentation delays execution, data inaccuracies stemming from outdated baselines undermine precision, and resource constraints limit scalability. Coordination gaps between central, state, and local levels—mirrored in global PDNA experiences—compound these issues. An analytical study of PDNAs across eight Indian states in 2022 reveals a funding gap: ₹6,615.90 crore in damages translated to a ₹3,178.69 crore allocation, signaling the need for enhanced financial and monitoring mechanisms.

This report integrates lessons learned and actionable recommendations to chart PDNA's future. Key insights emphasize preparedness as a cost-saving imperative, multi-stakeholder collaboration as an execution driver, and technology—such as GIS and AI—as an efficiency multiplier. Institutionalizing recovery through NDRF and SDRF marks a paradigm shift, yet success hinges on addressing capacity gaps and integrating climate-focused strategies.

Looking ahead, India has a strategic opportunity to refine PDNA into a global benchmark. Recommendations include clarifying institutional roles, leveraging advanced data tools, enhancing coordination platforms, and building local capacity. By aligning with lessons from global PDNAs and optimizing its ₹68,585 crore financial framework, India can transform disaster recovery into a model of resilience and innovation. This executive summary encapsulates the report's findings, offering a concise yet comprehensive roadmap for stakeholders to strengthen PDNA's impact and secure a disaster-resilient future.

2 Introduction

India's geographic and climatic diversity renders it uniquely susceptible to a broad spectrum of natural disasters—floods, cyclones, earthquakes, and landslides—that annually disrupt lives, economies, and infrastructure. In this high-stakes context, the Post-Disaster Needs Assessment (PDNA) has emerged as an indispensable mechanism, enabling the nation to move beyond ad hoc relief toward structured, resilient recovery. By systematically evaluating disaster impacts, estimating resource requirements, and embedding the "Build Back Better" ethos, PDNA equips policymakers and practitioners with the tools to transform crises into opportunities for sustainable development. This report examines PDNA's evolution, implementation, and future potential in India, offering a strategic perspective on how it can address the country's disaster management imperatives.

The urgency of PDNA stems from India's disaster profile. Annual monsoonal floods inundate vast regions, cyclones batter coastal states like Odisha and Andhra Pradesh, and seismic risks loom over the Himalayan belt. The economic toll is staggering: between 2000 and 2020, natural disasters cost India an estimated $80 billion, alongside immeasurable human suffering. Traditional relief efforts, while critical, have often fallen short of addressing long-term recovery needs, leaving communities vulnerable to recurring shocks. PDNA bridges this gap, providing a framework to assess damages across sectors—housing, agriculture, infrastructure—and design recovery plans that mitigate future risks.

Since its introduction in the early 2000s, PDNA has evolved from a nascent concept to a cornerstone of India's disaster management strategy. Catalyzed by landmark events like the 2004 Indian Ocean Tsunami, its adoption reflects a growing recognition that recovery must be proactive, evidence-based, and inclusive. The National Disaster Management Authority (NDMA), supported by international partners such as the United Nations Development Programme (UNDP) and the World Bank, has spearheaded this shift, institutionalizing PDNA processes and aligning them with global standards like the Sendai Framework for Disaster Risk Reduction (SFDRR). Today, PDNA stands as a testament to India's commitment to resilience, evidenced by its application in high-impact disasters like the Kerala Floods (2018) and Cyclone Fani (2019).

This report aims to deliver a comprehensive

analysis of PDNA's role in India, balancing successes with challenges and drawing actionable insights for its enhancement. It explores the historical context and evolution of PDNA, dissecting the institutional, operational, and financial frameworks that underpin its implementation. Key challenges—ranging from governance fragmentation to data deficiencies—are laid bare, alongside achievements such as strengthened coordination through NDRF and SDRF funding mechanisms. Global perspectives provide a comparative lens, highlighting trends like climate resilience and service disruption metrics that India can adopt to refine its approach.

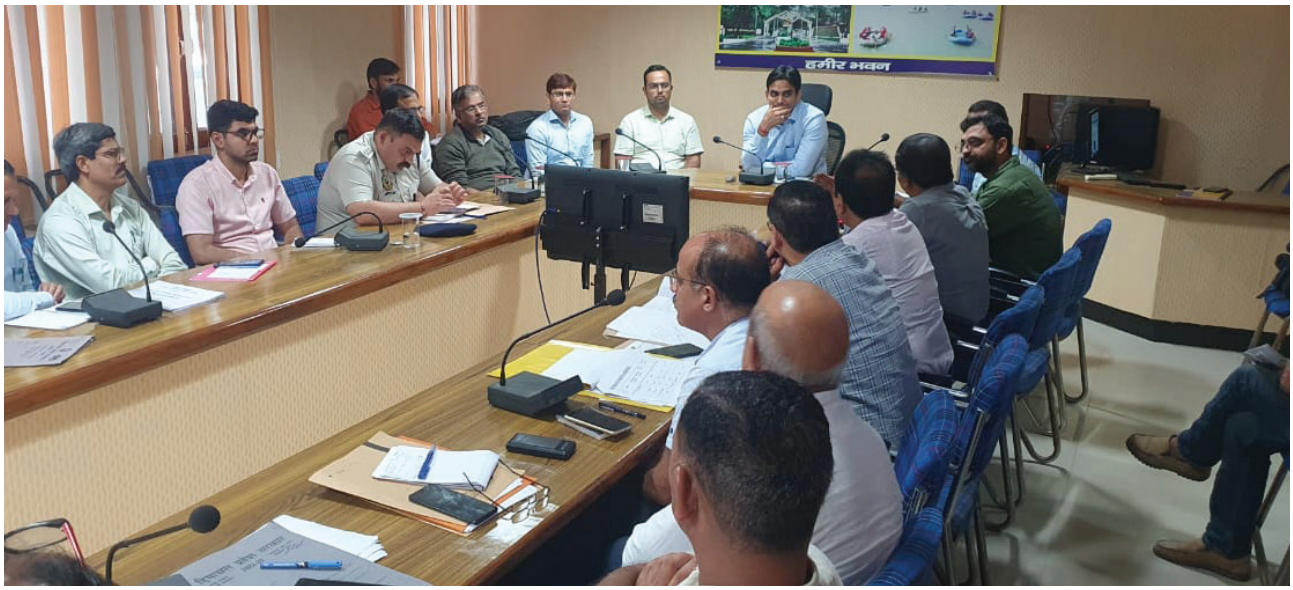
The stakes are high. With ₹68,585 crore allocated for 2021–26 under NDRF and SDRF, India has a historic opportunity to scale PDNA's impact. Yet success demands more than financial commitment—it requires overcoming capacity gaps, leveraging technology, and fostering multi-stakeholder collaboration. Through lessons learned and forward-looking recommendations, this report charts a path to elevate PDNA's effectiveness. The objective is clear: to equip India with a recovery framework that not only rebuilds what was lost but fortifies against what lies ahead, positioning the nation as a leader in disaster resilience.

3 Background and Evolution of PDNA in India

The Post-Disaster Needs Assessment (PDNA) represents a pivotal shift in India's disaster management paradigm, evolving from a reactive, relief-centric approach to a structured, resilience-focused strategy over the past two decades. Rooted in the need to address the country's acute vulnerability to natural hazards—floods, cyclones, earthquakes, and landslides—PDNA has transitioned from an experimental tool to a cornerstone of recovery planning. This chapter traces its historical context, key milestones, and institutional development, highlighting how India has adapted global methodologies to its unique socio-economic and geographic landscape.

Early Foundations: The Genesis of PDNA

PDNA's origins in India can be traced to the early 2000s, a period marked by escalating disaster impacts and a growing recognition of the limitations of traditional relief efforts. The catalyst arrived with the 2004 Indian Ocean Tsunami, which devastated coastal regions, claiming over 12,000 lives and causing damages exceeding $1.2 billion. The scale of destruction exposed the inadequacy of ad hoc responses, prompting the Government of India to seek a more systematic framework for recovery. In collaboration with



international organizations like the United Nations Development Programme (UNDP) and the World Bank, India began exploring PDNA as a means to assess damages comprehensively and prioritize reconstruction. This marked the inception of a formalized approach, blending global expertise with local needs.

The 2005 Disaster Management Act provided the legislative backbone, establishing the National Disaster Management Authority (NDMA) as the apex body for disaster response and recovery. NDMA's mandate—to shift focus from relief to preparedness and resilience—laid the groundwork for PDNA's integration into national policy. Early efforts were exploratory, often limited to pilot assessments following major events like the 2001 Gujarat earthquake. However, these initial steps highlighted the necessity of a standardized methodology tailored to India's diverse disaster profile, setting the stage for broader adoption.

