



Research article

Towards Resilient Urban Governance: Integrating the Bangladesh Army in Earthquake Disaster Management

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ABSTRACT

This study provides a critical examination of the feasibility and necessity of incorporating the Bangladesh Army into the nation's disaster management architecture, specifically targeting the seismic vulnerability of its urban centres. While Bangladesh has achieved global recognition for its resilience against hydro-meteorological hazards such as cyclones and floods, its urban governance structures remain dangerously unprepared for high-impact, low-frequency seismic events. This paper interrogates the "governance gap" between the military's logistical prowess, characterised by rapid deployment and discipline, and the civilian administration's policy frameworks, which currently relegate the military to a reactive role. Utilising a hybrid thematic analysis of secondary data, including government reports, military doctrines, and international comparative studies, this research identifies systemic institutional bottlenecks: specifically, fragmented civil-military coordination, a lack of specialised Urban Search and Rescue (USAR) doctrine within the armed forces, and political hesitancy regarding the militarisation of civilian governance. The analysis reveals that while the Bangladesh Army is the *de facto* first responder for major crises, its current capabilities are optimised for surface-level logistics rather than the technical complexities of extracting victims from collapsed urban infrastructure. The study proposes a revised National Plan for Disaster Management (NPDm) that institutionalises the military's role through pre-authorised "Aid to Civil Authority" mandates, focusing on heavy resource mobilisation and engineering support. By synthesising lessons from the Indonesian TNI's "Military Operations Other than War" and the Japanese "Self-Defence Force" integration with local prefectures, the research suggests that Bangladesh must move beyond ad-hoc arrangements to a formalised partnership that leverages military strength while preserving democratic civilian oversight.

Introduction

Background: The Urban Governance Crisis

Bangladesh, hosting over 170 million people within a deltaic landscape of just 147,570 square kilometres, represents one of the most complex development challenges in the modern world (Kaiser et al., 2025). The country's trajectory is defined by rapid, unplanned urbanisation, driven by economic migration and climate displacement. This demographic pressure is most acute in Dhaka, the capital city, which accommodates over 20 million residents and witnesses an annual urban population growth rate exceeding 3% (Trading Economics, 2025).

ARTICLE INFO

Article timeline:

Date of Submission:
09 November, 2025

Date of Acceptance:
19 December, 2025

Article available online:
21 December, 2025

Keywords:

Bangladesh Army

Earthquake

Disaster management

Urban governance

Civil-military relations

Disaster preparedness

This explosive growth has outpaced the capacity of urban governance institutions to provide basic safety infrastructure, resulting in a sprawling metropolis characterised by informal settlements, non-compliant high-rise construction, and severe environmental degradation (Ziari et al., 2024). Urban governance in Bangladesh operates within a highly centralised framework where decision-making power resides with the national government, leaving local bodies such as City Corporations with limited fiscal autonomy or enforcement power (Krogh & Roiseland, 2023). This centralisation creates significant bottlenecks in disaster management.

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Local ward commissioners, who possess the most granular knowledge of community vulnerabilities, often lack the authority or resources to initiate independent disaster response measures, waiting instead for directives from the Ministry of Disaster Management and Relief (MoDMR) (Rumbach, 2016). This bureaucratic inertia, while manageable during slow-onset disasters like floods, poses a catastrophic risk during rapid-onset seismic events where minutes determine survival rates.

The Tectonic Reality: Geological Vulnerability

Geologically, Bangladesh is situated at a precarious tectonic junction. It lies at the convergence of three major tectonic plates: the Indian Plate, the Eurasian Plate, and the Burmese Microplate. The collision of the Indian Plate moving northeast into the Eurasian Plate has created significant stored energy within the region's fault lines. Specifically, the country is threatened by the Dauki Fault to the north and the plate boundary faults of the Chittagong-Tripura Folded Belt to the east (Rashied et al., 2019). Historical seismicity confirms the danger; the Great Indian Earthquake of 1897 (Magnitude 8.1) caused widespread liquefaction and destruction in what is now Bangladesh. Recent research underscores that Dhaka sits upon the Madhupur Tract, a Pleistocene terrace surrounded by Holocene alluvium, making the city highly susceptible to ground motion amplification and soil liquefaction during a major earthquake (Alam & Haque, 2022). Despite this geological certainty, the built environment of Dhaka has evolved with scant regard for seismic safety. A significant portion of the city's building stock consists of unreinforced masonry and "soft story" structures that are seismically brittle. Consequently, the acute vulnerability of Dhaka's built environment is not merely a product of geological hazard but a direct manifestation of weak urban governance and the failure to enforce building codes (Ahmed & Kabir, 2021).

Problem Statement: The Gap Between Cyclone Success and Seismic Failure

Bangladesh has garnered global acclaim for its disaster management achievements, particularly in reducing mortality from tropical cyclones. Through the Cyclone Preparedness Programme (CPP) and a vast network of coastal shelters, the country has transformed its response capability for hydro-meteorological hazards. However, this success has created a "competency trap." The disaster management architecture, including the Standing Orders on Disaster (SOD), is path-dependent, heavily biased toward the early-warning and evacuation models effective for cyclones but ill-suited for earthquakes (Rahman et al., 2023). The vulnerability of the current system was starkly illustrated by the Chittagong earthquake on November 21, 1997. A moderate event of magnitude 6.1, originating near the Mizoram border, caused the collapse of a five-story building in Chittagong city, resulting in 23 fatalities and over 200 injuries. This incident exposed the fragility of urban structures and the inadequacy of rescue capabilities for even minor collapses.

If a magnitude 6.0 event can cause such destruction, a magnitude 7.0 or greater event near Dhaka would likely overwhelm the entire national response capacity within minutes. In this vacuum of civilian capacity, the Bangladesh Army acts as the responder of last resort. The military possesses the country's most disciplined manpower, heavy airlift capability, and a robust logistical backbone (Sattar et al., 2020). However, the integration of these assets into civilian planning remains fragmented and compartmentalised. The military's role is often viewed through the lens of "relief distribution" rather than "technical rescue," leading to a lack of specialised equipment and joint doctrine. Furthermore, the sensitive nature of Civil-Military Relations (CMR) creates institutional friction; civilian leaders are often wary of ceding operational control to the military, even during crises (Wolf, 2013).

Research Objectives

This study aims to bridge the gap between military capability and civilian governance requirements. Its primary objectives are:

1. To identify the institutional and political barriers preventing the effective integration of the Bangladesh Army into earthquake preparedness frameworks.
2. To evaluate the current operational readiness of the Army for Urban Search and Rescue (USAR) compared to its established prowess in cyclone relief.
3. To propose a policy framework for formalised civil-military coordination that enhances urban resilience while safeguarding democratic oversight.

Theoretical Framework

Urban Governance and the "Implementation Gap"

Urban governance involves the collaborative efforts of various stakeholders – local and national government, non-governmental organisations (NGOs), the private sector, and communities- to manage urban affairs (Mahmoud et al., 2021). In Bangladesh, however, governance of urban areas has been marked by inefficiencies, poor inter-agency coordination, and a narrowly centralised structure (Choudhury et al., 2021). The urban governance system is often described as fragmented despite policies aimed at decentralisation (Hossain et al., 2024). In practice, the central government retains predominant control over urban planning and development, while city corporations have very limited autonomy and resources (Adade, 2020). This concentration of power at the centre has constrained local authorities' capacity to address urban problems such as disaster management (Rumbach, 2016). Local governments in Bangladesh face significant bureaucratic hurdles, shortages of technical expertise, and chronic underfunding, which together hamper effective disaster preparedness at the city level. For example, Dhaka's urban environment is characterised by overcrowding, inadequate

infrastructure, and numerous informal settlements. These conditions not only heighten the city's exposure to hazards but also complicate governance responses. Poor and informally housed communities often occupy substandard buildings that can easily collapse in a seismic event, and they lack access to resources and basic services that would aid in disaster preparedness. The failure to effectively coordinate among stakeholders is another major governance challenge (Parvin et al., 2023). Government agencies, NGOs, and community groups in Bangladeshi cities often operate in isolation, resulting in duplication of effort, gaps in response, and overall inefficiency (Chakma & Matsui, 2022). This disjointed urban governance system has so far been unable to develop a unified disaster management plan that encompasses all relevant parties, leading to serious gaps in preparedness and response.

Bangladesh's Earthquake Vulnerability

Bangladesh lies close to the active boundary between the Indian and Eurasian tectonic plates and is thereby exposed to significant seismic risk (Alam & Haque, 2022). While the country is not directly atop a major fault line, it is near active plate boundaries and seismic zones; consequently, it remains vulnerable to moderate to strong earthquakes originating in the region. Seismic events in neighbouring countries (such as India and Nepal) have been felt in Bangladesh in the past (Shah et al., 2018). Despite this known risk, earthquake preparedness has not featured prominently in national disaster management discourse or planning. Studies show that Bangladesh's urban centres, especially Dhaka, would be severely affected by a major earthquake under current conditions (Rahman et al., 2023). Much of Dhaka's built environment, particularly in informal settlements, does not meet basic seismic safety standards (Rahman et al., 2023). Building code enforcement is lax to non-existent in many areas of the city, allowing unsafe construction to proliferate (Biswas et al., 2016). Additionally, there are a few policies or programs dedicated to managing earthquake risk, as most disaster management efforts have focused on more frequent hazards like floods and cyclones (Rahman et al., 2023). The lack of retrofitting programs, public education on earthquake safety, and routine earthquake drills further exacerbate urban vulnerability (Mavroulis et al., 2023). The combination of unregulated urban development and insufficient government attention means Bangladesh is effectively unprepared for a large earthquake (Zaman et al., 2022). In essence, these vulnerabilities reflect governance failures: weak enforcement of building regulations and the absence of proactive earthquake risk-reduction measures are institutional shortcomings that greatly increase the nation's seismic risk. Without substantial improvements in policy and governance (such as stricter code enforcement, retrofitting initiatives, and inclusion of earthquake scenarios in disaster plans), Bangladesh's urban population will remain dangerously exposed.

The Military's Role in Disaster Management

Globally, national militaries often play a critical role in managing disasters, especially in countries highly prone to natural hazards. Military forces possess unique capabilities- logistics, discipline, manpower, and rapid deployment- that make them invaluable during large-scale emergencies (Long, 2023). They can contribute across the disaster management cycle: providing immediate emergency response and search-and-rescue operations, delivering relief supplies, and assisting with post-disaster recovery and reconstruction of critical infrastructure (Alrehaile et al., 2022). In Bangladesh, the Army has repeatedly contributed to the aftermath of major natural disasters such as floods and cyclones by conducting search-and-rescue missions, providing medical assistance, and distributing relief (Haque, 2023; Zaman et al., 2022). However, these engagements have traditionally been reactive, with the military stepping in only after disasters strike, rather than being involved in proactive risk reduction or preparedness planning. The possibility of the military taking on a more active role in disaster preparedness, especially for an earthquake scenario, has not yet been systematically explored or institutionalised. The Bangladesh Army possesses several strengths that could make it an asset for earthquake disaster management. It can mobilise large numbers of personnel and resources on short notice, enabling a swift response to seismic events (Hasnain, 2024). Its organisational discipline and experience with large-scale operations could also facilitate better coordination among various stakeholders (local authorities, NGOs, the private sector) during a disaster (Hasan, 2024).

At the same time, integrating the military into urban governance for disaster management raises important challenges. Critics argue that an expanded military role in civilian governance could undermine democratic values and public participation, potentially opening the door to authoritarian tendencies (Hedlund & Alvinus, 2025). There is concern that too much reliance on the military could upset the balance of power between civilian and military leaders (Wolf, 2013). Indeed, in Bangladesh's case, the armed forces have historically wielded significant political influence, so any domestic deployment must be managed carefully to avoid encroaching on civilian authority. Excessive dependence on the military for disaster response could also breed a form of institutional inertia, where civilian agencies become less proactive, expecting the Army to handle major crises. This over-reliance risks eroding public trust in civilian institutions and blurring civil-military boundaries (Tusalem, 2013). Bangladesh's own civil-military relations literature underscores these sensitivities: maintaining strong civilian oversight of the military is considered vital for the country's governance stability (Pattanaik, 2021). Therefore, any model of military integration into disaster management must clearly define the Army's supporting role so that it complements, rather than supplants, civilian disaster management structures.

Civil-Military Relations (CMR): The “Guardian” Dilemma

Integrating the military into domestic governance touches upon the delicate balance of Civil-Military Relations. In Bangladesh, the military has historically viewed itself as the “guardian” of the nation, a role that has justified past interventions in politics (Wolf, 2013). This “guardian” self-conception creates a complex dynamic where the military is both a servant of the state and a potential rival for power. Consequently, civilian governments are often cautious about expanding the military’s internal mandate, fearing that extensive involvement in domestic administration could lead to politicisation (Wolf, 2013). However, the “utilitarian argument” for military involvement in disasters is compelling. As noted by scholars of humanitarian logistics, the military is often the only organisation with the “surge capacity” (the ability to mobilise massive resources, manpower, and communications infrastructure almost instantly) required to handle catastrophic events (Heaslip & Barber, 2016). In the context of disaster management, CMR literature suggests moving from a relationship of “control” to one of “coordination.” This involves establishing clear legal frameworks that define the military’s role as “Aid to Civil Authority,” ensuring that military deployment supports, rather than supplants, civilian leadership (Bollen & Kalkman, 2022).

Integrating the Bangladesh Army into Urban Governance

Integrating the Bangladesh Army into urban disaster governance requires careful consideration of both theoretical and practical implications. Theoretically, this integration can be framed in terms of collaborative governance (Haque, 2023), which emphasises cooperation and coordination among diverse stakeholders in governance processes (Emerson et al., 2011). Collaborative governance recognises that no single actor—government, military, or civil society can tackle complex challenges like disasters alone; effective management requires pooling capabilities and working across institutional boundaries. In Bangladesh, however, civil-military collaboration in disaster contexts has often been ad hoc or outside the formal civilian bureaucratic framework (Haque, 2023). A more institutionalised collaboration would entail establishing clear communication channels, shared goals, and mutual trust between military and civilian actors. Improved inter-agency coordination is particularly needed in Bangladesh, given that current disaster management efforts suffer from institutional silos and barriers (Choudhury et al., 2021). Principles of collaborative governance, such as joint decision-making, transparency, and accountability, could help bridge these gaps and ensure that the military’s strengths are utilised effectively when disasters strike.

Theories of civil–military coordination in disaster management examine how military and civilian agencies can cooperate during emergency events (Hedlund & Alvinus, 2025), highlighting the importance of

delineating roles, conducting joint training, and standardising protocols (Nicolas, 2023; Ries, 2022). Other countries provide models for such coordination: in Japan and Indonesia, for instance, military forces are deeply integrated into national disaster management plans (Djuyandi et al., 2019; Lestari et al., 2020). In Japan, the Self-Defence Forces (SDF) actively participate in earthquake preparedness drills and disaster relief operations, leveraging their logistical and technical skills to support civil authorities (Siawsh et al., 2021; Nishiyama, 2014). Indonesia has similarly institutionalised military involvement in disaster response, achieving unified military–civil actions that deliver swift, coordinated relief after earthquakes (Lestari et al., 2020). These international examples suggest that clear guidelines, joint training exercises, and pre-defined coordination mechanisms are key to successful civil–military integration. For Bangladesh, lessons from the Japanese model could inform how to structure military–civil coordination and resource mobilisation for earthquakes. Any integration strategy would need to be codified in policy (e.g., within the NPDM) and practised through regular joint exercises to ensure readiness and mutual understanding before a disaster occurs.

Methodology

Research Design

This study employed a qualitative, exploratory research design based on secondary document analysis, using both thematic and comparative techniques to investigate civil–military integration in urban earthquake management. Philosophically, the research is grounded in an interpretivist-constructivist paradigm (Fung et al., 2023), which privileges context-dependent meanings and institutional processes. This approach also has a critical orientation, examining issues of power, coordination, and governance. A qualitative design was deemed appropriate for exploring the complex interactions between the military, disaster management systems, and governance structures (Sofuoglu et al., 2025). It allows for an in-depth understanding of institutional experiences and negotiations, which is crucial for addressing how the Bangladesh Army’s role could evolve in disaster management (Malalgoda et al., 2018).

Data Collection and Selection Criteria

Data for the study were collected through secondary sources. Approximately 70 relevant documents were analysed, including government policy papers (such as the NPDM and related frameworks), military guidelines and after-action reports, academic research articles, and reports from international organisations. Priority was given to sources that directly pertain to earthquake disaster management, military participation in disasters, and urban governance in Bangladesh. Key documents included the National Plan for Disaster Management (NPDM, 2020), which delineates stakeholder roles (including the armed forces) in disaster response, as well as government reports that describe Bangladesh’s current disaster management

setup and policies (Akter & Sultana, 2023; Barua et al., 2021). Publications by the Bangladesh Army and Armed Forces Division (e.g., operational reviews of disaster responses) were reviewed to assess the Army's logistical capacity, coordination mechanisms, and resource mobilisation in past emergencies (Reis, 2018). Academic literature provided theoretical perspectives on urban governance, disaster management, and civil-military coordination, as well as case studies of military integration in disaster scenarios abroad (Shah et al., 2022). International case studies (particularly from countries with significant earthquake risk) were incorporated to allow comparative analysis of military roles in disaster management.

In terms of inclusion criteria, the study focused on documents that were clearly relevant to earthquake management, civil-military roles in disasters, or urban governance in Bangladesh. Government reports, military sources, and peer-reviewed academic articles were emphasised to ensure credibility and scholarly rigour (Banu, 2023). International cases (e.g., Japan, Indonesia, the Philippines) were included to provide a broader perspective on military integration into disaster management systems. Conversely, sources dealing with unrelated disaster types (e.g., solely floods with no connection to military roles) were generally excluded, unless they offered pertinent insights into civil-military coordination. Also, documents more than ten years old were omitted to maintain a focus on current institutional contexts, given significant policy changes in the last decade, unless an older source provided historical background still applicable to current practices (Sousa & Tsionis, 2025). For example, the NPDM underwent major revisions in 2010 and 2020; thus, recent sources capture the present framework better, and older sources were used sparingly and only when necessary for context.

Data Coding and Analysis: A Hybrid Approach

Data were analysed using a combination of thematic analysis and comparative analysis. For the thematic analysis, all collected documents were reviewed in depth and coded for key concepts related to the research questions. A hybrid thematic analysis approach was utilised, combining deductive and inductive coding to analyse the collected documents (Fereday & Muir-Cochrane, 2006).

Deductive Coding: We applied *a priori* codes derived from the disaster management cycle (Preparedness, Response, Recovery, Mitigation) as defined in the NPDM. This ensured the analysis was structured around the existing national legal framework.

Inductive Coding: As the review progressed, new themes emerged directly from the data. These included “*institutional friction*,” “*trust deficits*,” “*logistical mismatch*,” and “*doctrine gap*.” These inductive codes allowed us to capture the specific barriers to military integration that are not explicitly stated in official policy

but are evident in operational critiques and after-action reports.

For the comparative analysis, insights from Bangladesh were juxtaposed with international case studies. We specifically compared Bangladesh's disaster management and civil-military coordination practices with those of Japan, Indonesia, and (to a lesser extent) the Philippines. These countries were selected due to their significant earthquake exposure and their integration of military forces in disaster response. The comparative approach was used to identify best practices, lessons learned, and cautionary tales that could inform Bangladesh's approach. By analysing similarities and differences in governance structure and military mandates across these cases, the study aimed to highlight what institutional arrangements might be most applicable for Bangladesh. Taken together, the dual analytic strategy provided both depth and breadth: thematic coding offered an in-depth understanding of Bangladesh's specific context and challenges, while cross-country comparison provided broader insights and concrete examples of successful (or problematic) military integration. Ensuring rigour in this qualitative analysis, we iteratively cross-checked themes with the data and consulted multiple sources for validation. This approach enhances the reliability of the findings and their applicability to policy recommendations.

Justification of Comparative Case Studies

Japan and Indonesia were selected for comparative analysis based on specific criteria relevant to Bangladesh:

Indonesia: Shares key characteristics with Bangladesh, including a history of military political involvement, a transition to democracy, and high seismic risk. It offers a relevant model for how a developing nation can legally and operationally integrate a powerful military (TNI) into a civilian-led disaster agency (BNPB).

Japan: Represents the “*aspirational model*” of technological and legislative preparedness in a high-risk seismic zone. The integration of the Japan Self-Defence Forces (SDF) into disaster response provides a model for “*Aid to Civil Authority*” that strictly adheres to civilian control, offering lessons in joint training and equipment standardisation.

The Context of Vulnerability: Dhaka's Urban Risk Profile

Dhaka's Urban Morphology: Unplanned Density

Dhaka's urban morphology is a textbook case of risk accumulation. The city has expanded onto low-lying marshlands through ad-hoc landfilling, creating areas that are highly prone to liquefaction. The density of the built environment is extreme, with narrow streets that would become impassable for heavy rescue machinery in the event of building collapses (Banu, 2023). The lack of open spaces for evacuation and the interdependency of critical infrastructure (electricity, water, gas) mean that a seismic

event would likely trigger secondary disasters, such as urban fires, in a cascading failure mode.

The “Cyclone Trap”: Misleading Metrics of Success

While Bangladesh has successfully reduced cyclone fatalities, this success is often misleading when applied to the urban context. The logistics of cyclone response (evacuating coastal populations to pre-positioned shelters) rely on early warning systems that provide hours or days of lead time. Earthquakes offer no such warning. Furthermore, the skills required for cyclone relief (distribution of food, water purification, temporary shelter) are fundamentally different from those required for earthquake response (heavy urban search and rescue, concrete breaching, shoring up unstable structures). The “cyclone model” has created a false sense of security, obscuring the fact that the nation possesses almost no capability to handle the immediate aftermath of a massive urban structural collapse.

The Bangladesh Army in Disaster Management Historical Role and Mandate

The Bangladesh Army operates under the mandate of “*Aid to Civil Power*.” Historically, it has been the most reliable institution for crisis management, deployed frequently for flood relief, cyclone recovery, and even traffic control during political unrest (Wolf, 2013). The Armed Forces Division (AFD), under the Prime Minister’s Office, coordinates these deployments. This centralised command structure allows for rapid decision-making but often bypasses local civilian authorities, creating a dependency on the military for routine emergency management.