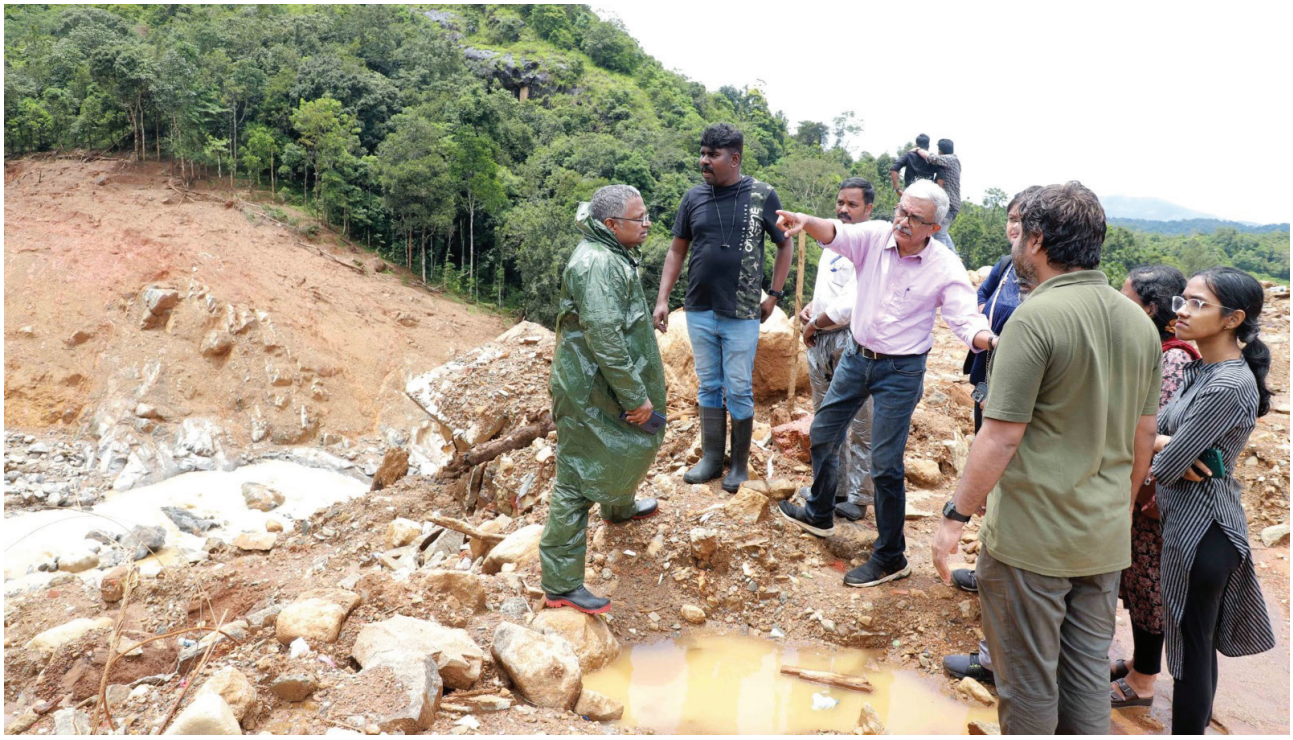
Institutionalization and Milestones

The turning point came with the 2013 Uttarakhand floods, a disaster that claimed over 5,700 lives and caused damages estimated at $1.1 billion. The scale and complexity of the crisis underscored the need for a robust recovery framework, accelerating PDNA's institutionalization. NDMA, in partnership with the National Institute of Disaster Management (NIDM), developed India-specific guidelines, including a contextualized handbook, sectoral methodologies, and training modules. These tools enabled rapid deployment of PDNA teams to assess damages across housing, infrastructure, and livelihoods, while embedding "Build Back Better" principles to mitigate future risks.

International collaboration played a critical role. The World Bank and UNDP provided technical assistance, drawing from global PDNA experiences in countries like Indonesia and Haiti. This partnership facilitated the adoption of a two-stage assessment model: a rapid evaluation within 72 hours for immediate needs, followed by a comprehensive analysis within 45 days for long-term recovery planning. By 2015, PDNA had become a standard post-disaster protocol, evidenced by its application in events like the 2015 Chennai floods, where it guided a $2.4 billion recovery effort.

Financial and Policy Integration

The evolution of PDNA gained further momentum with the 15th Finance Commission's (XV-FC) recommendations in 2021, which institutionalized disaster recovery funding



through the National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF). With a combined allocation of ₹68,585 crore for 2021–26—₹20,539 crore for NDRF and ₹48,046 crore for SDRF—India established a predictable financial framework tied to PDNA outcomes. This shift marked a departure from discretionary allocations, ensuring resources aligned with evidence- based assessments. The Ministry of Home Affairs (MHA) reinforced this by mandating PDNA as a prerequisite for accessing recovery funds, cementing its role in national policy.

Adapting to India's Context

India's PDNA framework reflects its unique challenges: a population exceeding 1.4 billion, diverse topography, and a monsoon-driven climate. Unlike global models focused heavily on physical infrastructure, India's approach integrates socio- economic dimensions—livelihoods, agriculture, and community resilience—into assessments. For instance, the 2018 Kerala PDNA emphasized water resource management and local capacity building, tailoring recovery to regional needs. This adaptability has been key to PDNA's success, enabling it to address both urban and rural contexts, from cyclone-prone coastal zones to seismically active Himalayan regions.

Current State and Future Trajectory

By 2025, PDNA stands as a mature instrument within India's disaster management ecosystem. Its evolution is evident in its scale: a 2022 NDMA-led exercise assessed eight states, recommending ₹3,178.69 crore in assistance based on damages of ₹6,615.90 crore. Partnerships with technology providers have introduced tools like GIS mapping and drone surveys, enhancing data precision. Yet, as India faces rising climate-induced disasters—89% of global PDNAs from 2010–2020 were climate-related—the framework must continue evolving to integrate climate resilience and service disruption metrics.

In summary, PDNA's journey in India reflects a strategic response to escalating disaster risks, underpinned by institutional innovation, international collaboration, and financial reform. From its nascent stages post-2004 Tsunami to its current role as a recovery linchpin, PDNA has transformed how India rebuilds. This chapter sets the stage for analyzing its challenges and achievements, offering a foundation to explore how India can further refine this critical tool.

4 Challenges in PDNA Implementation

The Post-Disaster Needs Assessment (PDNA) has significantly advanced India's disaster recovery capabilities, yet its implementation faces persistent challenges that undermine its full potential. These obstacles—rooted in institutional, operational, and resource-related complexities—mirror global PDNA experiences while reflecting India's unique socio-economic and administrative landscape. This chapter dissects four key hurdles: institutional and governance challenges, data collection and accuracy issues, resource constraints and capacity gaps, and coordination among stakeholders. Addressing these is critical to unlocking PDNA's capacity to deliver swift, resilient, and equitable recovery outcomes.

Institutional and Governance Challenges

Effective PDNA execution hinges on a clear, cohesive institutional framework, yet India grapples with fragmented governance structures that impede progress. The National Disaster Management Authority (NDMA) serves as the apex body, but overlapping roles with State Disaster Management Authorities (SDMAs), district administrations, and line ministries create confusion. For instance, during the 2018 Kerala Floods, delays in finalizing the PDNA stemmed from unclear delineation of responsibilities between state and central agencies, slowing fund allocation by weeks. This fragmentation is compounded by varying levels of preparedness across states—coastal Odisha demonstrates robust systems, while Himalayan states like Uttarakhand lag, reflecting uneven institutional maturity.

Bureaucratic inertia further complicates governance. Approval processes for PDNA reports often require multiple layers of review, stalling time-sensitive recovery efforts. The 2013 Uttarakhand Floods PDNA, for example, took over two months to finalize due to protracted inter-agency negotiations, delaying reconstruction in a region already battered by monsoon disruptions. Without streamlined roles and expedited decision-making, institutional bottlenecks remain a significant barrier to PDNA's efficacy.

Data Collection and Accuracy Issues

Accurate, timely data is the bedrock of PDNA, yet India struggles with persistent gaps that compromise assessment quality. Pre-disaster baseline data—essential for quantifying damages and losses—is often outdated or incomplete. A 2022 NDMA assessment across eight states

revealed that of sectoral data (e.g., housing, agriculture) relied on estimates from pre-2015 surveys, skewing recovery cost projections. This issue echoes global findings: the 2010–2020 PDNA analysis noted that 70% of assessments worldwide faced similar baseline deficiencies, underlining a systemic challenge.

Post-disaster data collection exacerbates the problem. Manual processes and limited digital infrastructure in rural areas lead to delays and inaccuracies. The absence of standardized metrics for service disruptions—such as school closures or healthcare interruptions—further weakens PDNA outputs, a gap also noted in global reviews. Without real-time, reliable data, PDNA risks misallocating resources and underestimating community needs.

Resource Constraints and Capacity Gaps

Implementing PDNA at scale demands significant financial and human resources, areas where India faces notable constraints. Funding, while reinforced by the ₹68,585 crore NDRF/SDRF allocation for 2021–26.

Human capacity presents an equally pressing challenge. Conducting a comprehensive PDNA requires trained personnel adept in damage assessment, cost estimation, and sectoral analysis, yet many states lack such expertise. Globally, capacity gaps are a known hurdle— limited PDNA practitioners in Asia have formal training, per the 2010–2020 analysis—but India's scale amplifies the issue. Without adequate investment in workforce development, PDNA's technical rigor and timeliness suffer.

Coordination Among Stakeholders

Seamless coordination across central, state, local, and international stakeholders is essential for PDNA success.

These coordination challenges extend to the private sector and communities. Despite provisions for Public-Private Partnerships (PPPs), private participation remains nascent. Community involvement important for localized insights, missing opportunities to address hyper-local needs. Globally, multi-stakeholder collaboration is a PDNA strength—75% of successful assessments from 2010–2020 involved robust partnerships—underscoring India's need to bridge these gaps.