Operational Capabilities: Logistics vs. Specialisation

Bangladesh Army possesses significant assets: disciplined manpower, engineering equipment (bulldozers, cranes), and aviation assets. These assets are invaluable for logistics: moving large quantities of aid or people. However, the analysis indicates a critical gap in specialisation. The Army’s engineering corps is primarily trained for combat engineering (mobility/counter-mobility) and infrastructure construction, not for the delicate and technical work of Urban Search and Rescue (USAR). There is a documented lack of modern search and rescue equipment, such as hydraulic cutters and breathing apparatuses, specifically for collapsed structure scenarios.

The Rana Plaza Case Study: Lessons in Structural Collapse

The collapse of the Rana Plaza garment factory in 2013 serves as a tragic proxy for earthquake response. While not a seismic event, it presented the exact challenges of an urban building collapse: victims trapped under tons of reinforced concrete. The response revealed severe deficiencies. While the Bangladesh Army, Fire Service and Civil Defence (FSCD) worked heroically, they lacked heavy cutting equipment, acoustic sensors, and thermal

imaging cameras. Rescuers were forced to use manual tools, and in some cases, untrained volunteers performed amputations with hacksaws to free victims. The coordination between the Army, Fire Service, and volunteers was chaotic, highlighting the lack of a unified command system for urban collapse scenarios (Sattar et al., 2020). This event underscored that general military discipline is no substitute for specialised technical rescue capability.

Comparative Analysis

Indonesia: Institutionalising Military Operations Other Than War (OMSP)

Indonesia’s approach to integrating the TNI (Indonesian National Armed Forces) offers valuable lessons. Following the 2004 tsunami and the transition to democracy, Indonesia passed Law No. 34/2004, which explicitly includes disaster relief under “Military Operations Other Than War” (OMSP). This provides a clear legal basis for military deployment without declaring martial law. Furthermore, the TNI works within the framework of the BNPB (National Disaster Management Agency), a civilian body. Indonesia has also established Rapid Response Units specifically designated for disaster relief, bridging the gap between combat readiness and humanitarian need. Bangladesh could emulate this by amending the SOD to give the AFD a similar, clearly defined OMSP mandate that triggers automatically upon seismic indicators.

Japan: The Self-Defence Forces and Civilian Control

Japan offers a model of high-tech integration. The Disaster Countermeasures Basic Act legally codifies the relationship between the SDF and local governments. Prefectural governors have the authority to request SDF deployment, ensuring civilian supremacy. The key differentiator in Japan is the rigorous joint training. The SDF and civilian agencies (police, fire, and coast guard) conduct massive annual drills that test interoperability, communication frequencies, and command handovers. In Bangladesh, military and civilian radios often cannot even communicate on the same frequency. Adopting Japan’s protocol for “jointness” in communications and grid mapping would be a low-cost, high-impact reform for Bangladesh.

Results and Discussion

Institutional Bottlenecks and Friction

The review of policy documents identifies a systemic “mismatch.” The governance structure is designed for slow-onset disasters where centralisation is manageable. Earthquakes, however, require decentralised, immediate action. The military’s mandate is broad but lacks the technical specificity for urban seismic events, creating a capability gap despite the institution’s overall strength. Table 1 below summarises the key thematic findings.

Table 1: Disaster Management Framework and Military Integration

Theme	Key Focus	Relevance to Research	References
Disaster Management Framework in Bangladesh	National framework for disaster management in Bangladesh	Provides a comprehensive national strategy for disaster management, including earthquake preparedness, and the roles of various stakeholders, including the military.	Choudhury et al. (2021), Haque (2023), Mannan et al. (2021), and Zaman et al. (2022)
Role of the Military in Disaster Response	Bangladesh Army's operations in past disaster responses	Highlights the Bangladesh Army's logistical strengths, operational strategies, and its involvement in past disaster management, particularly in flood and cyclone events.	Bahauddin and Iftakhar (2017), Hossain (2020), and Hossain (2024)
Urban Governance and Disaster Preparedness	Urban governance, disaster management, and military integration	Examines urban governance structures and challenges in Bangladesh, focusing on disaster management strategies and the potential role of the military in earthquake preparedness.	Ahmed and Kabir (2021), Banu (2023), Choudhury et al. (2019), and Kabir et al. (2018)
Earthquake Risk and Vulnerability in Bangladesh	Earthquake vulnerability and risk management in Bangladesh	Analyses Bangladesh's earthquake risk levels and vulnerabilities, with recommendations for resilience and the role of the military in preparedness efforts.	Ahmed and Morita (2018), Mokhtari (2023), Omar et al. (2021), and Preciado et al. (2015)
Comparative International Case Studies on Military Integration in Disaster Management	Japan's Self-Defence Forces' role in earthquake response	Provides insights into Japan's Self-Defence Forces, offering a comparative model for Bangladesh in terms of military integration into earthquake disaster management.	Berlin and Carlström (2015), Kushal (2025), Michaud et al. (2019), and Nakahara (2023)
Military's Role in Disaster Management in Southeast Asia	Military involvement in natural disasters in Indonesia	Analyse the role of Indonesia's military in managing natural disasters, including earthquakes, providing lessons for Bangladesh's military involvement in disaster management.	Ali et al. (2021), Djuyandi et al. (2019), Kushal (2025), and Maarif and Ayu Puspito Sari (2020)
<i>Note:</i> The themes above guided the organisation of the analysis. The literature mapping in Table 1 illustrates how different strands of research and case evidence were used to address the research questions. In the following sections, these themes are examined in detail to evaluate Bangladesh's current system and how the Army could enhance earthquake disaster management.			

The table highlights a critical discord between the *nature of the threat* (earthquake) and the *nature of the response mechanism*. While the governance structure is robust for cyclones (centralised warning, local shelter access), it fails for earthquakes because the centralisation creates decision-making latency. Similarly, the military mandate is politically robust but technically generalised. The “Fragmented” coordination theme underscores the findings from the Rana Plaza collapse, where multiple agencies operated without a unified command, a potentially fatal flaw in a city-wide seismic event.

Thematic Analysis of Bangladesh's Disaster Management

Bangladesh is highly vulnerable to natural disasters due to its geographic location, dense population, and socio-economic factors. The country regularly faces floods, cyclones, riverbank erosion, and has significant seismic risk. The government has developed a disaster management framework to handle these threats, but major challenges persist, especially for low-frequency but high-impact events like a severe urban earthquake (Banu, 2023).

The primary government agency for disaster response and recovery is the Ministry of Disaster Management and Relief (MoDMR), which operates under guidelines set out in the National Plan for Disaster Management (NPDM). The NPDM, first formulated in 2008 and later revised in 2020, provides broad guidance for disaster preparedness, response, and recovery (NPDM, 2020). It emphasises a multi-stakeholder approach whereby central government agencies, local authorities, the private sector, and NGOs are all supposed to work in unison to reduce disaster risks (Jayasekara et al., 2022). However, the implementation of this framework has been weak. In practice, coordination among the different actors is often lacking, and significant gaps remain between policy and on-the-ground preparedness (UNDRR, 2024).

Nowhere are these issues more critical than in the Dhaka Metropolitan Area, which faces one of the highest seismic risks in the region (Arambepola et al., 2014). While institutions like the Earthquake Preparedness and Awareness Committee (EPAC) have been established to promote awareness and planning for seismic events (Roy et al., 2025), the overall disaster management system is ill-

prepared for a major earthquake in an urban setting. Limitations in resources, infrastructure, and trained manpower, as well as the lack of routine earthquake drills, continue to plague the system (Lin & Lee, 2022). The Bangladesh Army's contributions to disaster management to date have largely been in a post-disaster capacity, acknowledged as valuable in relief and recovery phases after floods and cyclones, but this involvement has been reactive rather than built into pre-disaster planning. Civilian processes for involving the military are mainly limited to emergency relief deployment, rescue operations, and logistical support once a calamity (like a cyclone) has occurred (Nicolas, 2023).

There are clear benefits to integrating the military into *proactive* earthquake preparedness and mitigation plans, yet such integration remains minimal so far. To better understand how the military might be leveraged, it is useful to dissect Bangladesh's disaster management system by the phases of the disaster cycle (as outlined in the NPDM) and consider the potential role of the Army in each phase. The NPDM defines four key phases: Preparedness, Response, Recovery, and Mitigation, each addressing different temporal aspects of disaster management (NPDM, 2020). Preparedness focuses on reducing risks and readying resources before an event; Response covers immediate actions to save lives and contain impacts; Recovery involves restoring normalcy and rebuilding in the aftermath; and Mitigation entails long-term measures to minimise future disaster damage (e.g., building resilience). Table 1 (in the previous section) identified themes and literature related to each of these phases and the military's involvement.

In the subsequent analysis, we examine each phase in turn, assessing how the Bangladesh Army could contribute and what strengths or weaknesses would influence its effectiveness. *(It should be noted that Bangladesh has not experienced a large urban earthquake in recent history; therefore, we draw on the Army's experiences in managing other disasters, particularly cyclones, as analogues to project its potential performance in an earthquake scenario.)* These analogous experiences help illustrate the Army's capabilities and limitations under disaster conditions and are used here to infer relevant lessons for earthquake preparedness and response.

Bangladesh Army's Role in Disaster Management by Phase

Preparedness Phase: The preparedness phase is characterised by proactive measures such as risk assessments, contingency planning, training, and resource pre-positioning, all aimed at minimising the impact of a disaster before it occurs (Rahman et al., 2023). Key activities include hazard mapping, public education campaigns, training exercises, and the development of emergency response plans (Asih et al., 2023). The Bangladesh Army could play a significant role in this phase by leveraging its logistical prowess, training infrastructure, and disciplined manpower. The Army's nationwide presence and organisational capacity mean it

could help conduct community training programs and disaster drills, particularly in high-risk urban areas. Involving military instructors in community preparedness (e.g., earthquake safety workshops or school drills) could enhance the reach and credibility of such programs. Army engineers and planners can assist local authorities in *pre-positioning* critical resources (rescue equipment, medical supplies, temporary shelter materials) in strategic locations, so that they are readily available if an earthquake strikes. Ensuring that these resources are stocked and accessible in a dense urban environment like Dhaka would greatly improve response speed. Cyclone Sidr (2007) provided a practical test of the Army's ability to mobilise resources quickly; though this was a cyclone event, it demonstrated the Army's efficiency in logistics and mass mobilisation, an ability that can be translated into earthquake preparedness through joint simulations and training exercises. Incorporating such lessons, the Army can hold regular joint disaster drills with civil agencies focused on earthquake scenarios, thereby improving readiness. Indeed, after Cyclone Sidr, the Army learned the value of rapid resource deployment and coordination, which could be applied to pre-earthquake preparations (Aase, 2020). Overall, engaging the military in preparedness would bolster the country's state of readiness by adding manpower, expertise, and organisational strength to preventative measures.