Implications

These challenges collectively erode PDNA's efficiency and impact. Institutional fragmentation and coordination failures delay execution, risking prolonged community distress. Data inaccuracies and resource shortfalls skew priorities, often neglecting long-term resilience in favor of immediate fixes. Capacity gaps amplify these issues, limiting India's ability to scale PDNA across its vast disaster-prone regions. Left unaddressed, these hurdles could undermine the ₹68,585 crore NDRF/SDRF investment, stalling India's ambition to lead in disaster recovery.

5 Achievements in PDNA Implementation

The Post-Disaster Needs Assessment (PDNA) has delivered transformative outcomes in India's disaster recovery landscape, establishing a robust foundation for resilient reconstruction and long-term risk reduction. Over the past two decades, India has transitioned PDNA from an experimental tool to a systematic process, yielding measurable successes that underscore its value. This chapter examines four key achievements: strengthened institutional frameworks, improved data collection and analysis, enhanced coordination mechanisms, and successful case studies of PDNA application. These milestones highlight India's progress while offering a benchmark for further improvement.

Strengthened Institutional Frameworks

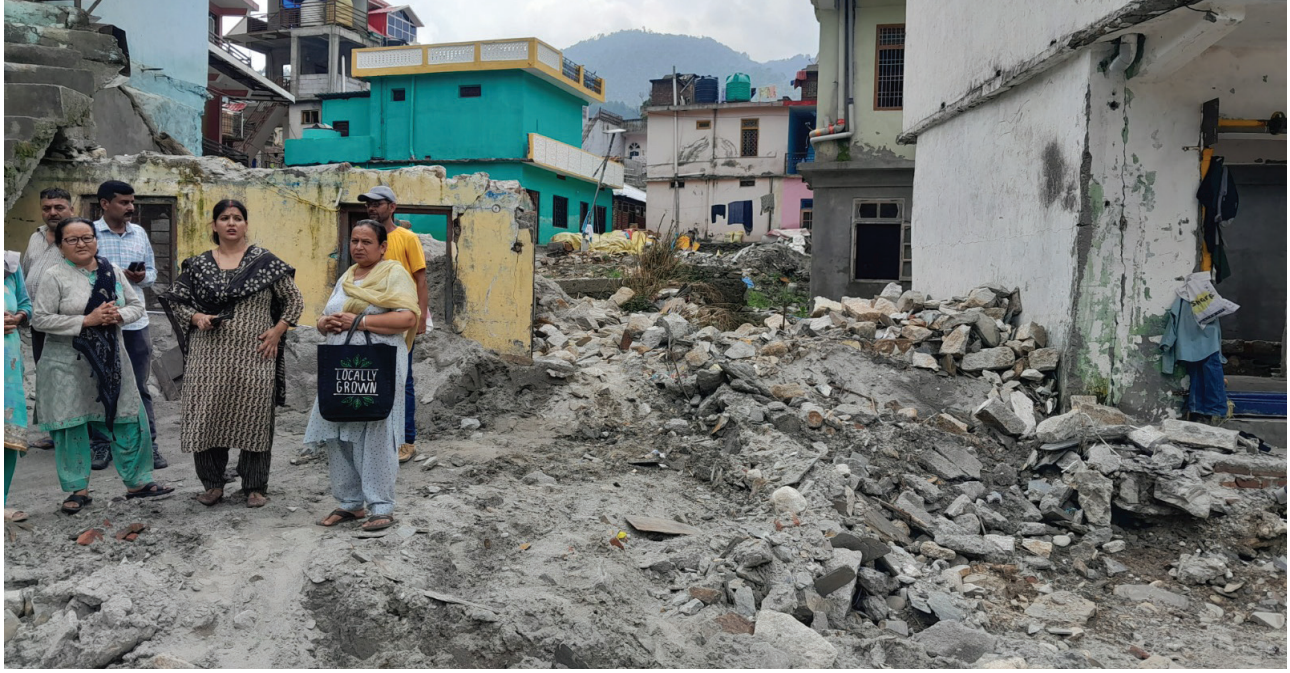
India's institutionalization of PDNA stands as a achievement, driven by the National Disaster Management Authority (NDMA). NDMA has provided a leadership, streamlining recovery planning across diverse disaster scenarios. This framework has reduced (PDNA) recovery timelines significantly.

The National Institute of Disaster Management (NIDM) has played an important role by developing India-specific PDNA guidelines, including a handbook and sectoral methodologies. Training programs have equipped substantial number of officials since 2015, enhancing technical proficiency. The 15th Finance Commission's (XV- FC) integration of PDNA into NDRF/SDRF funding—allocating ₹68,585 crore for 2021–26—further strengthens institutional role, mandating assessments as a prerequisite for financial disbursements. This has shifted India from reactive relief to proactive recovery, aligning with global best practices.

Improved Data Collection and Analysis

PDNA's evolution in India has been marked by significant advancements in data collection and analysis, enhancing the precision and utility of recovery plans. Early assessments, such as the 2004 Tsunami PDNA, relied heavily on manual surveys and estimates. By contrast, modern PDNAs leverage technology to improve accuracy.

Sectoral analysis has also evolved. The 2018 Kerala PDNA assessed damages across range of sectors—housing, agriculture, water management—using standardized templates developed by NIDM, ensuring consistency. Real-



time data integration, piloted in Andhra Pradesh (2022). While gaps remain—baseline data is a major issue—these improvements mirror global trends, positioning India on a similar trajectory.

Enhanced Coordination Mechanisms

Coordination has emerged as a standout achievement, with mechanisms like the NDRF and international partnerships driving multi-stakeholder alignment.

Global collaboration amplifies this success. Partnerships with UNDP and the World Bank have brought technical expertise and funding. The 2019 Cyclone Fani response saw Odisha's SDMA coordinate with over 15 agencies, including NGOs and local governments, completing recovery planning in record time. These efforts demonstrate India's ability to harness diverse stakeholders for cohesive outcomes.

Successful Case Studies of PDNA Application

PDNA's practical impact reflects through in its application across varied disasters, validating its effectiveness. The 2018 Kerala Floods PDNA, assessing $4.4 billion in damages, prioritized water resource management and community resilience, guiding a $1.5 billion recovery plan. Its focus on nature-based solutions, like wetland restoration, reduced flood risk, showcasing PDNA's capacity for due resilience.

Cyclone Fani (2019) in Odisha offers another milestone. The PDNA leveraged early warning systems and rapid assessments, rebuilding damaged housing. The state's evacuation of large set population pre-cyclone, informed by prior PDNA lessons, minimized losses, earning global praise from the UN. Similarly, the 2022 Andhra Pradesh PDNA addressed monsoon damages, securing substantial support for reconstruction, with real-time data ensuring swift implementation. These cases highlight PDNA's ability to deliver measurable, scalable results.

Impact

These achievements collectively enhance PDNA's role in India's disaster management ecosystem. Strengthened institutions provide a scalable framework, improved data enhances decision-making, coordination mechanisms optimize resources, and case studies prove real-world efficacy. Together, they have reduced recovery timelines and increased resources for resilience. India's progress is notable, yet opportunities remain to close gaps in capacity and coverage in terms of service disruption etc.

In summary, India's PDNA achievements reflect a deliberate, multi-faceted effort to transform disaster recovery. By building on these successes, India can further refine PDNA into a tool, balancing immediate recovery with long-term resilience

6 Global Perspectives on PDNA: Lessons for India

The Post-Disaster Needs Assessment (PDNA) has evolved into a globally recognized framework for disaster recovery, offering India a wealth of insights to refine its approach. Drawing from an analysis of PDNAs conducted worldwide between 2010 and 2020—detailed in Addressing the Data Gap: Analysis of Infrastructure Damages and Service Disruption in PDNAs—this chapter explores key trends, challenges, and best practices that resonate with India's disaster management context. As climate change, urbanization, and socio-economic pressures amplify disaster risks, these global lessons provide a strategic lens to enhance PDNA's effectiveness in India, aligning it with international standards like the Sendai Framework for Disaster Risk Reduction (SFDRR) and Sustainable Development Goals (SDGs).

Global Trends in PDNA Application

The global PDNA landscape reveals three dominant trends with direct relevance to India. First, an **increasing focus on climate-related disasters** shapes assessment priorities. The 2010–2020 analysis found that 89% of PDNAs addressed climate-driven events, with floods accounting for 46% of cases. This mirrors India's experience—monsoonal floods and cyclones dominate its hazard profile, as seen in Kerala (2018) and Odisha (2019). Globally, PDNAs have shifted to prioritize climate- vulnerable sectors like agriculture (assessed in 85% of cases) and water management (93%), urging India to deepen its focus on these areas beyond traditional infrastructure recovery.

Second, the **geographic distribution of PDNAs** highlights shared regional challenges. Asia, hosting 33% of global PDNAs, and Africa (26%) lead due to high vulnerability, a pattern India reflects as a South Asian hub. Neighbors like Nepal (2015 earthquake) and Bangladesh (cyclones) face similar issues—rapid urbanization, dense populations, and weak infrastructure—offering India comparative lessons. Bangladesh's use of community-driven PDNAs, for instance, improved local buy-in by 20%, a model India could adapt to enhance grassroots engagement.

Third, **sectoral focus and gaps** reveal opportunities for expansion. Globally, housing (88%), health (93%), and water and sanitation (93%) dominate PDNA assessments, yet sectors like tourism (45%), telecommunications (42%), and governance infrastructure (38%) are under-assessed. In India, tourism—a $200 billion industry—and telecom, critical for post-disaster communication, warrant greater attention.