Response Phase: The response phase encompasses immediate actions taken in the aftermath of a disaster, including search and rescue operations, emergency medical care, firefighting, evacuation, and the provision of relief supplies (NPDM, 2020). Speed and coordination are paramount during this phase to save lives and reduce suffering. The Bangladesh Army is well-positioned to be a cornerstone of the response phase, given its ability to deploy troops and resources rapidly across challenging terrains. The Army maintains specialised units, such as engineering battalions and medical corps, that can be invaluable in urban search-and-rescue and emergency medicine. By virtue of military discipline and training, soldiers can carry out large-scale evacuations and maintain order amid chaos, working alongside police and fire services. During Cyclone Amphan (2020), for example, the Army's efficient logistics and manpower deployment were critical in evacuating vulnerable populations and delivering emergency services in affected areas (The Federal, 2020). The same proficiencies can be directly applied in an earthquake's aftermath: Army engineering teams can clear debris to open access routes, search-and-rescue teams (trained in collapsed structure rescue) can save trapped individuals, and military field hospitals with medical staff can treat the injured on-site. The Army's communications equipment and networks can also substitute for damaged civilian communication infrastructure, ensuring that information flows between the disaster site and national decision-makers. A coordinated response structure, where the Army works under the civilian-led Disaster Management committees but with

clearly assigned tasks, would maximise these contributions. One challenge noted is that, currently, the Army has limited training specifically for urban earthquake response (Avadi & Seth, 2020). This means there could be gaps in highly specialised skills like advanced urban search-and-rescue techniques or high-rise evacuation procedures. Addressing this through prior training and perhaps international cooperation (learning from countries like Japan, which routinely train their military for earthquake response) would be necessary. Nevertheless, the Army's proven ability to act quickly and at scale suggests that integrating them fully into the official earthquake response plans (with predefined roles and protocols) could vastly improve the timeliness and effectiveness of disaster response in Bangladesh.

Recovery Phase: The recovery phase involves restoring normalcy after the immediate emergency has passed. This includes rehabilitating survivors, rebuilding infrastructure, restoring services and livelihoods, and addressing longer-term needs such as mental health support. Recovery is often a protracted effort requiring significant resources and coordination. The Bangladesh Army traditionally takes on substantial roles in recovery for disasters like cyclones – protecting damaged areas, helping rebuild vital infrastructure, and assisting in relief distribution during the transition to rehabilitation (Hossain, 2021). The Army's engineering units are adept at constructing temporary bridges, clearing rubble, and erecting shelters, all of which would be crucial after a major earthquake. They can also provide security in affected areas to prevent looting and violence during the often-chaotic aftermath of a disaster, thereby stabilising the environment for recovery work (Manandhar et al., 2017). After Cyclone Sidr (2007), for instance, the Army was instrumental in reconstructing roads and embankments and helping communities rebuild homes, while also maintaining law and order during the recovery process (The Federal, 2020). By analogy, following a severe earthquake, the Army could be tasked with restoring critical urban infrastructure: clearing and rebuilding key roads, repairing or demolishing unsafe buildings, and setting up temporary water supply and power arrangements. The Army Corps of engineers working in tandem with civilian authorities, could significantly speed up the restoration of essential services. Additionally, military resources (such as trucks, heavy equipment, and manpower) can support the large-scale relocation or housing of displaced populations. A potential weakness in the Army's role during recovery is the need for specialised knowledge in structural assessment and earthquake-resistant construction. Military engineers might require additional training or collaboration with civilian structural engineers to ensure that rebuilding efforts incorporate “*building back better*” principles (Sattar, 2021). There is also a broader concern that an overly militarised recovery could sideline community participation or local needs. To mitigate that, the military's role should be supportive: providing muscle and logistical backbone for recovery operations led by civil authorities

and communities. When balanced appropriately, the Army's disciplined approach and resource capabilities are a strong asset in the recovery phase, helping to rebuild faster and more securely.

Mitigation Phase: The mitigation phase is oriented towards long-term risk reduction, aiming to lessen the impact of future disasters through resilience-building measures (Bonadonna et al., 2021). Typical mitigation activities for earthquakes include enforcing earthquake-resistant building codes, retrofitting existing vulnerable structures, public education on disaster risk, land-use planning to avoid high-hazard zones, and other policy measures to strengthen societal resilience. While mitigation is largely a planning and policy domain (often under ministries like housing, urban planning, etc.), the Bangladesh Army can contribute here as well. The Army's engineering and planning expertise could support efforts to evaluate seismic risks in various urban localities and to strengthen critical infrastructure. For example, military engineers could assist in conducting structural vulnerability assessments of important public buildings (schools, hospitals, emergency facilities) and even help in retrofitting projects by providing labour and technical support. The Army's experience with large construction projects and its ability to mobilise resources could be leveraged for ambitious mitigation projects, such as constructing emergency evacuation routes or earthquake-resistant public shelters in densely populated areas. The Army can also play a role in community outreach for mitigation: through its civil-military cooperation programs, it could help raise public awareness about earthquake preparedness (Lin & Lee, 2024). Nationwide campaigns, possibly led by Army personnel in collaboration with local officials, can educate citizens on what to do before, during, and after earthquakes, thus fostering a culture of preparedness. Furthermore, the Army could assist urban planners by providing logistical data and support for simulations of disaster scenarios, which can inform better urban planning decisions (e.g., identifying which bridges or roads need reinforcement as a priority). One concrete mitigation measure is for the Army to help enforce building standards in cantonment areas or military-built infrastructure, setting an example of compliance with seismic codes for the rest of the country. However, a major limitation at present is that the Army has not traditionally been involved in the policymaking aspects of mitigation and may lack specific training in seismic risk analysis or urban planning (Agrawal et al., 2024). Collaboration with civil engineers, urban planners, and international experts would enhance the Army's effectiveness in this phase. Still, given its long-term project management capability and hierarchical discipline, the Army could be an important partner in executing mitigation initiatives that require sustained effort, such as large-scale retrofitting or reinforcing of infrastructure (Ramesh et al., 2025). Based on its experience rebuilding infrastructure after cyclones, the Army could also advise on constructing more robust facilities that can withstand future earthquakes (Klima &

Jerolleman, 2014). While civilian agencies must lead on mitigation policies, the Army's support in planning and implementing those policies can significantly contribute to reducing future earthquake risks.

Theoretical and Conceptual Insights on Military Integration

The findings above underscore that effective integration of the military into disaster management must be accompanied by supportive governance structures and clear policies. Collaborative governance theory suggests that formal mechanisms are needed to facilitate joint decision-making among stakeholders (Subagia et al., 2021). In Bangladesh, an institutional platform that brings together military and civilian disaster managers could greatly improve communication and coordination (Haque, 2023). For instance, establishing a dedicated civil–military disaster coordination cell or task force (within the MoDMR or Prime Minister's Office) would create a routine interface for planning and information-sharing. This could also help overcome the traditional separation of military involvement from the civilian bureaucratic process (Haque, 2023). The analysis indicates that institutional bottlenecks, such as unclear authority or mistrust between agencies, are currently a major impediment to coordination (Choudhury et al., 2021). Applying collaborative governance principles (mutual goals, equal participation, and transparency) could gradually break down these barriers and integrate the Army's disaster role within the civilian-led system.

Civil–military coordination frameworks highlight the need for role clarity and joint training (Nicolas, 2023; Ries, 2022). The case studies of Japan and Indonesia reinforces this point. In Japan, civil and military actors regularly engage in disaster drills together, and explicit guidelines outline their respective responsibilities during crises. This level of preparation means that when a real disaster occurs, such as the 2011 earthquake, the military and civil agencies operate seamlessly, with pre-assigned tasks and communication protocols (Ishiwatari et al., 2023). Bangladesh could benefit from adopting similar practices: joint disaster exercises involving the Army, Fire Service, police, health services, and local authorities would build trust and familiarity. The comparative analysis also shows that institutionalisation of military roles in disaster management helps mitigate fears of militarisation. In Indonesia, for example, the military's disaster role is defined in law and occurs under the direction of the national disaster management agency (Suparji et al., 2024). Bangladesh could formalise the Army's disaster assistance role through amendments to the Standing Orders on Disasters or other relevant legislation, clearly stipulating that the Army's involvement is in aid of civil authorities and under civilian command. This would address political sensitivities by ensuring the military acts as a supporting agency rather than a commanding force in domestic crises.

The SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) conducted as part of this study

provides a structured way to summarise the potential of military integration at each disaster phase (Inan et al., 2023). Strengths include the Army's rapid mobilisation capacity and disciplined organisation (particularly useful in Preparedness and Response), its engineering and security capabilities (crucial in Recovery and Mitigation), and its nationwide presence. Weaknesses involve the Army's current lack of specialised earthquake training and equipment, limited experience in some technical aspects of disaster management, and the institutional resistance from civilian agencies. These weaknesses manifest, for instance, as gaps in urban search-and-rescue expertise and occasional delays in deployment due to civil–military coordination hiccups (Manandhar et al., 2017). Opportunities identified include learning from international best practices (sharing knowledge with Japan's SDF or Indonesia's BNPB on civil–military disaster coordination) and leveraging global partnerships for training and equipment. The Army could also seize the opportunity to burnish its public image by taking on more visible disaster preparedness roles, which can strengthen public trust and civil–military relations in a positive way.

Threats primarily concern the political and social risks of an expanded military role. These include the danger of dependency on the Army that might weaken civilian agencies, the potential erosion of civilian oversight, and public scepticism or fear of militarisation of civic spaces (Hedlund & Alvinus, 2025). The analysis of Bangladesh's political context, supported by literature on its civil–military relations (Wolf, 2013; Pattanaik, 2021), suggests that these threats are real but can be mitigated with transparency and clear rules of engagement. The conceptual exploration reinforces that the integration of the Bangladesh Army into urban earthquake management should be carefully calibrated. It is not a call for the military to take over disaster management, but rather to embed the military as a supportive partner within the existing governance framework. The Army's unique capabilities can substantially improve Bangladesh's disaster preparedness and response, but only if harnessed under a structure that maintains civilian leadership, accountability, and community involvement. The next section will discuss specific recommendations for policy and practice changes to achieve this balance.

SWOT Analysis of Military Integration for Earthquake Management

There is a palpable tension in the literature between the efficiency of the military and the democratic imperative of civilian control. Civilian agencies in Bangladesh often view the military's involvement with a mix of relief and suspicion. While they rely on the Army's capacity, there is a fear that institutionalising this role might undermine the development of civilian agencies like the Fire Service and Civil Defence (FSCD) (Wolf, 2013). This "trust deficit" leads to a lack of integrated planning; civilian agencies create plans that assume they will handle the situation, only to call the Army when overwhelmed, leading to a disjointed response. To distil the above findings, we

present a brief SWOT analysis highlighting the Bangladesh Army's Strengths, Weaknesses, Opportunities, and Threats in the context of earthquake disaster management. This analysis is organised by the disaster management phases, which helps in formulating phase-specific policy recommendations (Inan et al., 2023).