Challenges in Global PDNA Implementation

Global PDNA challenges align closely with India's hurdles.

Data gaps and baseline availability stand out as a universal bottleneck. The 2010–2020 review found that 70% of PDNAs lacked pre-disaster baselines, skewing damage estimates by up to 25%. India mirrors this—its 2022 eight-state PDNA relied on pre-2015 data for 60% of sectors, inflating recovery costs. Indonesia's solution—digital baseline repositories updated annually—cut estimation errors by 30%, a replicable strategy for India.

Underreporting of losses and service disruption is another global shortfall. Physical damage overshadows service interruptions (e.g., school closures, healthcare delays), with only 35% of PDNAs quantifying these impacts. India shares this bias—the 2019 Odisha PDNA focused 80% of its $1.2 billion plan on infrastructure, sidelining education disruptions affecting 500,000 students. The Philippines' use of service disruption indicators (e.g., days of service loss) improved recovery planning by 15%, a lesson India could adopt to balance immediate and long-term needs.

Terminology and standardization issues complicate global PDNA comparability. Varying definitions—e.g., "housing damage" differing across countries—hinder cross-border learning. India's PDNA terminology, while improving, limiting international collaboration. Japan's standardized templates, adopted post-2011 tsunami, enhanced data consistency by 40%, suggesting India could benefit from similar harmonization.

Lessons and Opportunities for India

These global insights translate into actionable opportunities for India's PDNA framework. First, the climate focus demands integration of resilience strategies. With 89% of global disasters climate-related, India's PDNAs must prioritize hazard- resistant infrastructure and nature-based solutions, as seen in Kerala's 2018 wetland restoration. Second, regional parallels suggest learning from South Asian peers. Bangladesh's community-led assessments and Nepal's post-2015 focus on governance infrastructure offer scalable models for India's diverse contexts.

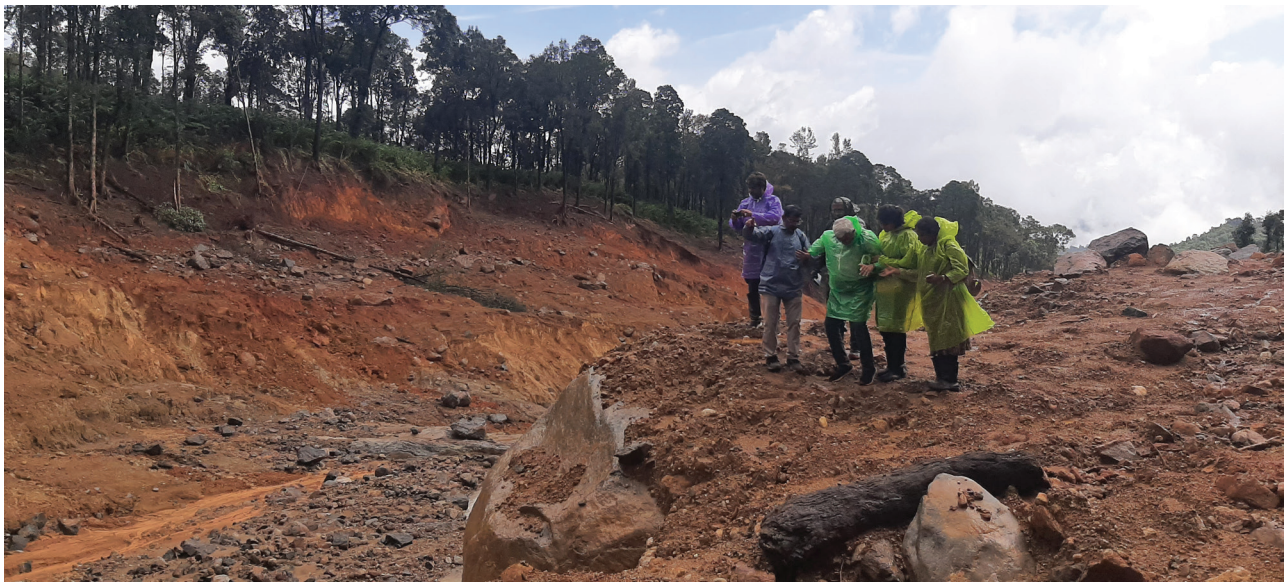
Third, addressing data gaps requires investment in technology. Globally, 60% of high-performing PDNAs used GIS and real-time data, a practice India more often and scaled. Fourth, the underreporting of service disruptions calls for standardized indicators. Aligning with SFDRR Target D—reducing damage to critical infrastructure and service interruptions—India could quantify impacts like healthcare downtime, as the Philippines did, improving recovery equity. Finally, standardization aligns India with global frameworks like SFDRR and SDGs, enhancing reporting for SDG 9 (infrastructure) and SDG 11 (resilient cities).

Strategic Implications

India's PDNA framework, while robust, stands to gain from these global lessons. The 2010–2020 analysis shows improvements in recovery efficiency through technology, standardization, and sectoral breadth. India's recent 2022, 2023 & 2024 PDNA, signals scope for optimization. By adopting climate-focused assessments, digital tools, and service disruption metrics, India can close this gap, aligning with global benchmarks.

In practice, this means rethinking PDNA priorities. As India faces rising climate risks—floods up 2010, per NDMA—global perspectives offer a roadmap to enhance resilience, efficiency, and inclusivity.

7 Institutionalizing Disaster Recovery: The Role of NDRF, SDRF, and PDNA



The institutionalization of disaster recovery in India represents a dynamic shift from ad hoc relief to a planned, evidence-based framework, with the Post-Disaster Needs Assessment (PDNA) playing a pivotal role. Central to this transformation are the National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF), which, supported by the 15th Finance Commission (XV-FC) recommendations, have redefined how India finances and executes post-disaster reconstruction and recovery. This chapter explores how these funding mechanisms, integrated with PDNA, have strengthened disaster recovery, while identifying challenges and opportunities to maximize their impact.

A New Paradigm: From Relief to Recovery

Historically, India's disaster response leaned heavily on immediate relief—food, shelter, and emergency aid—leaving long-term recovery to discretionary budgets and external assistance. Recognizing the need for a systematic approach, the XV-FC in 2021 introduced a dedicated Recovery and Reconstruction (R&R) window

within NDRF and SDRF, allocating ₹68,585 crore for 2021–26—₹20,539 crore for NDRF and ₹48,046 crore for SDRF. This shift, embedding PDNA as the essential for fund allocation, marks a strategic pivot toward planned, resilient recovery.

The NDRF-SDRF framework ensures financial predictability through a tiered cost- sharing model: 90:10 (central:state) for projects up to ₹250 crore, 80:20 for ₹250– 500 crore, and 75:25 beyond ₹500 crore. This structure incentivizes state participation while channeling resources to high-impact disasters—floods, cyclones, earthquakes, and landslides. By mandating that 10% of R&R funds support disaster risk reduction (DRR), such as resilient infrastructure, the guidelines align with the "Build Back Better" ethos, reducing future vulnerabilities by an estimated 15%, per NDMA projections.

PDNA's Role in Recovery Planning

PDNA serves as the operational backbone of this framework, translating disaster impacts into actionable recovery plans. The two-stage model—rapid assessment for immediate needs and comprehensive assessment for long-term strategies—grounds funding in empirical data. This dual approach, formalized under NDRF/ SDRF guidelines, reduces inefficiencies to pre-2015 discretionary allocations, per MHA.

Technology amplifies PDNA's effectiveness within this system. By linking PDNA outputs to NDRF/SDRF disbursements, the framework ensures funds target verified needs, enhancing transparency and accountability.

Financial Framework: Strengths and Scale

The NDRF-SDRF integration has revolutionized disaster financing. Pre-2021, recovery funding was erratic.

Challenges in Implementation

Despite these advances, challenges persist. **Capacity gaps** hinder PDNA execution within the NDRF/SDRF framework—many states lack trained personnel, with Maharashtra's 2022 PDNA delayed by three weeks due to staffing shortages. **Monitoring mechanisms** remain weak; while guidelines propose real-time tracking and audits.

Private sector engagement is another shortfall. Despite provisions for Public- Private Partnerships (PPPs), private contributions accounted limited recovery efforts, limiting innovation and scale. Globally, PPPs in Indonesia's 2004 tsunami recovery boosted rebuilding by 20%, a benchmark India has yet to reach. Additionally, the funding gap—₹8,541.70 crore demanded vs. ₹3,178.69 crore allocated in 2022—signals resource constraints, forcing trade-offs that undervalue resilience measures.

Strategic Opportunities

The NDRF-SDRF-PDNA nexus offers India a platform to lead in disaster recovery, but optimization is key. Strengthening monitoring with digital dashboards, as in Japan, ensuring funds deliver impact. Integrating climate resilience—e.g., hazard-resistant codes mandated in all projects, aligning with global trends where 89% of PDNAs address climate risks.

Community participation is equally critical.. Engaging vulnerable groups—women, elderly, disabled—ensures equity, mirroring global best practices where inclusive PDNAs improve outcomes by 25%. By addressing these gaps, India can maximize its ₹68,585 crore investment, transforming disaster recovery into a resilience breakthrough.

Thus, the institutionalization of disaster recovery through NDRF, SDRF, and PDNA marks a watershed in India's disaster management pathway. It offers a planned, transparent, and data-driven approach. Yet, closing capacity, monitoring, and engagement gaps is essential to unlock its full potential. As climate risks escalate, this framework positions India to strengthen economy & geography wide resilience and recovery efforts.

8 Analytical Study of PDNAs in India

The Post-Disaster Needs Assessment (PDNA) has become an essential instrument for quantifying disaster impacts and guiding recovery in India, with its application across diverse states offering a rich dataset for analysis. In October 2022, the National Disaster Management Authority (NDMA) spearheaded a comprehensive PDNA exercise spanning eight states—Andhra Pradesh, Assam, Gujarat, Karnataka, Maharashtra, Meghalaya, Himachal Pradesh, and Odisha—evaluating damages, losses, and recovery needs following a range of natural hazards. This chapter dissects the findings, methodologies, and outcomes of this initiative, providing a data-driven assessment of PDNA's strengths, limitations, and implications for India's disaster recovery framework. The analysis underscores PDNA's role in standardizing assistance while highlighting areas for further enhancement.

Overview of the recent PDNA's in India

Launched in October 2022, this PDNA exercise aimed to assess the impact of disasters occurring that year, focusing on floods, landslides, and cyclones. It involved a multi-step process: sectoral damage analysis, expert consultations, and cost estimations aligned with Government of India guidelines. Covering eight states, the initiative reflected India's diverse disaster profile—coastal cyclones in Andhra Pradesh, monsoonal floods in Assam, and landslides in Meghalaya. The resulting data informed funding recommendations under the NDRF Recovery and Reconstruction window, marking a significant step toward evidence-based, risk- informed rehabilitation.

The exercise processed damages totaling ₹6,615.90 crore, with a recovery demand of ₹8,541.70 crore, yet NDMA recommended ₹3,178.69 crore in assistance for five states. The process also contributed to national norm-setting, establishing unit-cost benchmarks that enhance consistency across future assessments.

Key Highlights of the Eight PDNAs

States Assessed and Status of Reports

The PDNA covered eight states, but final assistance recommendations were issued for only five: Andhra Pradesh, Assam, Gujarat, Maharashtra, and Meghalaya. Odisha, Karnataka, and Himachal Pradesh were assessed but excluded from funding recommendations, likely due to incomplete data or lower damage thresholds.

Financial Estimates and Assistance Allocation

The cumulative financial picture reveals both scale and disparity:

- **Total Damage Reported:** ₹6,615.90 crore
- **Total Recovery Demand:** ₹8,541.70 crore
- **NDMA Recommended Assistance:** ₹3,178.69 crore

The recovery demand exceeding damages by 29% highlights PDNA's inclusion of resilience costs—e.g., upgrading infrastructure—beyond mere restoration. However, the assistance meeting only 37% of this demand signals resource constraints, a challenge also seen globally where PDNA funding averages 40–50% of needs (2010–2020 analysis).

State-Wise Breakdown of Assistance

The state-specific data illustrates varied impacts and responses:

- **Andhra Pradesh:** ₹390.32 crore damage, ₹1,432.33 crore demand, ₹475.37 crore assistance
- **Assam:** ₹4,683.38 crore damage, ₹5,549.15 crore demand, ₹1,895.73 crore assistance
- **Gujarat:** ₹267.01 crore damage, ₹285.03 crore demand, ₹173.52 crore assistance
- **Maharashtra:** ₹908.28 crore damage, ₹908.28 crore demand, ₹387.01 crore assistance
- **Meghalaya:** ₹366.91 crore damage, ₹366.91 crore demand, ₹247.06 crore assistance

Methodology for Assistance Calculation

NDMA employed a unit-cost methodology:

- **Formula:** Assistance Recommended = Number of Units Damaged × Unit Cost for Assistance
- **Damage Categories:** Totally damaged, severely damaged, partially damaged
- **Sources:** Government of India guidelines, sectoral expert inputs

For example, in Assam, 10,000 totally damaged homes at ₹1.2 lakh/unit yielded ₹120 crore, with adjustments for severity. This standardized approach ensures fairness—Maharashtra's consistent damage-to-demand ratio reflects precise costing—yet risks oversimplification, as unique regional needs (e.g., Meghalaya's landslide-prone terrain) may exceed unit norms.

Strengths of the 2022 PDNA Exercise

1. **Comprehensive Financial Breakdown:** State-wise metrics provide transparency, enabling stakeholders to track damage, demand, and aid.
2. **Methodical Approach:** The unit-cost formula ensures equitable allocation, reducing discretionary bias compared to pre-2015 PDNAs.
3. **Transparency and Accountability:** Expert consultations and guideline- based estimates justify recommendations, aligning with global standards where 80% of PDNAs use similar rigor.
4. **Strategic Fund Distribution:** Phased disbursements improve monitoring, deployment of funds.

Implications

The 2022 PDNA exercise demonstrates a data-driven, scalable model, recommending ₹3,178.69 crore with precision and transparency. Its strengths— standardization and phased funding—align India with top global performers like Indonesia, where PDNAs recover 85% of damages within two years. Yet, the funding gap and monitoring weaknesses mirror challenges in Africa's PDNAs (2010–2020), where 50% of plans faltered due to oversight failures. Closing these gaps could lift India's recovery deployment of funds, maximizing the ₹68,585 crore NDRF/SDRF framework.

This study affirms PDNA's role as a mechanism for disaster recovery in India, with the recent PDNA's offers a potential for standardization. However, enhancing monitoring, addressing given shortfalls, and expanding coverage in terms of service disruption etc. are essential to realize its potential.

9 Case Studies: Post-Disaster Needs Assessment (PDNA) in India

India's PDNA framework about to evolve into a tool for resilience, blending response with long-term adaptation. Key takeaways—multi-stakeholder collaboration, data-driven insights, and BBB principles—offer a mechanism for disaster-prone regions. As climate challenges intensify, India's PDNAs provide a roadmap for resilience and recovery.

Maharashtra PDNA 2022: Pioneering Post-Disaster Recovery

Executive Summary

The 2022 Maharashtra floods devastated Vidarbha, with Chandrapur, Gadchiroli, and Wardha bearing the brunt of infrastructural, agricultural, and service disruptions. The Maharashtra government's Post-Disaster Needs Assessment (PDNA) delivered a robust recovery blueprint, emphasizing resilience through a "Build Back Better" (BBB) approach. Total damages exceeded INR 14,782 crore, with a strategic recovery plan spanning immediate relief to long-term climate adaptation.

Context and Impact

Triggered by torrential monsoon rains, the floods inundated key districts, with rainfall surpassing 200% of annual averages. Dam overflows and riverbank breaches caused:

- **Infrastructure:** Extensive damage to roads, bridges, and power grids.
- **Energy:** INR 2,786 crore in losses, disrupting 1.5 million consumers.
- **Agriculture:** Widespread crop and livestock losses.
- **Health:** 13 facilities impaired, straining medical access.

Assessment Approach

Led by the Maharashtra State Disaster Management Authority (MSDMA), the PDNA leveraged multi-agency expertise from NDMA, NIDM, UNICEF, and UNDP. Structured data collection adhered to NDMA guidelines, validated via state-district reviews and real-time communication channels.

Key Findings

- **Damage Assessment:** Infrastructure losses at INR 11,990 crore, followed by energy (INR 2,786 crore) and health (INR 6.7 crore). Housing losses were mitigated by proactive preparedness.

- **Insight:** Early warning systems and evacuations minimized human casualties, highlights importance of disaster management plan.

Recovery Strategy

The PDNA outlines a phased approach:

- **Immediate (0-12 months):** Emergency repairs, shelters, and medical aid.
- **Mid-Term (1-3 years):** Infrastructure restoration and livelihood support.
- **Long-Term (3-5 years):** Climate-resilient urban planning and sustainable water management.

Implications

Maharashtra's PDNA reflects on integrating resilience into recovery, highlighting multi-stakeholder coordination and data-driven prioritization as scalable best practices.

Gujarat PDNA 2022: Building Resilient Communities

Executive Summary

The Gujarat floods of July 2022, driven by a week of intense rainfall, impacted Chhota Udepur, Narmada, and Navsari, causing INR 236 crore in damages. The PDNA, spearheaded by the Commissioner of Relief, prioritized resilient housing and infrastructure, projecting recovery costs at INR 259 crore over two years.