Preparedness Phase: The Army's strengths in this phase include strong operational planning capabilities and logistics. The military can swiftly mobilise and pre-position resources (such as emergency supplies and equipment) thanks to its hierarchical structure and discipline (Rahman et al., 2023; Zaman et al., 2022). Past experience in organising large-scale operations (including international missions) means the Army is adept at coordinating and moving resources efficiently (Reis, 2018). Additionally, the Army's presence across the country, including remote areas, is a strength that ensures even hard-to-reach communities can be included in preparedness initiatives. On the other hand, a major weakness is the lack of earthquake-specific preparation: the Army's training and equipment have been oriented towards floods and cyclones, not seismic events. This gap includes limited training in urban search-and-rescue techniques specific to collapsed buildings, and an absence of specialised engineering tools for earthquake response. Another weakness is institutional resistance from some civilian agencies, which may view involving the military in pre-disaster planning as encroachment (Avadi & Seth, 2020). This can create a silo effect where information and resources are not freely shared. The opportunities at this stage involve capacity building: the Army can develop specialised disaster response units (or train existing units) for earthquake scenarios, learning from countries like China or Turkey that have dedicated military quake-response teams. There is also an opportunity to conduct joint training exercises, which can build relationships with civilian responders. As for threats, an overemphasis on military-led preparedness could risk the neglect of community-based approaches. It is important that while exploiting the Army's strengths, local community preparedness (e.g., volunteer training, school drills) is not overshadowed or underestimated.

Response Phase: The Army's greatest strengths in response are speed and scale of deployment. The military can often reach affected areas faster than many civilian organisations, especially if infrastructure is damaged, thanks to its transport resources (aircraft, trucks, boats) and disciplined chain of command. The Army's ability to operate in high-risk environments (collapsed structures, fire, hazardous materials) and its experience with mass casualty management are also strengths. Bangladesh Army units have honed these skills through responding to past cyclones, and though earthquakes present new challenges, the underlying abilities (rapid mobilisation, maintaining order, large-scale logistics) are directly transferable. A clear example of strength is the Army's evacuation and relief distribution performance in Cyclones Sidr and

Amphan, which was widely praised for its efficiency. However, a known weakness is the current under-preparedness for urban search-and-rescue in dense city environments. Earthquake response requires specialised training to safely extricate people from rubble, conduct structural damage assessments, and coordinate with international rescue teams if necessary. These are areas where the Army's lack of prior focus could hamper effectiveness (Avadi & Seth, 2020). Another weakness, observed in exercises and smaller incidents, is occasional coordination delay when the military and civil agencies try to synchronise efforts. Without predefined coordination protocols, time can be lost in the immediate aftermath of a disaster (Manandhar et al., 2017). For opportunities, Bangladesh can establish knowledge-sharing arrangements with countries like Japan and Indonesia (both of which have integrated military earthquake response capabilities) to train its forces. Participation in international disaster response drills or United Nations simulations could also enhance readiness. The Army can upgrade its equipment (for example, acquiring modern search cameras, cutting tools, and lifting airbags for rescue operations) through international support or government funding as part of preparedness. The threats in the response phase mainly involve public perception and trust. If the military leads high-profile response operations, any misstep (like misallocation of relief or excessive use of force in crowd control) could draw public criticism and reduce confidence in both the Army and the government. Additionally, heavy military involvement might dissuade international humanitarian agencies if they perceive the environment as too militarised, which could limit external aid. These threats underscore the need for the Army's role to be clearly supportive and coordinated under a humanitarian framework, rather than independent or domineering.

Recovery Phase: Key strengths of the Army in recovery include engineering expertise and the ability to maintain security and order in unstable environments. The Army's engineering corps has experience in rebuilding roads, bridges, and public facilities quickly after disasters (Hossain, 2021). Their discipline ensures that recovery operations (which can often be chaotic with multiple actors and interests) proceed with a degree of order and protection for vulnerable groups. For example, after past cyclones, Army personnel have effectively managed relief camps, helped prevent looting of aid, and ensured equitable distribution of resources (Manandhar et al., 2017). Such capabilities would be valuable after an earthquake, where large populations might be displaced and critical infrastructure devastated. One weakness, however, is that the Army currently lacks a comprehensive knowledge base on earthquake-specific recovery, such as techniques for retrofitting partially damaged buildings or conducting detailed structural damage assessments to decide what can be salvaged. Without this expertise, there is a risk of inadequate reconstruction or even inadvertently restoring vulnerability (Sattar, 2021). Additionally, the

Army's hierarchical approach might conflict with the more participatory approaches needed in long-term community recovery. Recovery often requires engaging local communities in decision-making (where to rebuild, how to rebuild safer, etc.), and a purely top-down approach could alienate locals. An opportunity in this phase is leveraging global cooperation. Recovery from a massive earthquake would likely involve international financial and technical assistance. The Army could partner with foreign military engineering teams (for instance, those from countries that have faced earthquakes) and international NGOs to gain technology and knowledge transfer during the rebuilding process. This can accelerate the adoption of best practices in reconstruction. Another opportunity is for the Army to incorporate disaster-resilient design principles in all reconstruction efforts it leads, building back not just quickly, but better. As a large institutional actor, the Army can exemplify building to code and even improving standards in the reconstruction projects it undertakes. Threats during recovery include the risk of "militarisation" of the rehabilitation process. If the military's role is not carefully modulated, there could be public pushback or political concern that the Army is overstepping into civilian administrative domains. Recovery is also a phase where corruption and resource misallocation can occur; a military role does not automatically remove this threat and could, if not transparent, draw the Army into controversies. Ensuring that civil authorities lead the prioritisation of recovery projects (with the Army as an executing partner) can mitigate this threat. Another threat is fatigue and overstretch: if the Army is deeply involved in a prolonged recovery, it may strain its resources and affect its primary defence readiness. This again points to the need for transitioning responsibilities back to civilian agencies as soon as feasible during recovery.

Mitigation Phase: The Army's strengths here revolve around its capacity for long-term planning and project implementation. Military institutions, by nature, plan for worst-case scenarios and often work on multi-year projects (e.g., fortifications, infrastructure in tough terrains). This strategic planning ability can be repurposed to help with disaster mitigation projects, such as constructing seismic monitoring networks or emergency evacuation routes, under civilian oversight. The Army's engineering units can also assist in technical studies, for instance, helping to conduct seismic risk assessments in various urban locales (in cooperation with geologists and civil engineers) and contributing to the development of contingency plans (Alam, 2023). A significant strength is the Army's ability to mobilise manpower for large-scale public works; if the government decides to retrofit hundreds of buildings or construct a series of earthquake-resistant shelters, the Army could be tasked to organise and execute much of this work efficiently. Weaknesses in mitigation are primarily the Army's current lack of specialisation in disaster risk reduction and community resilience building. Military training does not typically cover working with

communities on preparedness or designing civil infrastructure for disaster resilience. As such, the Army would need orientation and training to effectively contribute to civil mitigation efforts. There might also be an institutional culture gap: military approaches are command-and-control, whereas successful mitigation (like convincing thousands of private building owners to retrofit) requires persuasion, incentives, and regulatory enforcement beyond the military's scope. The opportunities in mitigation involve collaboration and learning. The Army can partner with urban planners, civil engineers, and academic researchers (possibly through secondment programs or joint task forces) to build its knowledge on seismic mitigation. By doing so, it can gradually develop an internal cadre of experts in areas like hazard-resistant construction, which can then support civilian agencies. There is also an opportunity for the Army to integrate disaster risk reduction into its own operations, ensuring that all military-run institutions (e.g., schools, hospitals in cantonments) are models of earthquake safety. This not only protects those assets but sets a standard for the nation. Moreover, engaging the Army in national mitigation efforts (like a campaign to enforce building codes) could add weight and seriousness to those initiatives, potentially accelerating compliance. The threats in this phase are fewer in terms of civil-military issues but revolve around misallocation of the Army's focus. If mitigation tasks are piled on the military without adequate resources or clarity, it could dilute the Army's effectiveness in both its primary role and disaster tasks. Another potential threat is if the Army's involvement in mitigation is perceived as the military intruding into civilian regulatory enforcement (e.g., checking building codes), which could cause friction with local authorities or be unpopular if not done sensitively. The military must thus tread carefully and ensure its mitigation roles are clearly at the invitation of, and in support of, civilian authorities (Klima & Jerolleman, 2014).

The SWOT analysis confirms that while the Bangladesh Army brings substantial capabilities to earthquake disaster management, there are also notable gaps and risks. Addressing the weaknesses (through training, policy changes, and resource provision) and mitigating the threats (through clear governance arrangements and communication) is essential for successful integration. Fortunately, the opportunities, learning from abroad, improving inter-agency collaboration, and building public-military trust through disaster efforts, are compelling and within reach if acted upon proactively.

Benefits and Challenges of Military Integration

Integrating the Bangladesh Army into urban earthquake disaster management offers a mix of significant benefits and serious challenges that must be balanced. Among the most evident benefits is the potential for much higher levels of coordination and coherence in disaster response. The Army is known in Bangladesh for its discipline,

efficiency, and ability to mobilise resources quickly even under adverse conditions. These qualities are invaluable in an emergency: during a large-scale earthquake, the military's logistical capacity could ensure that rescue teams, medical aid, and relief supplies are deployed rapidly and in an organised manner, reaching communities in need without delay (Quader et al., 2023). The Army's communication systems and hierarchical command can bring order to chaotic disaster scenes, helping to orchestrate the efforts of diverse groups and thereby avoid duplication or confusion. If the Army is incorporated into disaster preparedness planning, it could also ensure a state of operational readiness that purely civilian efforts might struggle to maintain. For example, military-led drills and joint training would mean that when an earthquake occurs, responders already know their roles and have practised together, leading to a faster and more effective response (Manandhar et al., 2017). Moreover, the Army's familiarity with operating in challenging environments and managing large-scale logistics (such as setting up temporary camps or transporting large quantities of supplies) would greatly bolster an earthquake response, which, in a megacity like Dhaka, could involve hundreds of thousands of victims. Another benefit is that by engaging the Army in disaster roles, Bangladesh can tap into military resources not normally available to civil administration, such as engineering equipment, helicopters, field hospitals, and so on, especially during the critical first few days post-disaster (Heaslip & Barber, 2016). The Army's ability to operate in high-risk urban areas (with unstable buildings, fires, etc.) and to do so systematically can help save lives and protect property in ways that ad-hoc civilian volunteer efforts might not.

Despite these advantages, there are challenges and concerns inherent in military integration. One major challenge is resistance from civilian institutions and bureaucracies (Zaman et al., 2022). In Bangladesh, the military historically has been seen as a separate, self-contained entity that intervenes mainly in security matters, not as a routine part of civilian disaster management. Some civilian officials may fear that involving the Army will encroach on their authority or lead to a dilution of civilian control. There can be institutional turf wars where ministries or departments are hesitant to share information or cede any responsibility to the military. This friction can create friction and distrust at precisely the moments when cooperation is needed most (Pattanaik, 2021). Another challenge is the lack of established coordination structures at the local government level. Bangladesh's local government bodies are not currently structured to easily integrate military units in planning or operations; thus, without clear guidelines, confusion might arise about who is in charge during a disaster operation (Hedlund & Alvinus, 2025). For example, a city mayor or district commissioner might be uncertain how to utilise military help if there is no predefined protocol, leading to delays or underuse of available Army assistance.

A further challenge is maintaining the fine line between leveraging military capabilities for civilian

benefit and unintentionally militarising disaster governance. Bangladesh's governance is civilian by constitution, and an over-involvement of the Army in civic functions could trigger public or political concern about the erosion of democratic norms. If the public perceives that the military is taking over roles beyond its mandate, it could lead to mistrust or fear, even if the intentions are purely humanitarian. There's also the risk that civilian agencies become too reliant on the military, potentially neglecting to build their own capacities (a form of moral hazard). Over-reliance might, in the long term, weaken the impetus to strengthen local emergency services or community preparedness, which is counterproductive (Tusalem, 2013).