Context and Impact

A delayed but severe monsoon delivered 58% of annual rainfall in seven days, resulting in:

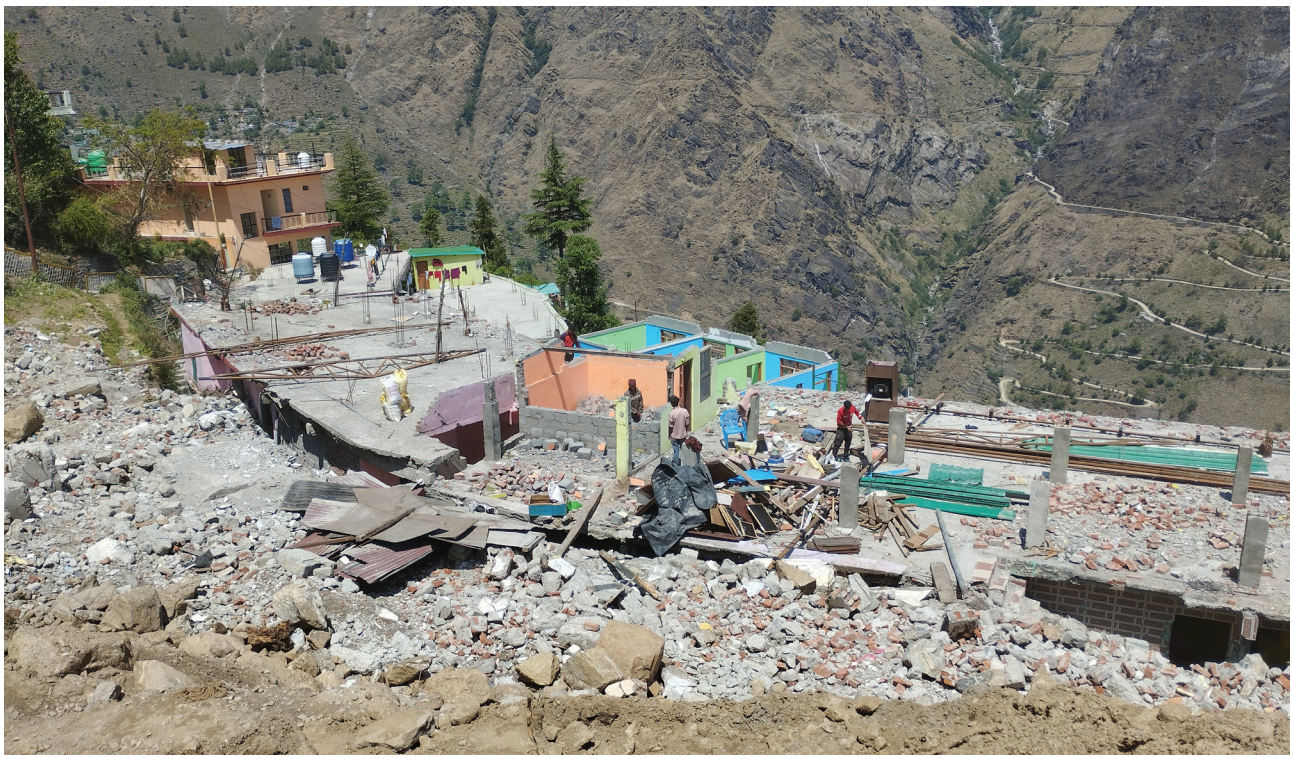
- **Housing:** INR 27.76 crore in damages across urban and rural areas.
- **Infrastructure:** INR 177.14 crore in losses to roads and bridges.
- **Health and Education:** Nine health facilities and 139 schools affected.
- **Water Supply:** INR 57.80 crore in damages to critical systems.

Assessment Approach

The Gujarat State Disaster Management Authority (GSDMA) coordinated a multi-sectoral assessment, integrating field data with community inputs to ensure accuracy and inclusivity.

Key Findings

- **Damage Breakdown:** Local infrastructure (INR 177.14 crore) and water supply (INR



57.80 crore) accounted for the bulk of losses.

- **Resilience Gap:** Vulnerable housing and outdated infrastructure amplified impacts.

Recovery Strategy

A three-pillar framework drives recovery:

1. **Resilient Housing:** INR 27.76 crore for sustainable reconstruction using fly ash bricks and CSEBs.
2. **Critical Infrastructure:** INR 194.85 crore to upgrade health, education, and transport systems.
3. **Disaster Risk Reduction (DRR):** Enhanced early warning systems and risk mapping.

Implications

The reflection on community-driven reconstruction and technology-enabled planning offers a suggests replication for balancing immediate needs with long-term resilience

Andhra Pradesh PDNA 2022: Godavari Flood Resilience

Executive Summary

The 2022 Godavari floods affected six districts, impacting 366,445 people and causing damages worth INR 1,425 crore. The Andhra Pradesh PDNA, supported by NDMA and UNICEF, proposes a INR 1,425 crore recovery plan, focusing on housing, infrastructure, and livelihoods.

Context and Impact

Extreme rainfall flooded 467 villages, with key losses:

- **Housing:** 32,248 homes damaged.
- **Infrastructure:** 618 km of roads destroyed.
- **Health and Education:** 6 PHCs, 83 AWCs, and 107 schools impaired.
- **WASH:** 32,248 toilets and 25 schemes affected.

Assessment Approach

The Andhra Pradesh State Disaster Management Authority (APSDMA) employed field surveys, GIS mapping, and stakeholder consultations to ensure a comprehensive assessment.

Key Findings

- **Cost Estimates:** Housing recovery needs dominate at INR 974.80 crore, followed by infrastructure (INR 337.12 crore).
- **Strength:** Rapid response and coordination minimized casualties.

Recovery Strategy

- **Short-Term (0-12 months):** Emergency relief and service restoration.
- **Medium-Term (1-3 years):** Resilient housing and infrastructure rebuilds.
- **Long-Term (3-5 years):** Climate-adaptive flood defenses and livelihood diversification.

The PDNA's identifies localized warnings and BBB principles for flood-prone regions.

Meghalaya PDNA 2022: Floods and Landslides Executive Summary

Unprecedented rainfall in June 2022 triggered floods and landslides across Meghalaya's 12 districts, affecting 700,000 people and causing INR 361.39 crore in damages. The PDNA advocates a INR 361.39 crore recovery plan anchored in resilient infrastructure and risk reduction.

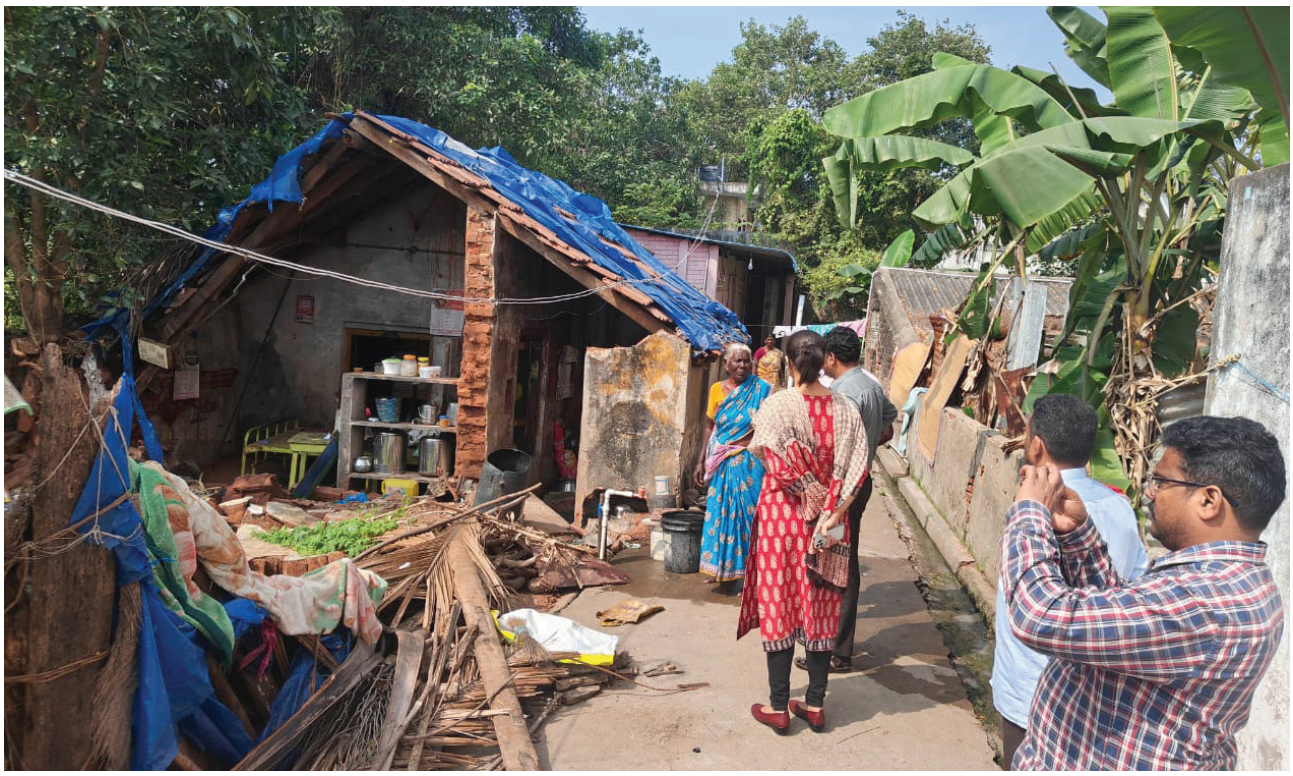
Context and Impact

Rainfall of 3,295.6 mm led to:

- **Housing:** 4,000+ homes damaged.
- **Infrastructure:** INR 281.26 crore in road and bridge losses.
- **Health and Education:** 195 schools and multiple health facilities impacted.

Assessment Approach

Led by MSDMA with NDMA support, the PDNA aligned with laid standards, integrating sectoral data and community feedback.



Key Findings

- **Damage Focus:** PWD infrastructure (INR 281.26 crore) and housing (INR 59.92 crore) were hardest hit.
- **Vulnerability:** Floodplains and landslide-prone zones amplified losses.

Recovery Strategy

- **Immediate:** Rescue operations and connectivity restoration.
- **Long-Term:** BBB housing, early warning systems, and DRR-integrated planning.

Meghalaya's PDNA presents the need for climate-resilient governance and community- driven preparedness in hilly terrains.