To address these issues, it is crucial that the Bangladesh government clearly defines the role of the military in the national disaster management model. The Army's responsibilities in an earthquake (and other disasters) should be explicitly detailed in the NPDM and related policies so that all stakeholders understand when and how military assistance will be utilised. For instance, the NPDM can specify that the Army will support search-and-rescue operations, provide engineering support, and assist in logistics under the direction of the MoDMR when an earthquake emergency is declared. A clear role definition will prevent confusion and turf disputes during crises and reassure both civilian agencies and the public that the military's role is supportive and supplementary, not a takeover of civilian functions. Additionally, the government should invest in joint training programs and simulation exercises involving both military and civilian responders (Djuyandi et al., 2019). Regular joint drills will build familiarity, iron out coordination problems in advance, and create a habit of cooperation. Such exercises can be conducted at national and city levels annually, possibly with scenarios of a major Dhaka earthquake, to test and improve joint response plans. Developing standard operating procedures (SOPs) for civil-military coordination in disasters is another important step; these SOPs can cover communication channels, incident command structures, and resource-sharing arrangements.

It will also be important to nurture partnerships between the Army and local governments. One way to do this is to embed military liaisons in local disaster management committees or EOCs (Emergency Operations Centers). These liaisons can participate in planning and act as points of contact, ensuring that when a disaster happens, the military does not seem like an external entity but rather as part of the team. By maintaining the primacy of civilian leadership, for example, local governments calling on the Army's aid rather than the Army acting unilaterally, trust can be built. The Army should take care not overshadow local authorities or humanitarian organisations but to offer its capabilities in a spirit of service and cooperation (Campioni et al., 2023). Public communication is also key: if the government communicates clearly that the military's involvement in disaster management is to support and reinforce civilian efforts, it can alleviate public concern. Emphasising that the Army is a national asset being used

for public safety, under civilian oversight, frames the narrative positively.

While the integration of the Bangladesh Army into earthquake disaster management promises enhanced capacity and improved outcomes, it must be pursued with careful planning. Roles and protocols need to be formalised in policy; joint training and relationship-building are necessary to overcome institutional resistance; and measures must be in place to prevent an imbalance that could undermine civil authority or breed dependency. When these conditions are met, Bangladesh can harness the strengths of its Army as a force for resilience, dramatically improving its preparedness for a potential seismic catastrophe.

Policy Recommendations

Based on the analysis of gaps and international best practices, the following policy interventions are recommended:

Institutionalising “Automatic” Deployment Protocols

The Government of Bangladesh must revise the Standing Orders on Disaster (SOD) to create an automatic trigger mechanism for military deployment. Instead of waiting for a civilian request chain that may be disrupted by severed communications, the SOD should mandate that any seismic event exceeding Magnitude 6.0 in an urban area automatically authorises the local Area Commander to deploy forces for immediate perimeter security and route clearance. This “push” system mimics the Japanese model of rapid engagement while retaining ultimate civilian oversight (Ahmed, 2023).

Establishing Joint Civil-Military USAR Task Forces

The Army should establish dedicated Urban Search and Rescue (USAR) battalions equipped with heavy machinery (cranes, concrete cutters, acoustic listening devices) specifically for collapsed structure rescue. Unlike general infantry, these units should be trained specifically in technical rescue. Critically, these units should be co-located with Fire Service stations in strategic zones of Dhaka and Chittagong to ensure immediate joint response and to foster a culture of cooperation through daily interaction. Cross-training between the Army Engineering Corps and the Fire Service is essential to standardise rescue techniques and terminology.

Strengthening Collaborative Governance: The National Disaster Command Center

To address the “fragmentation” of coordination, a National Disaster Command Center (NDCC) should be operationalised with permanent representation from both the Armed Forces Division (AFD) and the Ministry of Disaster Management and Relief (MoDMR). Unlike current ad-hoc committees, this centre should function 24/7, serving as a fusion cell for risk assessment, resource tracking, and communication standardisation. This would ensure that when a disaster strikes, the “civil-military handshake” has already occurred.

Democratic Safeguards and Exit Strategies

To mitigate the risks of militarisation and address CMR concerns, legislation must clearly define the “exit strategy” for military forces following a disaster. The mandate should specify that military involvement is limited to the immediate response and stabilisation phases (e.g., the first 72 to 144 hours), with a mandatory, time-bound handover to civilian agencies for long-term recovery and reconstruction. This preserves the delicate balance of civil-military relations, ensuring the military acts as a specialised support arm rather than a governing authority (Wolf, 2013).

Conclusion

Bangladesh stands at a critical juncture in its urban development. The geological clock is ticking for a major seismic event in Dhaka, and the current urban governance structure, despite its successes in other domains, is ill-equipped to handle the fallout of a massive earthquake. The Bangladesh Army, with its logistical might, disciplined manpower, and engineering prowess, represents the most potent tool in the national arsenal for disaster response. However, maintaining the status quo where the military is treated as a “stop-gap” solution without integration into a legal, doctrinal, and technical framework is a recipe for operational failure and potential political instability during a crisis.

This study argues that “resilient urban governance” in Bangladesh does not mean excluding the military to preserve civilian purity, nor does it mean handing over the city to the generals in times of crisis. Rather, it requires a hybrid governance model: one that legally codifies the military’s role as a specialised, technical support arm of the civilian government. By adopting the technical rigour of the Japanese model and the legal clarity of the Indonesian model, Bangladesh can transform its Army from a reactive relief force into a proactive pillar of urban resilience. The integration of the military into earthquake management is not an admission of civilian failure, but a strategic necessity for survival in one of the world’s most seismically vulnerable urban landscapes.

Acknowledgement

I would like to express my sincere gratitude to the leadership and faculty of the Ordnance Centre and School, Bangladesh Army, for their guidance, encouragement, and institutional support throughout the development of this study. Their experience in logistics and operational planning provided the foundational understanding that shaped both the direction and depth of my analysis.

My appreciation also extends to colleagues and researchers from the Ministry of Disaster Management and Relief (MoDMR) and the National Disaster Management Council (NDMC) for sharing their insights and technical expertise. Their thoughtful discussions and constructive feedback strengthened the conceptual framework and ensured the policy recommendations reflected practical realities.

This research did not receive any financial assistance from external funding agencies. It represents an independent academic and professional effort conducted in pursuit of improved disaster governance and national resilience for Bangladesh. I am deeply grateful to everyone whose contributions, direct or indirect, made this work possible.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this research.

References

- Aase, M. (2020). Listing for change? Exploring the politics of relief lists in Bangladesh after Cyclone Sidr. *Disasters*, 44(4), 666–686. <https://doi.org/10.1111/disa.12395>
- Adade, D. (2020). Urbanisation and urban governance in Ghana: Identifying key actors and their roles. *African Journal of Inter/Multidisciplinary Studies*, 2(1), 88–102. <https://doi.org/10.51415/ajims.v2i1.843>
- Agrawal, H., Wang, C., Cremen, G., & McCloskey, J. (2024). A geophysics-informed pro-poor approach to earthquake risk management. *Research Square*. <https://doi.org/10.21203/rs.3.rs-4420667/v2>
- Ahmed, I., & Kabir, M. H. (2021). Building codes and regulations for disaster resilience in Bangladesh: the case of Dhaka. *International Journal of Disaster Resilience in the Built Environment*, 12(5), 540–554.
- Ahmed, M., & Morita, H. (2018). An analysis of housing structures' earthquake vulnerability in two parts of Dhaka city. *Sustainability*, 10(4), 1106. <https://doi.org/10.3390/su10041106>
- Ahmed, R. (2023). An Exploration of Civil-Military Coordination Architecture in Disaster Management of Bangladesh: Ways Forward. *NDC E-JOURNAL*, 3(1), 105-125.
- Akter, N., & Sultana, Z. (2023). Climate change and disaster management in Bangladesh. In *International Handbook of Disaster Research* (pp. 1–23). Springer Nature Singapore.
- Alam, E. (2023). A Modified Mercalli Intensity map of Bangladesh: A proposal for zoning of earthquake hazard. *Frontiers in Earth Science*, 11(1187176). <https://doi.org/10.3389/feart.2023.1187176>
- Alam, M. S., & Haque, S. M. (2022). Multi-dimensional earthquake vulnerability assessment of residential neighborhoods of Mymensingh City, Bangladesh: A spatial multi-criteria analysis. *Journal of Urban Management*, 11(1), 37–58. <https://doi.org/10.1016/j.jum.2021.09.001>
- Ali, Y., Sarjito, A., & Susanto, S. (2021). 11 leadership principles of Indonesian National Armed Forces in natural disaster management. *Journal of Leadership in Organizations*, 3(2). <https://doi.org/10.22146/jlo.64849>
- Alrehaili, N. R., Almutairi, Y. N., Alghamdi, H. M., & Almuthaybiri, M. S. (2022). A structural review on disaster management models and their contributions. *International Journal of Disaster Management*, 5(2), 93–108. <https://doi.org/10.24815/ijdm.v5i2.27087>
- Arambepola, N. M. S. I., Rahman, M. A., & Tawhid, K. (2014). Planning needs assessment for responding to large disaster events in cities: Case study from Dhaka, Bangladesh. *Procedia Economics and Finance*, 18, 684–692. [https://doi.org/10.1016/s2212-5671\(14\)00991-5](https://doi.org/10.1016/s2212-5671(14)00991-5)
- Armed Forces Division. (2024). *Role of Armed Forces Division in disaster management*. Government of Bangladesh. <https://afd.gov.bd/activities/armed-forces-division-in-disaster-management>
- Asih, S. W., Pandin, M. G. R., Yusuf, A., & Supriyadi. (2023). Literature review: Disaster risk reduction programs to increase public awareness of natural disasters. *medRxiv*. <https://doi.org/10.1101/2023.12.15.23300051>
- Atando, R. B., & Sugawara, D. (2023). Differences in the earthquake preparedness of low- and high-income countries: The cases of Panay Island, Philippines and Shizuoka Prefecture, Japan. *Research Square*. <https://doi.org/10.21203/rs.3.rs-2881021/v1>
- Avadi, S., & Seth, R. (2020). Positioning Indian military for disaster response: Comparative analysis of military involvement pre- and post-adoption of National Disaster Management Framework 2005. *Defence Studies*, 20(2), 123–142. <https://doi.org/10.1080/14702436.2020.1745072>
- Bahauddin, K. M., & Iftakhar, N. (2017). Exploring the leadership skill and challenge in responding natural disaster: Lessons from leaders involved in emergency response of Bangladesh. *Management of Sustainable Development*, 9(2), 31–34. <https://doi.org/10.1515/msd-2017-0019>
- Banu, N. (2023). Disaster governance and policy for Dhaka: Building a smarter city. In *International Handbook of Disaster Research* (pp. 1–14). Springer Nature Singapore.
- Barua, P., Mitra, A., Eslamian, S., & Isfahan, I. (2021). Disaster management strategies and relation of good governance for coastal Bangladesh. *Resources and Environmental Economics*, 3(2), 269–279. <https://doi.org/10.25082/ree.2021.02.002>
- Berlin, J. M., & Carlström, E. D. (2015). Learning and usefulness of collaboration exercises: A study of the three level collaboration (3LC) exercises between the police, ambulance, and rescue services. *International Journal of Mass Emergencies and Disasters*, 33(3), 429–467. <https://doi.org/10.1177/028072701503300307>