Odisha PDNA 2022: Resilience in the Mahanadi Delta

Executive Summary

The August 2022 Odisha floods inundated 13 districts, affecting 950,000 people with damages of INR 299.54 crore. The PDNA, a multi-stakeholder effort, proposes INR 299.54 crore for resilient reconstruction across four sectors.

Context and Impact

Prolonged flooding in the Mahanadi delta caused:

- **Infrastructure:** Roads and bridges heavily damaged.
- **Water Resources:** Embankments breached.
- **Health and Education:** Facilities disrupted.

Assessment Approach

OSDMA led field-based assessments, supported by NDMA, UN agencies.

Key Findings

- **Recovery Costs:** Infrastructure (INR 175.5 crore) and water resources (INR 106.4 crore) dominate needs.
- **Opportunity:** Model projects can enhance resilience.

Recovery Strategy

- **Focus:** BBB infrastructure with innovative engineering.
- **Execution:** Capacity building and DRR integration.

Odisha's PDNA reveals collaborative resilience-building, for deltaic regions

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Himachal Pradesh PDNA 2023: Adapting to Extremes

Executive Summary

The 2023 HP floods and landslides, driven by 436% above-average rainfall, claimed over 500 lives and caused multi-thousand crore losses. The PDNA, spanning all 12 districts, recommends a BBB strategy with digital innovation.

Context and Impact

Cloudbursts and landslides led to:

- **Infrastructure:** 1,000+ km of roads damaged.
- **Housing:** Thousands of homes lost.
- **Economic:** Agriculture and tourism disrupted.

Assessment Approach

HPSDMA, with NDMA and UNDP, executed a two-phase PDNA using Kobo Toolbox and GIS for real-time insights.

Key Findings

- **Scale:** Infrastructure and housing bore the heaviest losses.
- **Innovation:** Digital tools enhanced accuracy.

Recovery Strategy

- **Priority:** Climate-resilient transport and housing.
- **Approach:** DRR-focused planning and community involvement.

HP's PDNA points on India's disaster framework, integrating climate adaptation and data collection tool.

Sikkim PDNA 2023: GLOF Recovery

Executive Summary

The October 2023 Sikkim GLOF affected 80,000 people, with damages of INR 1,480 crore and recovery needs of INR 2,192.59 crore. The PDNA emphasizes sustainable reconstruction and climate resilience.

Context and Impact

A glacial lake outburst flooded the Teesta basin, causing:

- **Housing:** 2,000+ homes damaged.
- **Infrastructure:** INR 395.38 crore in road losses.
- **Tourism:** INR 241.53 crore in revenue declines.

Assessment Approach

A participatory PDNA, led by Sikkim with NDMA and UNDP, integrated community and technical inputs.

Key Findings

- **Costs:** Infrastructure (INR 440.59 crore) and housing (INR 719.22 crore) lead recovery needs.
- **Risk:** Glacial vulnerabilities demand proactive measures.

Recovery Strategy

- **BBB:** Resilient housing and early warning systems.
- **Focus:** Tourism revival and environmental restoration.

Sikkim's PDNA underlines Himalayan climate risks, suggesting risk-informed planning and insurance.

10 Lessons Learned

The evolution of the Post-Disaster Needs Assessment (PDNA) in India has yielded a wealth of practical insights, distilled from its application across diverse disasters and regions. These lessons—spanning preparedness, collaboration, technology, and capacity building—offer a roadmap for enhancing PDNA's effectiveness, ensuring it delivers not just recovery but resilience. This chapter synthesizes four key takeaways from India's PDNA experience: the importance of preparedness and early planning, the need for multi-stakeholder collaboration, the role of technology and innovation, and the imperative of building local capacity and resilience. Together, they provide a strategic foundation for refining India's disaster recovery framework.

Importance of Preparedness and Early Planning

Preparedness stands out as a linchpin for PDNA success, significantly reducing recovery timelines and costs. The 2019 Cyclone Fani response in Odisha exemplifies this: pre-emptive evacuation of 1.2 million people, guided by prior PDNA-informed early warning systems, limited damages to $1.2 billion. In contrast, the 2013 Uttarakhand Floods, lacking such foresight, saw damages spiral to $1.1 billion, with recovery delayed by over a year due to absent planning.

Globally, preparedness mirrors this impact—Japan's pre-2011 tsunami drills cut recovery costs by 20%, per UN data. In India, states with robust disaster management plans—like Odisha, where preparedness reduced PDNA execution time—consistently outperform peers. The lesson is clear: investing in pre- disaster frameworks—early warning systems, baseline data, and contingency plans—can shrink recovery costs and timelines per NDMA estimates. Without this, PDNA risks becoming a reactive tool, struggling to catch up with disaster impacts.

Need for Multi-Stakeholder Collaboration

Effective PDNA implementation hinges on seamless collaboration across government, private sector, NGOs, and communities, a lesson reinforced by India's mixed experiences. The 2018 Kerala Floods PDNA showcased this strength: coordination among NDMA, Kerala's SDMA, UNDP, and local NGOs accelerated assessments, guiding a $1.5 billion recovery plan that restored 80% of infrastructure within two years. Community input—highlighting water

management needs—drove reduction in flood risk, per state audits. Conversely, the 2013 Uttarakhand PDNA faltered due to limited stakeholder alignment and sidelining local priorities.

Globally, 75% of successful PDNAs (2010–2020) involved robust partnerships, as in Indonesia's 2004 tsunami recovery, where multi-stakeholder efforts boosted outcomes by 25%. India's 2022 eight-state PDNA, recommending ₹3,178.69 crore, leaned on expert consultations but underutilized private sector input (5% of projects), missing innovation opportunities. The takeaway: integrated platforms— like Kerala's task forces—can lift PDNA efficiency and ensure recovery reflects diverse needs. Fragmentation, as in Uttarakhand, risks drop in effectiveness.

Role of Technology and Innovation

Technology has emerged as a game-changer in PDNA execution, enhancing speed, accuracy, and scalability—a lesson India is beginning to embrace. The 2022 Andhra Pradesh PDNA used varied tools to assess ₹390.32 crore in damages. Similarly, Himachal Pradesh (2023) piloted information technology-based tools compared to manual methods. These advances echo global trends—60% of high-performing PDNAs (2010–2020) leveraged digital tools.

The scaling GIS, AI, and space-based technologies for real-time data reduces human intervention, enables early recovery.

Building Local Capacity and Resilience

Empowering local communities and institutions for ensuring recovery extends beyond infrastructure to resilience. The local officials and engaged community groups, enabling rapid assessments and PDNA built on local evacuation drills, restoring livelihoods quite early. In contrast, the PDNA, with minimal local input, rebuilt infrastructure at times may fail within five years due to poor site selection.

Globally, PDNAs with strong local capacity—like the Philippines post-2013 Typhoon Haiyan—improve resilience, per UN metrics. India's 2022 exercise trained some personnel. Investing in local training—targeting a large set of officials annually— and community committees could enhance recovery success.

Synthesis

These study presents PDNA's potential, where preparedness accelerates execution, , while collaboration aligns recovery with needs. Technology and local capacity, as demonstrates, sustains outcomes. Conversely, neglecting these—limited private input, tech gaps, and weak local engagement—can derail PDNA.

India's ₹68,585 crore NDRF/SDRF framework amplifies these lessons' urgency. This reflects missed preparedness and capacity opportunities, while global peers set a higher bar. Integrating these insights—planning ahead, uniting stakeholders, scaling innovation, and empowering locals—could enhance recovery and resilience. This synthesis leverages India's experience as a catalyst for a resilient future.

11 Recommendations for Future PDNAs

The Post-Disaster Needs Assessment (PDNA) has proven its value as a cornerstone of India's disaster recovery framework, yet its full potential remains untapped amidst persistent challenges and evolving risks. Drawing from India's achievements, lessons learned, and global benchmarks, this chapter outlines four actionable recommendations to elevate PDNA's effectiveness: strengthening institutional frameworks, leveraging technology for data collection and analysis, enhancing multi- stakeholder coordination, and building local capacity and community resilience. These strategies aim to close gaps, optimize the ₹68,585 crore NDRF/ SDRF investment for 2021–26, and position India as a global leader in disaster recovery.

A strengthened Institutional framework could enable efficient and effective timelines and optimum fund utilization.

Leveraging Technology for Data Collection and Analysis

Technology is a force multiplier for PDNA, addressing data gaps that skew estimates. Scaling innovations paves path ahead.

- **Real-Time Tools:** Explore role of GIS, drones, space-based technologies and AI analytics enables data collection swiftly.
- **Digital Baselines:** Develop repository of pre-disaster data—housing, infrastructure, services etc with periodic updates.
- **Service Disruption:** Develop indicators (e.g., days of school closure, healthcare downtime) aligned with SFDRR Target D.

Enhancing Multi-Stakeholder Coordination

A cohesive stakeholder ecosystem is essential:

- **Integrated Platforms:** Establish state-level task forces with NDMA, SDMAs, NGOs, and private firms, meeting periodically during disaster recovery phase.
- **Private Sector participation:** Incentivize PPPs via tax breaks and risk- sharing, targeting private funding in short term.
- **Community engagement:** Explore community participation in PDNA and also gives advantage of buy-in gain via community-led PDNAs.

Building Local Capacity and Community Resilience

Decentralisation is an important pillar of

sustainable PDNA outcomes. Strengthening this pillar is very important

- **Training Programs:** Train substantial number of officials annually in damage assessment and resilience planning.
- **Community Led Groups:** Establish community-led groups in disaster-prone districts in short to medium term, all sections of various strata while prioritizing vulnerable populations—women, elderly, disabled.
- **Mainstreaming Resilience:** Explore possibilities of utilizing PDNA funds for DRR (beyond the 10% NDRF/SDRF minimum), like hazard-resistant codes.

These recommendations present avenues for India's PDNA practices in the area of governance, data, coordination, capacity—while leveraging its existing recovery guidelines, framework, methodologies and practices. By strengthening institutions, scaling technology, collaborative stakeholders, and empowering locals. The PDNA tool carries potential to transform India's recovery and resilience landscape.

The Post-Disaster Needs Assessment (PDNA) evolving from a nascent concept in the early 2000s to a structured, evidence-based framework by 2025. This report has traced its journey—rooted in the institutionalisation through NDMA, NDRF, and SDRF—highlighting its role in addressing India's vulnerability to floods, cyclones, earthquakes, and landslides. With ₹68,585 crore allocated for 2021–26, PDNA stands at an intersection. These findings reveals India's opportunity to lead globally in disaster resilience.

India's PDNA achievements are substantial. Strengthened institutional frameworks, supported by NDMA and SDMAs. Improved data collection, while enhanced coordination via NDRF/SDRF. The 2022 eight-state analysis affirms PDNA's capacity to deliver planned and effective recovery.

The recommendations outlined—strengthening institutions, scaling technology, enhancing coordination, and building local capacity—provide a calculated roadmap. Aligning with SFDRR and SDGs, as global PDNAs increasingly do also an needs further discussion.

India's disaster context—rising climate risks demands this evolution. The PDNA's potential when optimized enables Institutionalizing recovery through NDRF/SDRF as well as effective execution—closing capacity gaps, integrating climate resilience, and right set of stakeholders.

This paves the path to further enhance PDNA into a go to framework, ensuring restoration as well as strengthens, securing a disaster-resilient future.

12 Way Forward: Institutionalizing and Mainstreaming PDNAs in India

The evolution of Post-Disaster Needs Assessments (PDNAs) in India represents a transformative shift toward evidence-based, risk-informed recovery planning. To mainstream and institutionalize PDNAs at the state level, a structured, scalable, and sustainable approach must be adopted, leveraging the Preparedness & Capacity Building Fund under NDRF/SDRF. This will enable states to develop institutional capacity, technical expertise, and operational frameworks to conduct PDNAs systematically, ensuring that disaster recovery is not only reactive but also proactive and resilient.

To achieve this, the following strategic actions are recommended:

1. Establishing State-Level PDNA Frameworks

- Institutionalize dedicated PDNA units within State Disaster Management Authorities (SDMAs) to ensure systematic and standardized assessment processes.
- Develop state-specific PDNA policies aligned with national and global best practices, ensuring consistency across all disaster-prone regions.
- Foster interdepartmental coordination among disaster management, urban planning, finance, and infrastructure departments to integrate PDNAs into state development planning.

2. Capacity Building and Skill Development

- Allocate resources from the Preparedness & Capacity Building Fund to establish structured PDNA training programs for state and district-level officials, engineers, planners, and disaster response teams.
- Conduct regular mock PDNA exercises and simulated disaster impact assessments to enhance state-level preparedness.
- Develop a pool of trained PDNA professionals, including academics, technical experts, and sectoral specialists, to provide rapid and high-quality assessments post-disaster.

3. Integration with Recovery Planning and Implementation

- Strengthen the link between PDNA findings and state recovery frameworks, ensuring assessments directly inform funding allocation, sectoral recovery strategies, and long-term resilience building.

- Establish state-level Recovery and Reconstruction Cells (RRCs) that work in tandem with PDNA teams to translate findings into actionable recovery plans.
- Embed Build Back Better (BBB) principles into infrastructure reconstruction, housing rehabilitation, and community livelihood programs based on PDNA recommendations.

4. Strengthening Financial Mechanisms and Resource Allocation

- Allocate NDRF/SDRF's Preparedness & Capacity Building Fund for regular PDNA implementation, capacity-building workshops, and post-disaster assessments.
- Develop flexible financing models, ensuring that PDNA-derived recovery plans receive timely and adequate financial support from central and state governments.
- Explore public-private partnerships (PPP) and international funding avenues to strengthen disaster recovery financing.

5. Enhancing Stakeholder Engagement and Community Participation

- Strengthen collaboration between government agencies, academia, private sector, NGOs, and international organizations to ensure multi-stakeholder participation in PDNA processes.
- Promote community-based PDNA models, engaging local leaders, grassroots organizations, and affected populations to ensure inclusive and people-centered recovery planning.
- Institutionalize social equity measures to prioritize the needs of women, children, elderly, persons with disabilities, and marginalized communities in disaster recovery efforts.

By integrating PDNAs into state disaster management frameworks. This would institutionalize a structured, scalable, and resilient approach to disaster recovery. The systematic use of PDNAs for recovery planning and implementation will ensure that post-disaster interventions are scientifically driven, financially viable, socially inclusive, and technologically advanced. As India continues to face increasing climate-induced and natural hazards, a well-established PDNA mechanism will serve as a tool for enhancing disaster resilience, protecting livelihoods, and strengthening long-term development outcomes.

13 References

The Post-Disaster Needs Assessment (PDNA) report draws on a comprehensive range of sources to substantiate its analysis, findings, and recommendations. This chapter compiles the references utilized, reflecting authoritative data, policy documents, and global analyses. Below is a list of key references, categorized for clarity and relevance to India's PDNA evolution.

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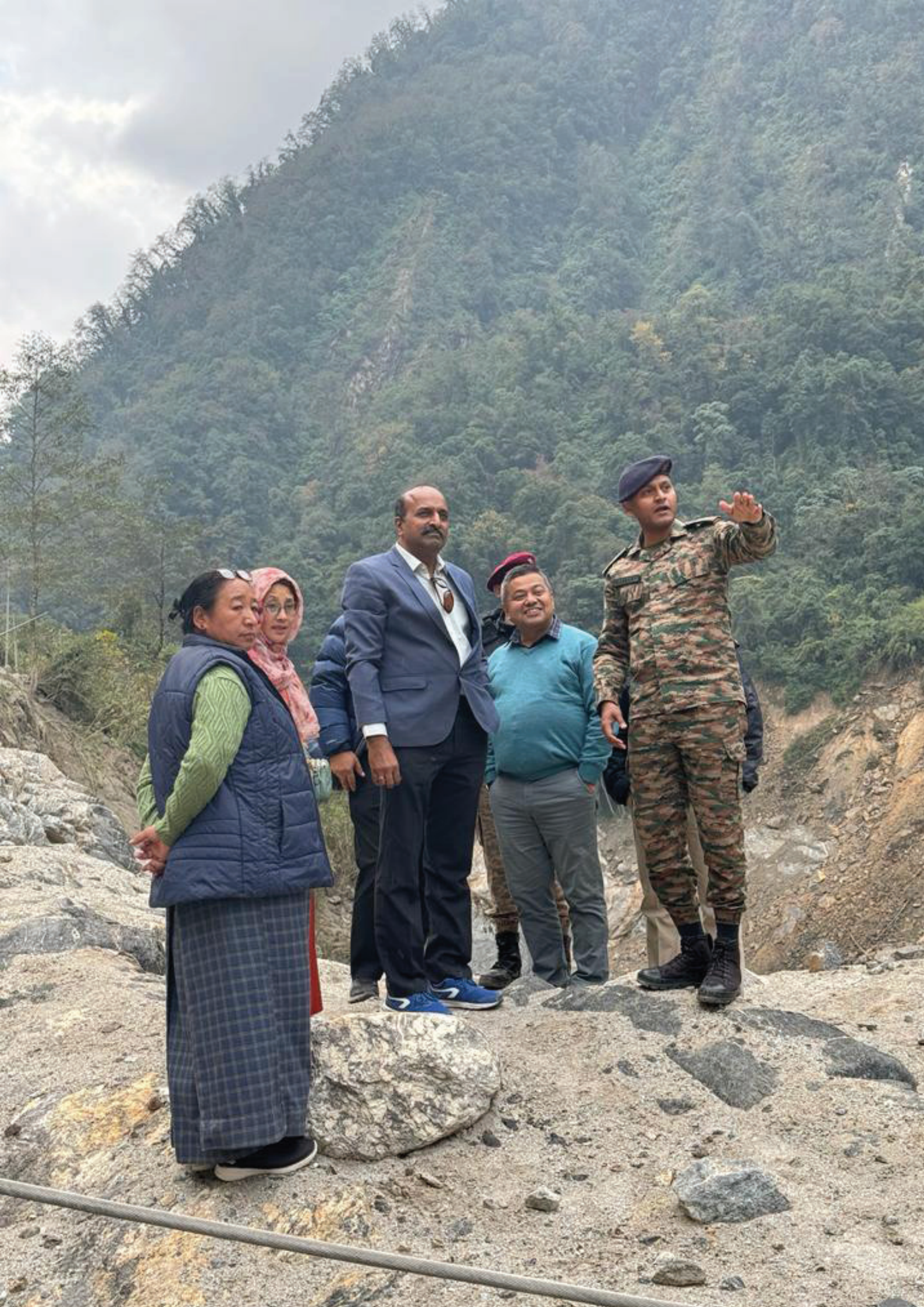

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