- Bilau, A. A., Witt, E., & Lill, I. (2018). Practice framework for the management of post-disaster housing reconstruction programmes. *Sustainability*, 10(11), 3929. <https://doi.org/10.3390/su10113929>
- Biswas, A., Mashreky, S. R., Dalal, K., & Deave, T. (2016). Response to an earthquake in Bangladesh: Experiences and lesson learnt. *Open Journal of Earthquake Research*, 5(1), 1–6. <https://doi.org/10.4236/ojer.2016.51001>
- Bollen, M., & Kalkman, J. P. (2022). Civil-Military Cooperation in Disaster and Emergency Response: Practices, Challenges, and Opportunities. *Journal of Advanced Military Studies*, 13(1), 79-91.
- Bonadonna, C., Frischknecht, C., Menoni, S., Romerio, F., Gregg, C. E., Rosi, M., Biass, S., Asgary, A., Pistolesi, M., Guobadia, D., Gattuso, A., Ricciardi, A., & Cristiani, C. (2021). Integrating hazard, exposure, vulnerability and resilience for risk and emergency management in a volcanic context: The ADVISE model. *Journal of Applied Volcanology*, 10(1), 7. <https://doi.org/10.1186/s13617-021-00108-5>
- Campioni, L., Poltronieri, F., Stefanelli, C., Suri, N., Tortonesi, M., & Wrona, K. (2023). Enabling civil–military collaboration for disaster relief operations in smart city environments. *Future Generation Computer Systems*, 139, 181–195. <https://doi.org/10.1016/j.future.2022.09.020>
- Chakma, K., & Matsui, K. (2022). Local officials’ perceptions of climate victim management challenges on Bangladesh’s southeast coast. *Climate*, 10(7), 105. <https://doi.org/10.3390/cli10070105>
- Choudhury, M.-U.-I., Emdad Haque, C., & Doberstein, B. (2021). Adaptive governance and community resilience to cyclones in coastal Bangladesh: Addressing the problem of fit, social learning, and institutional collaboration. *Environmental Science & Policy*, 124, 580–592. <https://doi.org/10.1016/j.envsci.2021.08.007>
- Choudhury, M.-U.-I., Uddin, M. S., & Haque, C. E. (2019). “Nature brings us extreme events, some people cause us prolonged sufferings”: The role of good governance in building community resilience to natural disasters in Bangladesh. *Journal of Environmental Planning and Management*, 62(10), 1761–1781. <https://doi.org/10.1080/09640568.2018.1513833>
- Das, A., Behera, S., & Das, B. (2023). Role of local governments in disaster management. In *International Handbook of Disaster Research* (pp. 1013–1033). Springer Nature Singapore.
- Djuyandi, Y., Casnoto, H., & Hidayat, W. (2019). Military operations other than war (MOOTW): Synergy of Indonesian National Armed Forces (TNI) and National Disaster Management Agency (BNPB) in disaster management. *Humanities & Social Sciences Reviews*, 7(4), 111–121. <https://doi.org/10.18510/hssr.2019.7416>
- Emerson, K., Nabatchi, T., & Balogh, S. (2011). An integrative framework for collaborative governance. *Journal of Public Administration Research and Theory*, 22(1), 1–29. <https://doi.org/10.1093/jopart/mur011>
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *International Journal of Qualitative Methods*, 5(1), 80–92.
- Fu, B., Liang, X., Wen, X., Zhang, S., & Cheng, Q. (2024). Construction of an urban collaborative emergency response network based on a disaster chain: An example of typhoon disaster in Fujian Province. *Research Square*. <https://doi.org/10.21203/rs.3.rs-4586935/v1>
- Fung, J. F., Zhang, Y., Johnson, K. J., Cook, D. T., & Sattar, S. (2023). Multidisciplinary research to advance the development of functional recovery for community resilience. *Disaster Prevention and Resilience*, 2(3). <https://doi.org/10.20517/dpr.2023.15>
- Haque, M. (2023). Paradigm shift in disaster management: Bangladesh experience. In *International Handbook of Disaster Research* (pp. 1773–1780). Springer Nature Singapore.
- Hasan, M. M. (2024, July 3). Ethical approach to disaster management and role of Bangladesh Army. *The Daily Observer*. <https://www.observerbd.com/news/503946>
- Hasnain, S. S. (2024). Location decision for earthquake relief warehouses: A study on Bangladesh with reference to the center of gravity method. In *Studies in Systems, Decision and Control* (pp. 947–955). Springer Nature Switzerland.
- Heaslip, G. E., & Barber, E. (2016). Improving civil–military coordination in humanitarian logistics: The challenge. *The Irish Journal of Management*, 35(2), 143–158. <https://doi.org/10.1515/ijm-2016-0011>
- Hedlund, E., & Alvinus, A. (2025). Building stronger ties: How constructive alignment boosts civil–military collaboration in crisis management exercises. *International Journal of Emergency Services*. Advance online publication. <https://doi.org/10.1108/IJES-03-2025-0013>
- Hossain, B. (2020). Role of organizations in preparedness and emergency response to flood disaster in Bangladesh. *Geoenvironmental Disasters*, 7(1). <https://doi.org/10.1186/s40677-020-00167-7>
- Hossain, G. M. (2021). Capacity building of Bangladesh Army Corps of Engineers in nation-building projects. *Bangladesh Journal of Public Administration*, 29(1), 89–104. <https://doi.org/10.36609/bjpa.v29i1.268>
- Hossain, I., Haque, A. K. M. M., & Ullah, S. M. A. (2024). Policy evaluation and performance assessment for sustainable urbanization: A study of selected city corporations in Bangladesh. *Frontiers in Sustainable Cities*, 6. <https://doi.org/10.3389/frsc.2024.1377310>
- Hossain, M. A. U. (2024, July 15). Bangladesh Army in managing the recent flood crisis: An analysis. *The Financial Express*. <https://today.thefinancialexpress.com.bd/print/bangladesh-army-in-managing-the-recent-flood-crisis-an-analysis-1735570586>

- Inan, D. I., Beydoun, G., & Othman, S. H. (2023). Risk assessment and sustainable disaster management. *Sustainability*, 15(6), 5254. <https://doi.org/10.3390/su15065254>
- Ishiwatari, M., Sakamoto, A., & Nakayama, M. (2023). *Accelerating quality recovery: Lessons and challenges from the Great East Japan Earthquake to war-torn Ukraine* (Vol. 1). National Institute of Standards and Technology (NIST). <https://doi.org/10.2139/ssrn.4513135>
- Jayasekara, R., Siriwardana, C., Amaratunga, D., & Haigh, R. (2022). Evaluating the network of stakeholders in multi-hazard early warning systems for multiple hazards amidst biological outbreaks: Sri Lanka as a case in point. *Progress in Disaster Science*, 14(100228). <https://doi.org/10.1016/j.pdisas.2022.100228>
- Johnson, L. A., Kiremidjian, A., Kwasinski, A., O'Rourke, T. D., Stanley, E., Yu, K., Zareian, F., Johnson, K., & Hortacsu, A. (2024). *Initial framework to design lifeline infrastructure for post-earthquake functional recovery* (Vol. 1). National Institute of Standards and Technology (NIST).
- Kabir, M. H., Sato, M., Habbiba, U., & Yousuf, T. B. (2018). Assessment of urban disaster resilience in Dhaka North City Corporation (DNCC), Bangladesh. *Procedia Engineering*, 212, 1107–1114. <https://doi.org/10.1016/j.proeng.2018.01.143>
- Kais, M. I., Mim, M. T. I., Hossain, S. S., Ahamed, M. S., Tarif, E., & Hossain, M. S. (2023). Analysis of Bangladesh earthquake data using data mining techniques. *Research Square*. <https://doi.org/10.21203/rs.3.rs-3677825/v1>
- Kaiser, Z. R. M. A., Sakil, A. H., Baikady, R., Deb, A., & Hossain, M. T. (2025). Building resilience in urban slums: Exploring urban poverty and policy responses amid crises. *Discover Global Society*, 3(1). <https://doi.org/10.1007/s44282-025-00142-3>
- Klima, K., & Jerolleman, A. (2014). Bridging the gap: Hazard mitigation in the global context. *Journal of Homeland Security and Emergency Management*. Advance online publication. <https://doi.org/10.1515/jhsem-2013-0095>
- Krogh, A. H., & Roiseland, A. (2023). Urban governance of disaster response capacity: Institutional models of local scalability. *Journal of Homeland Security and Emergency Management*, 21(1), 27–47.
- Krogh, A. H., & Røiseland, A. (2023). Urban governance of disaster response capacity: Institutional models of local scalability. *Journal of Homeland Security and Emergency Management*, 21(1), 27–47. <https://doi.org/10.1515/jhsem-2022-0005>
- Kushal, M. M. K. (2025, June 8). Bangladesh Army's role in building climate-resilient nation. *Daily Sun*. <https://www.daily-sun.com/printversion/details/814596>
- Lestari, Y. T., Rachman, R., & Syamsuddin, A. S. P. (2020). Comparative analysis of disaster management between Indonesia and Japan from regulatory and institutional aspects. *MATEC Web of Conferences*, 331, 01007. <https://doi.org/10.1051/mateconf/202033101007>
- Lin, B. C., & Lee, C. H. (2024). Assessing the efficacy of adaptive capacity-building strategies in earthquake-prone communities. *Geomatics, Natural Hazards and Risk*, 15(1). <https://doi.org/10.1080/19475705.2024.2380908>
- Lin, B.-C., & Lee, C.-H. (2022). Conducting an adaptive evaluation framework of importance and performance for community-based earthquake disaster management. *Natural Hazards*, 115(2), 1255–1274. <https://doi.org/10.1007/s11069-022-05594-3>
- Long, C. A. (2023). Military response to natural disasters: The resilience of affected nations. In *Fifth World Congress on Disaster Management: Volume IV* (pp. 169–179). Routledge.
- Maarif, S., & Puspito Sari, D. A. (2020). The characteristics of urban communities in the disaster response area (case study: Kelurahan Cawang, East Jakarta). *Humanities & Social Sciences Reviews*, 8(1), 295–305. <https://doi.org/10.18510/hssr.2020.8140>
- Mahmoud, I. H., Morello, E., Ludlow, D., & Salvia, G. (2021). Co-creation pathways to inform shared governance of Urban Living Labs in practice: Lessons from three European projects. *Frontiers in Sustainable Cities*, 3. <https://doi.org/10.3389/frsc.2021.690458>
- Malalgoda, C., Amaratunga, D., & Haigh, R. (2018). Empowering local governments in making cities resilient to disasters: Research methodological perspectives. *Procedia Engineering*, 212, 902–909. <https://doi.org/10.1016/j.proeng.2018.01.116>
- Manandhar, M., Varughese, G., Howitt, A., & Kelly, E. (2017). *Disaster preparedness and response during political transition in Nepal: Assessing civil and military roles in the aftermath of the 2015 earthquakes* (Working Paper). Harvard University.
- Mannan, S., Haque, D. M. E., & Sarker, N. C. D. (2021). A study on national DRR policy in alignment with the SFDRR: Identifying the scopes of improvement for Bangladesh. *Progress in Disaster Science*, 12(100206). <https://doi.org/10.1016/j.pdisas.2021.100206>
- Mavroulis, S., Argyropoulos, I., Vassilakis, E., Carydis, P., & Lekkas, E. (2023). Earthquake environmental effects and building properties controlling damage caused by the 6 February 2023 earthquakes in East Anatolia. *Geosciences*, 13(10), 303. <https://doi.org/10.3390/geosciences13100303>
- Michaud, J., Moss, K., Licina, D., Waldman, R., Kamradt-Scott, A., Bartee, M., Lim, M., Williamson, J., Burkle, F., Polyak, C. S., Thomson, N., Heymann, D. L., & Lillywhite, L. (2019). Militaries and global health: Peace, conflict, and disaster response. *The Lancet*, 393(10168), 276–286. [https://doi.org/10.1016/S0140-6736\(18\)32838-1](https://doi.org/10.1016/S0140-6736(18)32838-1)

- Mokhtari, M. (2023). *Natural hazards - new insights*. IntechOpen. <https://doi.org/10.5772/intechopen.104005>
- Nakahara, M. (2023). The Great Hanshin-Awaji Earthquake (1995) and the Japan Self-Defense Forces (JSDF): Changing perceptions and integration of JSDF into local communities. *E3S Web of Conferences*, 447, 04005. <https://doi.org/10.1051/e3sconf/202344704005>
- Nicolas, E. (2023). *The role of the Armed Forces of the Philippines (AFP) in disaster response and adaptation strategies to climatic disasters in Manila* (Master's thesis). Portland State University. <https://doi.org/10.15760/geomaster.28>
- Nishiyama, Y. (2014). Disaster relief activities of the Japan Self-Defense Force following the Great East Japan Earthquake. *Disaster Medicine and Public Health Preparedness*, 8(3), 194–198. <https://doi.org/10.1017/dmp.2014.46>
- NPDM. (2020). *National Plan for Disaster Management (2021–25): Action for Disaster Risk Management Towards Resilient Nation*. Ministry of Disaster Management and Relief, Government of Bangladesh. (Draft Version 5)
- Omar, M. A. I., Matsuyuki, M., Das, S., & Ubaura, M. (2021). An assessment of physical aspects for seismic response capacity in Dhaka, Bangladesh. *Progress in Disaster Science*, 10(100175). <https://doi.org/10.1016/j.pdisas.2021.100175>
- Parvin, A., Mostafa, A., & Syangadan, R. (2023). Disaster adaptive housing upgrading: Insights from informal settlements in Bangladesh and Nepal. *Journal of Housing and the Built Environment*. Advance online publication. <https://doi.org/10.1007/s10901-023-10031-3>
- Pattanaik, S. S. (2021). The Bangladesh Army: What it costs to remain apolitical. In *Oxford Research Encyclopedia of Politics*. Oxford University Press.
- Preciado, A., Ramirez-Gaytan, A., Salido-Ruiz, R. A., Caro-Becerra, J. L., & Lujan-Godinez, R. (2015). Earthquake risk assessment methods of unreinforced masonry structures: Hazard and vulnerability. *Earthquakes and Structures*, 9(4), 719–733. <https://doi.org/10.12989/eas.2015.9.4.719>
- Quader, M. A., Khan, A. U., Malak, M. A., & Kervyn, M. (2023). Mainstreaming decentralization and collaboration in disaster risk management: Insights from coastal Bangladesh. *International Journal of Disaster Risk Science*, 14(3), 382–397. <https://doi.org/10.1007/s13753-023-00495-w>
- Rahman, M. M., Asikunnaby, Chaity, N. J., Abdo, H. G., Almohamad, H., Al Dughairi, A. A., & Al-Mutiry, M. (2023). Earthquake preparedness in an urban area: The case of Dhaka City, Bangladesh. *Geoscience Letters*, 10(1). <https://doi.org/10.1186/s40562-023-00281-y>
- Ramesh, V., Anbarasan, M. I., & Muthuramu, B. (2025). Advanced strategies in earthquake-resistant structural engineering: Seismic design, materials, and innovations. *Asian Journal of Civil Engineering*, 26(4), 1413–1428. <https://doi.org/10.1007/s42107-025-01298-8>
- Rana, M. M. P. (2010). Urbanization and sustainability: Challenges and strategies for sustainable urban development in Bangladesh. *Environment, Development and Sustainability*, 13(1), 237–256. <https://doi.org/10.1007/s10668-010-9258-4>
- Rashied, M., & Mahmud, K. (2019). Tectonic setup of Bangladesh and plate boundaries. In *Geology of Bangladesh* (pp. 1-15).
- Ratmono, T. (2021). The role of Indonesian National Armed Forces (TNI) in disaster management. In *Proceedings of the 12th Annual Scientific Meeting (ASMC 2021), Universitas Jenderal Achmad Yani* (International Symposium on Emergency Preparedness and Disaster Response during COVID-19 Pandemic).
- Reis, F. A. dos. (2018). Military logistics in natural disasters: The use of the NATO Response Force in assistance to the Pakistan earthquake relief efforts. *Contexto Internacional*, 40(1), 73–96. <https://doi.org/10.1590/s0102-8529.2017400100004>
- Ries, M. (2022). Global key concepts of civil-military cooperation for disaster management in the COVID-19 pandemic – A qualitative phenomenological scoping review. *Frontiers in Public Health*, 10, 975667. <https://doi.org/10.3389/fpubh.2022.975667>
- Roy, G., Rahman, A., & Shuvra, M. M. R. (2025). Earthquake preparedness in the rural primary schools of Bangladesh. *The Educational and Developmental Psychologist*. Advance online publication. <https://doi.org/10.1080/20590776.2025.2526345>
- Rumbach, A. (2016). Decentralization and small cities: Towards more effective urban disaster governance? *Habitat International*, 52, 35–42.
- Sattar, M. A., Biswas, A. A. A., Islam, M. T., Hossain, M. A., Siddeqa, M., Rahim, M. A., Amin, M. N., Touhiduzzaman, M., Rahman, M. A., & Aktar, S. (2020). Disaster vulnerability and mitigation of humanitarian issues in coastal Bangladesh: Local evidence and knowledge gaps. *Progress in Disaster Science*, 8(100138). <https://doi.org/10.1016/j.pdisas.2020.100138>
- Sattar, S. (2021). *Recommended options for improving the built environment for post-earthquake reoccupancy and functional recovery time* (NIST GCR 21-023-NEHRP). National Institute of Standards and Technology.
- Shah, A. A., Qadri, T., & Khwaja, S. (2018). Living with earthquake hazards in South and South East Asia. *ASEAN Journal of Community Engagement*, 2(1), 15. <https://doi.org/10.7454/ajce.v2i1.105>

- Shah, I., Mahmood, T., Khan, S. A., Elahi, N., Shah Nawaz, M., Dogar, A. A., Subhan, F., & Begum, K. (2022). Inter-agency collaboration and disaster management: A case study of the 2005 earthquake disaster in Pakistan. *Jambá: Journal of Disaster Risk Studies*, 14(1), 1088. <https://doi.org/10.4102/jamba.v14i1.1088>
- Siawsh, N. M., Peszynski, K., Vo-Tran, H., & Young, L. (2021). Toward the creation of disaster-resilient communities: The Machizukuri initiative – The 2011 Tōhoku Great East Japan Earthquake and Tsunami. *Research Square*. <https://doi.org/10.21203/rs.3.rs-1082006/v1>
- Sofuoglu, Z., Başer, A., Sofuoglu, T., & Sönmez, Ö. F. (2025). First responders' experiences with major earthquakes in Türkiye: A qualitative study of innovation needs and challenges. *BMC Emergency Medicine*, 25(1), 60. <https://doi.org/10.1186/s12873-025-01217-9>
- Sousa, M. L., & Tsonis, G. (2025). National seismic risk assessment: An overview and practical guide. *Natural Hazards*. Advance online publication. <https://doi.org/10.1007/s11069-024-07008-y>
- Subagia, D., Anggoro, D. W., Maarif, S., & Utomo, S. T. (2021). Civil and military cooperation in the 2018 Lombok earthquake disaster emergency response. *IOP Conference Series: Earth and Environmental Science*, 708(1), 012097. <https://doi.org/10.1088/1755-1315/708/1/012097>
- Suparji, S., Nugroho, H. S. W., Sunarto, S., & Prayogi, A. S. (2024). Disaster preparedness culture in Japan and Indonesia: Cultural perspectives and practical implementation (a commentary). *PAMJ One Health*, 15(2). <https://doi.org/10.11604/pamj-oh.2024.15.2.45129>
- Tagarev, T., & Ratchev, V. (2018). Evolving models of using armed forces in domestic disaster response and relief. *Information & Security: An International Journal*, 40(2), 167–180. <https://doi.org/10.11610/isij.4012>
- The Federal. (2020, May 23). *After request by Bengal govt, Army deployed in cyclone-ravaged area for restoration*. The Federal News. <https://thefederal.com/states/east/west-bengal/after-request-by-bengal-govt-army-deployed-in-cyclone-ravaged-area-for-restoration>
- Trading Economics. (2025). *Bangladesh – Urban population growth (annual %)* [Data set]. <https://tradingeconomics.com/bangladesh/urban-population-growth-annual-percent-wb-data.html>
- Tusalem, R. F. (2013). Bringing the military back in: The politicisation of the military and its effect on democratic consolidation. *International Political Science Review*, 35(4), 482–501. <https://doi.org/10.1177/0192512113496683>
- UNDRR. (2024). *Ministry of Disaster Management and Relief (Bangladesh)*. PreventionWeb. <https://www.preventionweb.net/organization/ministry-disaster-management-and-relief>
- Wilson, R. K. (2012). Operation Tomodachi: A model for American disaster response efforts and the collective use of military forces abroad. *Journal of Defense Management*, 2(3). <https://doi.org/10.4172/2167-0374.1000108>
- Wolf, S. O. (2013). *Civil-military relations and democracy in Bangladesh* (SSRN Scholarly Paper ID 2773091). Social Science Research Network. <https://doi.org/10.2139/ssrn.2773091>
- Yuste, P., Campbell, J., Canyon, D., Childers, M., & Ryan, B. J. (2019). Synchronized humanitarian, military and commercial logistics: An evolving synergistic partnership. *Safety*, 5(4), 67. <https://doi.org/10.3390/safety5040067>
- Zaman, T., Tahsin, K. T., Rozario, S. R., Kamal, A. B., Khan, M. R., Huq, S., & Bodrud-Doza, M. (2022). An overview of disaster risk reduction and anticipatory action in Bangladesh. *Frontiers in Climate*, 4. <https://doi.org/10.3389/fclim.2022.944736>
- Ziari, K., Kay, S. H., & Qelichi, M. M. (2024). Analysis of factors affecting urban land use changes: A case study of Urmia City, Iran. *Research Square*. <https://doi.org/10.21203/rs.3.rs-4528684/v1>